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Promoting Interdisciplinarity in Knowledge Generation and Problem Solving



Mohammed Nasser Al-Suqri, Abdullah Khamis Al-Kindi,
Salim Said AlKindi, and Naifa Eid Saleem

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Promoting Interdisciplinarity in Knowledge Generation and Problem Solving

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The concept of interdisciplinarity has a long history but interpretations of this term and the importance of interdisciplinarity in research and education have varied over time. This chapter traces the theoretical understanding and historical development of interdisciplinarity to provide background and context for the book. First it examines the ways in which interdisciplinarity and similar phenomena have been conceptualized in the literature. A roughly chronological account of the main theoretical and empirical developments in interdisciplinarity is then set out, divided into three main periods dating from the early 20th century to the present day.

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Calls for interdisciplinarity abound across science and technology, social sciences, humanities, and arts. They also populate reports from professional societies, educational organizations, and funding agencies. Definitions of “what” interdisciplinarity is are entangled with justifications of “why” particular practices are important in a semantic web of purposes, contexts, organizational structures, and theoretical constructs. Citations to earlier literature appear throughout the chapter, but it is the first publication to present insights from the latest authoritative accounts in the 2017 edition of *The Oxford Handbook of Interdisciplinarity*. The chapter begins by describing four major drivers identified in a 2005 report on *Facilitating Interdisciplinary Research* and the current ascendancy of transdisciplinarity. It then examines controversies and problematics in three major faultlines of debate: the relationship of disciplinarity and interdisciplinarity, the status of interdisciplinary fields, and tensions between instrumentality and critique. The conclusion reflects on future directions and recommendations, noting patterns of increase alongside continuing challenges.

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Medieval Arabic translation (MedAT) played a crucial role in the formulation of the Islamic and Arab civilization. For the first time in the history of medieval Arabs, materials related to an array of multidisciplinary fields were translated, allowing the Arabs to import and master disciplines they did not have or never bothered about, and to subsequently become exporters of knowledge and their language, Arabic, the global donor of such knowledge for centuries. The glorious history of Arabic translation at medieval times put translation at the heart of society, but there is little written about the role translation in forming an interdisciplinary unique Arab culture, bringing various disciplines together. This chapter investigates the role of translation in the formation of the interdisciplinary role of translation in the Arab culture during its medieval times, particularly the Umayyad and Abbasid dynasties. It examines the position medieval Arabic translation had in transferring and diffusing new disciplines and in creating an interdisciplinary environment which nurtured the production of native knowledge.

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In the late 1980s, the Jordanian economy suffered a depression; consequently, public higher education institutions started receiving less government funding. To contain the economic crisis, Jordan underwent an economic reform which changed labor market needs. In response to these developments, Yarmouk University (YU) established global partnerships in an attempt to face the new challenges. An exceptionally successful example was the first joint program between the University of Arkansas (UA) and YU which was initiated in 1996-1999. The cooperation resulted in the establishment of the Department of Conservation and the Management of Cultural Resources which was an interdisciplinary program, faculty exchange, training programs, and collaboration on interdisciplinary research and grant proposals. This innovative endeavor helped Yarmouk University keep abreast of global changes while providing a demanding and continually changing marketplace with the best possibly trained specialists and professionals. The study explores how such a model can solve problems with stagnant specialties.

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Based on empirical studies carrying a common thread of design creativity as well as systemic analysis, interdisciplinarity's fostering of innovation is exemplified. The studies illustrate contexts for systems perspectives in design. A lot of transformation in socio-economic systems is taking place, individuals have a choice to either react to it as it happens or attempt to take the lead on change and position themselves in

the frontline or ahead of the fundamental changes that are bound to occur. Designers are well versed in the knowledge and skills necessary to lead this transformational process, requiring forward looking, focusing on problems, working across disciplines, participating in teams and leading by example and inspiration, while adopting a systems perspective and focusing on people. Systemic analysis triggers design work, through the development of solutions, as illustrated in the two cases. One concerns sustainable solutions for water management in a community. The other focuses on the production system for a Portuguese semi-artisanal certified cheese.

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In this chapter, the author describes the education for the professions in the nineteenth century, with particular emphasis on the extent to which professional education relied on the apprenticeship model rather than on formal, university-based education. The author describes how such non-standardized education was eventually brought under control after the establishment of professional associations which sought to standardize such education. With the establishment of such standards, the education of professions was eventually brought into a higher education setting where disciplinary education programs co-existed within a standardized education environment. This coexistence or colocation enabled professional education efforts to begin interacting with each other and gave rise to interdisciplinary, multidisciplinary, and transdisciplinary efforts in the preparation of professionals for the workforce. The author reports on the variety of interdisciplinary educational programs that have emerged in higher education and demonstrates the availability of professional positions that exist in the work force for new graduates with interdisciplinary and multidisciplinary educational preparation. Routes to attaining an interdisciplinary education are discussed, including student-designed interdisciplinary educational programs as well as pre-designed interdisciplinary programs in which students may enroll. The role of higher education program directors and student advisors is considered as well as their importance in enabling students to transition into interdisciplinary careers. The concepts of problem passing and problem solution are described as a means of enabling various disciplines to work together (particularly in localized settings) to generate new interdisciplinary solutions to problems, particularly in the area of the applied sciences. Suggestions for further reading are provided.

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During the last two decades, the pros and cons of applying interdisciplinary approaches in teaching have been debated endlessly. Many scholars have pointed to the favorable impact of interdisciplinary teaching on the quality of education; others have expressed reservations. In the context of an undergraduate Western literature classroom in Oman, teachers are challenged to make literary texts comprehensible and appealing to Omani English majors who have no familiarity with the Western literary tradition when they enroll in literature courses. This chapter explores the possibility of applying interdisciplinary teaching approaches in the undergraduate American literature classroom at Sultan Qaboos University (SQU). It discusses some innovative teaching methods which help create an effective teaching and learning environment. The study found, among other things, that the application of interdisciplinary methods can contribute to the development of higher order cognitive skills, broaden students' knowledge base, and heighten their sensitivity to global problems.

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Since introducing the concept integrated marketing communications (IMC) in the communication field, researchers and practitioners admitted to the interdisciplinary nature of the nascent concept. The current chapter tries to further explore the interdisciplinary concept of IMC, through subjecting IMC into in-depth analysis of its origin disciplines (Communication, Marketing and Branding). Furthermore, the paper resides to synthesize IMC empirical research in a meta-analytic framework to assert on the interdisciplinary field research trends emerging from utilizing the concept as a dependent or independent variable in different research disciplines. Finally, a case study tackling the status of Egyptian tourism after the recent political turmoil post the uprisings was assessed had the designated authorities turned to executing Integrated Marketing Communications instead of relying on temporary unfeasible solutions. A conceptual framework was proposed as a permanent solution of this matter. Employing a theoretical method and a Meta analytical method of 135 research papers, findings proved IMC to be an interdisciplinary concept. IMC research trends could be traced to three development phases with the third phase being crucially related to interdisciplinary frameworks. Thus, IMC is proved to be a viable framework to study topics related to branding, education, services and tourism.

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Interdisciplinary Relationships Between Medicine and Social Sciences..... 124

Said Saud Al-Busaidi, Khawla Hospital, Oman

The aim of medical science is treating and preventing diseases. The development of medical sciences has been influenced by developments taking place in other sciences including social sciences. Sciences including physical sciences, biological sciences or social sciences interact with each other. The interaction takes place between sciences in each category and between sciences from different categories. However, there are very few studies that deal specifically with the interaction of medicine with social sciences. As both have to work together because of the human complex nature as a result some authors considered medicine itself as a social science, thus creating an interdisciplinary environment that hosts both medicine and social sciences. This chapter reviews the complex interdisciplinarity between medicine and a number of social sciences, including anthropology, psychology, sociology, political sciences and economy.

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Linda L. Lillard, Clarion University, USA

A description of how interdisciplinary collaboration can take place is presented to frame this chapter on the risks and barriers to interdisciplinary collaboration. Beginning with a working definition of interdisciplinary collaboration, defined as jointly co-authoring a paper, academic project, or grant with somebody from another discipline or jointly creating a program that contains courses from the joint collaborators' disciplines, this chapter reviews recommendations for creating and supporting successful interdisciplinary collaborations. Included are ten simple rules for successful cross-disciplinary

collaborations put together by a group of researchers in the sciences, who more often participate in interdisciplinary collaborations than do their counterparts in the humanities and social sciences. The chapter closes with the case of issues with interdisciplinary collaboration in library and information science, an area that is truly interdisciplinary, yet often becomes the object of turf battles with other academic areas. This case provides a true-life look at just how attempts at interdisciplinary collaboration that should work, can easily backfire.

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Abdullahi I. Musa, Kaduna State University, Nigeria

This chapter examines the cultural and communicative challenges of interdisciplinary research. The author argues that to understand the nature and scope of cultural and communicative barriers to interdisciplinary research, we must focus on the link between the philosophy of science and research philosophy which shape how scholars frame empirical inquiries, determine interesting research questions, and define the choice of research methodologies and methods. The chapter examined the cultural and communicative challenges of interdisciplinary research through the philosophical perspectives of philosophy of science and research philosophy. It distinguished between main research choices: deductive and inductive and their relevance to the cultural and communicative challenges of interdisciplinary research. It also explains the epistemological, ontological and axiological positions of research and its role in understanding the cultural and communicative challenges of interdisciplinary research. It discusses how scholars are socialized into a scholarly tradition, and how scholarly tradition is perpetuated. It outlined the assumptions of contending scientific methods and how they hinder interdisciplinary research with implications for global health information and communication programs. The chapter demonstrates why it is important for global health information and communication scholars to examine and contrast the opposing scientific research paradigms with associated competing knowledge claims since each offered a different way of understanding how research should be done.

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Siraj K. K., Ibra College of Technology, Oman

Azzah Al-Maskari, Ibra College of Technology, Oman

The need for interdisciplinary studies to address the complex issues, too broad to deal adequately by a single discipline, is widely acknowledged in literature. Many issues in modern days such as climate change, food security and energy crisis, are interdisciplinary in nature. The success of interdisciplinary studies depends on ‘collaboration’ and ‘synthesizing mind’ among researchers in different disciplines. Research studies have identified disciplinary focus, assumptions, theories and practices, research design, and methodological pluralism as the major sources of conflict in an interdisciplinary context. In particular, the chapter discusses the various methodological barriers such as differing methodological approach, conflicting research findings, methodological pluralism, terminological problems, time barriers, and diverse motivations in interdisciplinary studies. Based on analysis, the chapter provides few recommendations to address methodological barriers and to promote collaboration and integration among members from various disciplines involved in interdisciplinary studies.

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<i>Iman Mohamed Zahra, Sultan Qaboos University, Oman</i>	

The objective of the current chapter is to analyze one of the most recent and successful social media campaigns namely #NotInMyName from the viewpoint of the seven dimensions of religion utilized by Van Esch and others as the main pillar of social marketing and media campaigns. Further #NotInMyName Public Relations (PR) campaign is scrutinized for PR strategies and message strategies utilized in formulating the campaign messages. To achieve that end, a qualitative analysis was implemented on three levels relating to each video and vine of the study sample: first locating the Dimensions of Religion (DOR taxonomy(ies) used in this video or vine, then emanating on the PR campaign strategies implemented in the video or vine and finally searching for the message strategies utilized in the video or vine. The major conclusion of this study was that although campaigns launched via social media lack the scientific known steps utilized to plan and launch media campaigns traditionally, those campaigns derive from the social media platform exacerbating an unprecedented power to stir political and social movements especially, regarding controversial and stagnant matters. Posts, comments and shares on different social media platforms go viral, stir discussions, and trigger public opinion both virtually and in reality. Dimensions of Religion taxonomies proved reliability as a viable platform stemming from another discipline to plan messages and to analyze campaigns based on the different aspects the model would provide. Ranging from simple aspects to more complicated aspects, Dimensions of Religion model must be subjected to further research to determine its feasibility to be applied to different campaigning structures and objectives.

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<i>Naifa Eid Saleem, Sultan Qaboos University, Oman</i>	

In a fast-changing world, which depends on science and technology, it is very hard for disciplines to remain isolated and hide away from each other. When disciplines are isolated, students' outcomes and achievements are affected negatively. A graduate will be equipped with multi skills, when disciplines interact with each other instead of just one skill when a particular discipline exists in isolation. To address this problem of graduates, many universities offer "interdisciplinary studies". This chapter discusses the "interdisciplinary studies" and their history. To discover the history of the "interdisciplinary studies", the current study aims to explore the definition of the "interdisciplinary studies", as well as their historical development. This study is a theoretical study designed to trace the history of "interdisciplinary studies". The study adopted a qualitative research methodology, as the essential purpose of the qualitative methodology is to understand reality. The findings revealed that the literature is full of studies that define "interdisciplinary studies", and all the studies that related to the "interdisciplinary studies" agreed that the "interdisciplinary studies" involve researchers from different institutes and disciplines to solve a problem that is hard to solve by a single discipline. With respect to historical development of "interdisciplinary studies", the study found that, as a term, it appeared in the 20th century, but as a practice, it is imbedded in the work of old societies, where several millennia ago, the Mesopotamians, the Egyptians, and the Greeks put interdisciplinary into practice.

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Effect of Accreditation on Quality of Teaching and Learning and Multi-Disciplinary

Collaboration: Case Study 234

Nasser Hosseinzadeh, Sultan Qaboos University, Oman

Abdullah Al-Badi, Sultan Qaboos University, Oman

Usually, so far, formal education mostly focuses on treating only strictly separated and specialized topic areas, called disciplines. However, as the need for cooperation between professionals oriented from different disciplines grows, the need for a multidisciplinary educational approach becomes more and more important. For a technical education to be completed, it is no longer enough to train scientists and engineers solely in technical areas. In development and implementation of technology-driven applications, multidisciplinary issues should be properly addressed in the academic sense. The College of Engineering at Sultan Qaboos University (SQU) has addressed this issue of multidisciplinary education by developing and offering interdisciplinary programs such as Mechatronics program, which is jointly offered by the Department of Electrical and Computer Engineering (ECE) and Department of Mechanical and Industrial Engineering (MIE), and also transdisciplinary programs such as a specialization in biomedical signals and medical devices (approved, but not yet offered at the time of writing this book chapter, 2016) and a program in agricultural engineering. Also, to make engineering graduates capable of working effectively in multidisciplinary teams, final-year projects (FYP) of multidisciplinary nature has been defined and implemented by the students under the supervision of faculty members.

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Naeema H. Jabur, Sultan Qaboos University, Oman

Abdelmajed Bouazza, Sultan Qaboos University, Oman

Soft Systems Methodology (SSM) provides an inquiry process for taking a systemic view of a problem situation, incorporating elements of intervention, social and political analysis, and then understanding of the real-world problem situation. The holistic view embodied by SSM facilitated capture of the relationships, procedures, attitudes, culture and structure of each participating organizations through thematic analysis and developing rich pictures. Furthermore, the use of SSM enabled creation of homogeneous groups of actors and system owners to go through different intervention processes. This chapter aims mainly to introduce SSM as interdisciplinary approach that can be applied in complex situation and deal effectively with different viewpoints about the definition of the problem. In the current research, reflection on the use of SSM in adoption of Web 2.0 applications in Omani academic libraries is reported. It focuses on contributions of SSM in enhancing knowledge and practice of participants and researchers through different stages of SSM. This study approves that SSM is a methodology rather than a method. A set of tools and techniques can be adapted to investigate the problematical situation and deal with complexity and different perspectives of organizational people. In this research, SSM is described by participants as a learning process that not only define the problem but also improve the situation.

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<i>Abdullah K. Al-Kindi, Sultan Qaboos University, Oman</i>	

As regards the issue of journalists' qualifications and media professionals in general in the field of media work, evidently including economics, the countries of the world are divided into two main directions: the direction of general scholastic qualification, and the trend of specialized qualitative qualification that separates work fields and distinguishes between the skills and conditions to be provided by journalists working in a specialized field. In fact, working in the field of economic journalism requires a qualitative qualification that responds to the nature and special work conditions in this area. Furthermore, when some international universities offer quality qualification programs in the field of economic journalism, the majority of Arab world media qualification institutions continue to adopt the classical approach in qualifying economic journalists. Actually, academic institutions give professional institutions, where journalists are supposed to work after graduation, the task of compensating for their lack of information and skills in deferent areas of specialization. Hence, this study presents a proposal for the establishment of an academic program between the media and economics, called "Economic Journalism", throughout which journalists specialized in economics, are trained through a university qualification program that combines journalism knowledge and its arts with the fundamentals and principles of economics. This program is suggested to be offered by Sultan Qaboos University, in the Sultanate of Oman and could be adopted by other Arab universities and could well benefit from international experiences in qualifying economic journalists so as to build an academic program model that would reflect the importance of an overlap across science disciplines. This will help in having qualified human cadres in the economic journalism. Eventually, the study is based on an analysis of the current global economic journalists' qualification trends through a close reading of the available university programs worldwide.

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Preface

Interdisciplinarity within and between the social sciences and the natural sciences has become a highly topical but also a frequently contentious issue. On the one hand, there is growing recognition that traditional disciplinary approaches are inadequate for understanding and resolving the types of complex social, economic and environmental issues that we face today (Brewer, 1999; Lach, 2013), and that integrating knowledge and methods from multiple disciplines is increasingly important for generating real-world understanding and solutions (Hills & Richards, 2013; Holland, 2006). Universities are also under pressure to adapt their academic programs to the skills requirements of today's employers, which often include the ability to work effectively in multi-disciplinary teams and use holistic approaches to problem-solving (Higher Education Academy, 2015).

In response, there has been growing interest in interdisciplinary approaches, and a recognition that these are important in contributing to improved innovation, scientific breakthroughs and create new areas of research (Hills & Richards, 2013). In some countries, such as the U.S. and the UK interdisciplinarity has in recent years been an explicit goal for governmental organizations, research councils, scientific and industry associations and academic institutions (Sá, 2008). A recent study by the Higher Education Funding Council for England (2014) found that interdisciplinary research activity is growing in intensity in the UK, in line with a global trend which often takes the form of international collaboration.

On the other hand, institutional, cultural and other barriers continue to hinder the use of interdisciplinarity both within and across the social and natural sciences. Academic institutions have been warned that they risk impairing the advancement of science and its potential contributions to society by retaining conventional organizational forms and modes of working based on disciplinary specializations, and a number of institutions have responded by implementing funding for the establishment of new interdisciplinary programs and collaborations (Creso, 2008). Yet the structural as well as the cultural shifts needed to facilitate and promote interdisciplinarity are extensive and often difficult to overcome (Sá, 2008).

Previous researchers have documented numerous barriers to and difficulties in implementing this approach, including communication problems; differences in the cultural and methodological approaches of disciplines; the challenges of managing inter-disciplinary research teams; institutional systems that do not reward individuals and research teams for collaborative or interdisciplinary work; difficulties of evaluating inter-disciplinary research proposals and completed work; and a lack of suitable funding opportunities (Sá, 2008; Feller, 2006; Mansilla et al., 2006; Lamont et al., 2006; Lach, 2013; Rylance, 2015).

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PURPOSE OF THE BOOK

The purpose of this book is to provide understanding and guidance on the effective use of interdisciplinarity, by drawing on the experience and expertise of a diverse range of contributors, including representatives of various academic disciplines; as well as funders and end users of inter-disciplinary research. The contributors were selected to represent different types of interdisciplinary projects from around the world, highlighting the broad range of circumstances in which this approach can be effectively used to solve problems and generate new knowledge.

The book has a highly practical approach, which focuses on lessons learned from interdisciplinary projects and initiatives. The book identifies and discuss effective practice in the development, implementation and use of interdisciplinarity, as well as the examples of the difficulties and challenges encountered in real-life projects and how these have been overcome.

SIGNIFICANCE OF THE BOOK

As long ago as the 1992 Rio Conference, the convergence of social, economic and environmental issues was identified as the highest global priority (Brewer, 1999), and one that requires the integration of multiple disciplines for effective understanding and problem solving. Rapid advances in information and communications technologies have facilitated collaborative working and the use of “big data” which cuts across traditional disciplines (Marrar, 2016). Budget constraints mean that funders are increasingly likely to favor research providers that offer integrated, multi-perspective approaches to generate practical usable solutions (Feller, 2004; Hills and Richards, 2013). Students as consumers are also increasingly demanding more interdisciplinary programs to reflect the needs of the labor market; to date, numbers of multi-disciplinary programs have been gradually expanding, but there are reported to be very few genuinely interdisciplinary academic programs available worldwide (Davidotch & Roman 2015).

On the whole, academic institutions have been slow to adopt interdisciplinarity in education and research, remaining largely organized by traditional disciplines and constrained by administrative structures that hinder this approach. In order to adapt to the changing external environment and the demands of funders, industry and students alike, there is a need for improved understanding of both the benefits and the potential difficulties of inter-disciplinary approaches, and for best practice guidance on “what works” in interdisciplinarity and how to achieve this.

ORGANIZATION OF THE BOOK

The book is divided into four sections, each containing a number of chapters reflecting different perspectives and experiences which are related to the theme of that section. Case studies from around the world are included to highlight successful examples of interdisciplinarity, from which key lessons are drawn about effective practices and overcoming challenges.

The first section of the book is titled “What is Interdisciplinarity and Why Does It Matter?” It is devoted to describe and discuss the nature of interdisciplinarity and why it is important. This section contains four chapters.

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The first chapter of the first section of the book is written by Mohammed Al-Suqri and Salim AlKindi and it traces the theoretical understanding and historical development of interdisciplinarity to provide background and context for the book. First it examines the ways in which interdisciplinarity and other similar issues have been conceptualized in the literature. A roughly chronological account of the main theoretical and empirical developments in interdisciplinarity is then set out, divided into three main periods dating from the early 20th century to the present day.

Klein in Chapter 2 discusses the current drivers of interdisciplinarity. She begins by describing four major drivers identified in a 2005 report on Facilitating Interdisciplinary Research and the current ascendancy of transdisciplinarity. She then examines controversies and problematics in three major faultlines of debate: the relationship of disciplinarity and interdisciplinarity, the status of interdisciplinary fields, and tensions between instrumentality and critique. The conclusion of this chapter reflects on future directions and recommendations, noting patterns of increase alongside continuing challenges.

Chapter 3 deals with one of the important issues of how translation served as a platform for interdisciplinary interaction. In this chapter, Musallam Al-Ma'ani focusses on a crucial period of the Arab history, medieval times. At a time when the Arabic language was rich in poetic and religious matters, translation allowed the Arabs during the Umayyad dynasty to come in contact with Greek, allowing various disciplines to enter the Arab nationhood. It also continued to do so during the Abbasid times, where more sciences were transferred and developed through translation, creating a unique culture of interdisciplinarity at the time.

Chapter 4 is the last in this section. The chapter documents a uniquely successful interdisciplinary program between Yarmouk University in Jordan and the University of Arkansas at Fayetteville, USA and describes its creation and evolution. It also details the goals, deliverables, and challenges of the joint program and explores what was crucial for its success. Collaborative efforts were initiated in 1996 and officially continued until 1999, resulting in the establishment of the Department of Conservation and the Management of Cultural Resources at Yarmouk University, student and faculty exchanges, training programs, and coordinated interdisciplinary research and grant proposals. Both institutions also created graduate programs in CRM. The international partnership was of great benefit to both Yarmouk University and its American counterpart as it led to technology and knowledge transfer in addition to skills training and the engagement of stakeholders.

Section 2 of the book deals with the potential benefits and opportunities provided by interdisciplinarity approaches and includes five chapters. The first chapter of this section is Chapter 5 which aims to advance the understandings of systemic analysis. It demonstrates how systemic analysis triggers design work, through the development of solutions. This is illustrated through two case studies (the first one concerns sustainable solutions for water management in a community and the second one focuses on the production system for a Portuguese semi-artisanal certified cheese: *Serra da Estrela* PDO cheese). Both studies illustrate contexts for systems perspectives in design, as transformational processes, requiring forward looking, focusing on problems, working across disciplines in teams and exercising creativity in solution generation, while focusing on people.

In Chapter 6, William Buchanan traces the characteristics of the new labor market. He starts the chapter by describing the education for the professions in the nineteenth century, particularly focusing on the extent to which professional education relied on the apprenticeship model rather than on formal, university-based education. Then, he describes how such non-standardized education has been eventually

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brought under control after the establishment of professional associations which sought to standardize such education. With the establishment of such standards, the education of professions was eventually brought into a higher education setting where disciplinary education programs co-existed within a standardized education environment. This coexistence or colocation enabled professional education efforts to begin interacting with each other and gave rise to interdisciplinary, multidisciplinary, and transdisciplinary efforts in the preparation of professionals for the workforce. The author reports on the variety of interdisciplinary educational programs that have emerged in higher education and demonstrates the availability of professional positions that exist in the work force for new graduates with interdisciplinary and multidisciplinary educational preparation. Routes to attaining an interdisciplinary education are discussed, including student-designed interdisciplinary educational programs as well as predesigned interdisciplinary programs in which students may enroll.

Benefits of interdisciplinary teaching is further elaborated in Chapter 7. The chapter describes how the application of an interdisciplinary approach in an American literature classroom in Oman can assist in the teaching of American literature to undergraduate students who have no grounding in the Western literary tradition. The chapter explores how the application of interdisciplinary teaching approaches in a literature course at Sultan Qaboos University (SQU) can help create an effective teaching and learning environment. Since teachers encounter various challenges when teaching Western literature to foreign language learners with minimal or no knowledge the foreign literary tradition, finding ways to make the course material comprehensible and interesting is an important part of the classroom pedagogy a teacher needs to consider. The case study found that the application of interdisciplinary methods can help achieve certain important learning outcomes such as the development of higher order cognitive skills, broadening students' knowledge base, and heightening their sensitivity to global issues.

Chapter 8 of Section 2 elaborates on one of the challenges facing interdisciplinary research; that is adopting a model from a different discipline to analyze a communication campaign. The paper in hand utilizes the seven dimensions of religion to analyze one of the most recent and successful social media campaigns namely #NotInMyName. Residing to dimensions of religion whilst breaking the campaign theme into its seven taxonomies justifies the validity of seeking other sciences to study communication. Moreover, the research applies public relations strategies and message strategies utilized in formulating campaign messages to figure out the essence of the current campaign. A qualitative analysis is implemented on the study sample composed of all videos and vines posted via social media accounts of the hashtag campaign. The major findings of the current research proves that dimensions of religion taxonomies pose themselves as viable platforms rooted in another discipline to plan messages and to analyze campaigns based on the different aspects the model would provide. The experiential and emotional dimension turns out to be the most salient taxonomy appearing through the whole study sample. The campaign is discovered to be built upon the offensive reactive strategies, the defensive reactive strategies and finally the rectifying behavior reactive strategies. Ethos, logos and pathos message strategies appear to be consistent throughout the campaign.

The interdisciplinary relationship between medicine and social sciences is the topic of the last chapter (9) in Section 2. In this chapter the author argues that there are broad, multifaceted interdisciplinary relations between medicine and social sciences. This interaction is the result of human nature where the physical component cannot be separated from social and psychological components. Medicine interacts with almost every social science: anthropology, sociology, economy, political sciences and so on. Social

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sciences promote direct and control the progress of medicine in order for the people to have a better live. This chapter reviews the complex interdisciplinarity between medicine and a number of social sciences, including anthropology, psychology, sociology, political sciences and economy.

Section 3 of the book discusses the role of interdisciplinary education and contains four chapters. Institutional Barriers and risks is the topic of the first chapter (10) in this section. Beginning with a working definition of interdisciplinary collaboration, defined as jointly co-authoring a paper, academic project, or grant with somebody from another discipline or jointly creating a program that contains courses from the joint collaborators' disciplines, this chapter reviews recommendations for creating and supporting successful interdisciplinary collaborations. Included are ten simple rules for successful cross-disciplinary collaborations put together by a group of researchers in the sciences, who more often participate in interdisciplinary collaborations than do their counterparts in the humanities and social sciences. The chapter closes with the case of issues with interdisciplinary collaboration in library and information science, an area that is genuinely interdisciplinary in nature, yet often becomes an object of turf battles with other academic areas. This case provides a true-life look at how attempts at interdisciplinary collaboration that should work can easily backfire.

Next come in the third section of the book is the cultural and communicative barriers to interdisciplinary research covered in Chapter 11. In this chapter, Abdullahi Musa aims to advance the understandings of cultural and communicative challenges of interdisciplinary research through the philosophical perspectives of philosophy of science and research philosophy. He distinguishes between main research choices: deductive and inductive and their relevance to the cultural and communicative challenges of interdisciplinary research. He also explains the epistemological, ontological and axiological positions of research and its role in understanding cultural and communicative challenges of interdisciplinary research. He discusses how scholars are socialized into a scholarly tradition, and how scholarly tradition is perpetuated. He outlines the assumptions of the scientific method and how they might hinder interdisciplinary research. Finally, the author demonstrates why it is important to examine and contrast the competing scientific research paradigm with competing knowledge claim, since each offers a different way of understanding how research should be done.

Chapter 12 encompasses methodological barriers to interdisciplinary education. It discusses the various methodological barriers such as differing methodological approach, conflicting research findings, methodological pluralism, terminological problems, time barriers, and diverse motivations in interdisciplinary studies. The chapter concludes by providing recommendations to address methodological barriers and to promote collaboration and integration among members from various disciplines involved in interdisciplinary studies.

The last chapter (13) in this section of the book discusses in detail the benefits and opportunities of interdisciplinary concepts through focusing on the nascent interdisciplinary concept Integrated Marketing Communications (IMC). The researcher gets off to explore the interdisciplinary concept of IMC, via an in-depth analysis of its origin constituents (Communication, Marketing and Branding). As a next step, the paper analyzes IMC's empirical research in a meta-analytic framework to discover interdisciplinary field research trends. The final step presents a case study of the status of Egyptian tourism after the recent political turmoil hit Egypt in the aftermath of the Arab spring revolutions via executing Integrated Marketing Communications; to set a conceptual comprehensive model as a solution of the current state of affairs. The research uses a theoretical method and a Meta analytical method of 135 research papers.

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Major findings prove that IMC is in fact an interdisciplinary concept. IMC research trends are traced back to three development phases with the third phase being crucially related to interdisciplinary frameworks. Finally, the viability of IMC to be a framework utilized to study topics related to branding, education, services and tourism is extensively elaborated; taking the tourism case study as a live proof.

The last section (4) of the book deals with the role of interdisciplinary education and contains four chapters. The first chapter (14) is by Naifa Eid Saleem and it discusses the historical developments of interdisciplinary studies. In her chapter, Naifa attempts to review the development of interdisciplinary studies over the history. Based on a review of literature, she revealed that the term appeared in the 20th century, but as a practice, it is imbedded in the work of old societies, where several millennia ago, the Mesopotamians, the Egyptians, and the Greeks put interdisciplinary into practice.

Chapter 15 by Hosseinzadeh and Al-Badi, focuses on the need for a multidisciplinary educational approach which has become more and more important and it should be properly addressed in the academic sense. The researchers present the experience of the College of Engineering at Sultan Qaboos University (SQU) in addressing this issue of multidisciplinary education by developing and offering interdisciplinary programs such as Mechatronics program, which is jointly offered by the Department of Electrical and Computer Engineering (ECE) and the Department of Mechanical and Industrial Engineering (MIE), and also transdisciplinary programs such as a specialization in biomedical signals and medical devices and a program in agricultural engineering.

Soft Systems Methodology (SSM) is the topic of Chapter 16. SSM is one of the prominent research approaches for understanding issues that involve perceptions of human beings and it creates interdisciplinary relations among different disciplines. This chapter attempts to introduce SSM as an interdisciplinary approach. The methodology has been applied in a four-year project on using Web 2.0 applications in Omani academic libraries. This project encompassed both human and technical aspects. People of Omani universities of different levels were involved in all the stages of SSM and their reflections were reported. In addition, the authors of the project reported the different processes of using the methodology and the learning and improvement that were achieved by the end of the project.

The last chapter (17) of this book is written by Abdullah Al-Kindi. In this chapter, Al-Kindi proposes an interdisciplinary academic program between the media and economics called “Economic Journalism.” The program is suggested to be offered by Sultan Qaboos University, in the Sultanate of Oman, and could be adopted by other Arab universities and could well benefit from international experiences in qualifying economic journalists so as to build an academic program model that would reflect the importance of an overlap across science disciplines.

The book is designed to appeal to a wide segment of audience in the academic, governmental and business sectors, both regionally and internationally. The practical focus means that it will be particularly well suited to those directly responsible for the design, implementation and management of interdisciplinary initiatives in both education and research.

It is believed that the book will be a useful and complementary addition to the existing literature in this area, which for example has traced the chronological development of interdisciplinarity and the issues encountered over time (Graff, 2015), documented the current state of knowledge and practice in this area (Frodeman & Klein, 2010) and explored specific aspects of interdisciplinarity (Davidotch & Roman 2015; Hills and Richards, 2013). The book will contribute additional value and knowledge to this area by pulling together a diverse range of informed perspectives on interdisciplinarity, and a wealth of

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practical guidance on developing, implementing and managing interdisciplinary approaches, programs and projects, drawn from multiple countries and contexts. It is expected that the book will become a highly valued resource within education and training in the area of Interdisciplinarity.

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Section 1

What Is Interdisciplinarity and Why Does It Matter?

Chapter 1

The Theoretical Foundations and Historical Development of Interdisciplinarity

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ABSTRACT

The concept of interdisciplinarity has a long history but interpretations of this term and the importance of interdisciplinarity in research and education have varied over time. This chapter traces the theoretical understanding and historical development of interdisciplinarity to provide background and context for the book. First it examines the ways in which interdisciplinarity and similar phenomena have been conceptualized in the literature. A roughly chronological account of the main theoretical and empirical developments in interdisciplinarity is then set out, divided into three main periods dating from the early 20th century to the present day.

INTRODUCTION

Interdisciplinarity as a concept has a long history, though there has rarely been much consensus about what it means in practice. This chapter examines the ways in which this interdisciplinary has been conceptualized in the literature, the theories that have been developed to explain the phenomenon, and historical developments in interdisciplinary policy and practice both in the United States and Europe. The related concepts of multidisciplinary and transdisciplinarity are also discussed, in order to help define the conceptual boundaries of interdisciplinarity and to highlight the ways in which these terms have been by previous researchers and how they relate to interdisciplinarity. In tracing the historical development and the theory of interdisciplinarity, some key drivers of growth in this practice are identified, as well as some of the factors that have prevented or hindered its further expansion.

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The Theoretical Foundations and Historical Development of Interdisciplinarity

CONCEPTS AND DEFINITIONS

Understanding interdisciplinarity requires an appreciation of the ways in which a number of related concepts have been conceptualized in the literature. Specifically, the following sub-sections first examine the nature of disciplines, followed by an exploration of interdisciplinarity as it has been defined by researchers and distinguished from the similar concepts of multidisciplinary and transdisciplinarity.

Disciplines

Since interdisciplinarity describes various forms of research and teaching that straddle disciplinary boundaries, it is first important to understand what a discipline consists of. Most authors concur that a discipline refers to a field of academic study that has its own distinctive approach for identifying and solving problems. According to Kuhn (1974), for example, any discipline has three key components: symbolic generalizations, models and exemplars, which define the problems addressed by practitioners in that community, the ways they solve them and the types of solutions reached. Similarly, Klein (1990) argues that disciplines can be identified in terms of the particular worldview they hold, which limit the types of questions asked, the methods used and the criteria used to evaluate the validity of findings. Aldrich (2014) explains that a discipline usually has its own “professional organizations, conferences, publications, standards, academic job market, and so on” (p.6), and, crucially, “defines the appropriate membership of the relevant scientific community from which to draw those who give their assent via peer review” (p14).

There are numerous disciplines within the social and natural sciences. The social sciences, for example, include sociology, psychology, demography, economics, politics, law, and social anthropology, while the natural sciences incorporate biological science, chemistry, mathematics, the earth sciences, and physics, to name but a few. Disciplines have often been conceptualized in terms of a hierarchy (e.g. Bertalanffy, 1973; Comte, 1835; Faber & Scheper, 1997), based on the level of generality or unit they are concerned with analyzing, with the natural sciences at the lower levels of the hierarchy and the social sciences at the higher levels. As Aldrich (2014) observes, although disciplines rarely possess any formal structural or institutional identities, nonetheless they represent quite “stable and robust ways of organizing knowledge (p.18). At the same time, this means that they are associated with methodological and intellectual “boundaries” which can hinder their value for addressing real life research problems (Aldrich, 2014).

Interdisciplinarity, Multidisciplinary, and Transdisciplinarity

Because disciplines have inherent limitations in their ability to address issues that cut across subject fields, it has long been common practice for disciplinarians to collaborate with others, in organizational arrangements variously defined in the literature as interdisciplinarity, multidisciplinary or transdisciplinarity. The term *interdisciplinarity* is sometimes used in a generic way to refer to all these different cross-disciplinary approaches to knowledge generation (Barry and Born, 2013; Frodeman & Klein, 2017). For example, the Organization for Economic Cooperation and Development (OECD) (1972) described interdisciplinarity as encompassing a range of ways of working across disciplines, from “the simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organisation of research and education in a fairly large field” (pp. 25-26). In this broad sense, there is a great deal of diversity in approaches to interdisciplinarity,

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with approaches ranging “from borrowing to problem solving” (Graff, 2015, p.3). In this generic sense, therefore, interdisciplinarity incorporates what is often more specifically referred to as multidisciplinary or transdisciplinarity.

The term multidisciplinary is most often to refer to collaboration or co-working across disciplines for the purpose of addressing a particular research problem when there is little or no integration of disciplinary approaches (Barry & Born, 2013; Kühnle & Dekkers, 2012). In other words, the methods, ideas and subject matter of the different disciplines are used in a complementary way to solve the problem, but no new forms of knowledge are generated (Holland, 2006). This is perhaps the most common form of cross-disciplinary working to this day, largely because of the relative ease with which such arrangements can be established and disbanded to meet project needs, but one that does not fully exploit the potential of interdisciplinarity in providing new, creative ways of addressing research issues.

At the other extreme, the term transdisciplinarity has been used to describe forms of interdisciplinarity that do generate new forms of knowledge. Definitions of this vary from the advanced synthesis of knowledge which “transcends disciplinary boundaries” (Nowotny, Scott & Gibbons, 2001) to any new form of knowledge that is co-produced across disciplines or in collaboration with non-academic actors such as government stakeholders or industry specialists (Frodeman and Klein (2017)). The latter approach has been described as the generation of *Mode 2* knowledge (Gibbons et al., 1994; Nowotny et al, 2001) in contrast with the more traditional *Mode 1* knowledge production, which is primarily academic and generated within disciplinary boundaries. Transdisciplinarity is usually associated with applied research, and emphasizes “experience-based context-specific knowledge” just as much as academic knowledge (Newell, 2013, p.35). Similarly, Klein notes that transdisciplinarity has an applied focus in which research problems are defined outside disciplinary boundaries, and is characterized by “closer interaction among scientific, technological and industrial modes of knowledge production” (Klein, 1996, p.144).

In contrast, the term interdisciplinarity is often used to refer to types of cross-disciplinary working that involve at least some degree of integration of the paradigms and methods associated with relevant disciplines. By the end of the 20th century, this had become the most commonly accepted approach to defining interdisciplinarity, as encapsulated in the following description put forward by The National Academy of Sciences (2004):

A mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or field of research practice. (p.2)

In an advanced form, this type of interdisciplinarity is what Aldrich (2014) describes as the integration of ideas and methods from separate disciplines into a “single, new, intellectually coherent whole”. Similarly, Meek & Newell, 2005 observe that interdisciplinary integration of this type “replaces the reductionist thinking of the disciplines with holistic thinking” (p.330). However, this approach to interdisciplinarity can still generally be distinguished from transdisciplinarity. This is because the respective disciplinary specialists continue to work within their conventional paradigms and methodological approaches, while at the same time developing new collaborative approaches and knowledge in a “dual agenda” type of arrangement (Palmer, 1999). This can work, according to Lach (2013), because all natural and social scientists share a common understanding that a scientific or “systematic, skeptical, analytical and ethical” approach (p.88) is essential in research even though their specific ways of achieving this may differ.

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As documented later in the chapter, interdisciplinarity often results in the emergence of completely new disciplines (or “interdisciplines”) if there is sufficient common ground as well as a significant knowledge gap at the interface of existing disciplines (Rader, 2012).

However, there is no single form of interdisciplinarity and researchers have conceptualized this in different ways. For example, Klein (1996) identified three different approaches to interdisciplinarity, characterized by the extent of integration involved, and broadly corresponding to what others have referred to as multidisciplinary, interdisciplinarity and transdisciplinarity respectively. These consisted of a) instrumental interdisciplinarity, also referred to as “bridge building” and involving the establishment of mere connections between disciplines; b) epistemological interdisciplinarity, which involves restructuring the ways in which knowledge is organized within and across disciplines, and c) transdisciplinarity which involves a move towards greater coherence, unity and simplicity of knowledge by breaking down disciplinary boundaries in the ways it is created.

Building on earlier definitions proposed by von Bertalanffy (1973) and based on the hierarchy of sciences approach, Faber & Scheper (1997) distinguished between four main types of interdisciplinarity arising in the social sciences. The first involves the integration of theories with those from disciplines in other layers of the hierarchy, such as biology, which Faber & Scheper (1997) referred to as “reductionist interdisciplinarity”. The second relates to the integration of micro and macro theories within the social sciences, which is defined as “micro-macro interdisciplinarity”. The third relates to the integration of theories addressing different aspects of the same unit of analysis, such as sociology and anthropology, which they refer to as “lateral interdisciplinarity”. The fourth type relates to the integration of theories within the same discipline, defined by Faber & Scheper (1997) as “intradisciplinarity”.

As Frodeman and Klein (2017) point out, the terms interdisciplinarity and transdisciplinarity have held different meanings over time and by different groups. In particular, the Anglo-American academies of science have tended to focus more on the concept of interdisciplinarity, while the concept of transdisciplinarity has figured more extensively in other European countries. As a result, the meanings associated with these concepts, and with the term multidisciplinary, often overlap. With this in mind, the following sections trace the theoretical and historical development of interdisciplinarity, broadly defined, from the early 20th Century to the present day.

HISTORY AND THEORY OF INTERDISCIPLINARITY: EARLY TWENTIETH CENTURY

The concept of interdisciplinary reportedly dates back to the first decades of the 20th Century and by the 1930s the term was being used by bodies such as the United States’ Social Science Research Council to refer to research involving more than one discipline (Klein, 1996). The increasing adoption of this approach was influenced at this time by developments in the humanities and social sciences in Europe. For example, French historian Henri Berr (1863-1944) promoted the idea of “historical synthesis” in which various disciplines would be combined to provide a better understanding of society, while in Germany Lamprecht put forward the concept of “cultural history” incorporating aspects of psychology, sociology, anthropology and art history in a more “systematic and scientific approach to interdisciplinary research” (cited in Abushouk & Zweiri, 2016, p.x). The ideas of these early theorists contributed to the establishment in 1929 of the journal *Annales* as “an intellectual platform for dialogue between various

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social sciences”, reportedly a source of inspiration for early 20th century advocates of interdisciplinarity in both the Anglo-American and the European social science communities (Abushouk & Zweiri, 2016).

In the pre World War II period, however, interdisciplinary activity in the United States was more evident in the field of education than in research, as a response to the growing perception that university programs in the United States needed to be more relevant to the needs of society (Szostak, 2008). In this context, two important new fields of interdisciplinary studies emerged in the 1930s and 1940s, Area Studies and American Studies (Klein, 1996). In the research domain, the earliest forms of interdisciplinarity in the 1920s and 1930s generally took the instrumental or “bridge building” approach identified by Klein (1996). In particular, the social sciences were increasingly borrowing quantitative methods from the natural sciences in order to apply a more systematic approach to the study of society, but with little critique of these methods or critical reflection on the choice of problems to be addressed (Klein, 1996).

This began to change to some extent in the post-World War Two era, with the emergence of new interdisciplinary fields such as mass communications, which straddled basic and applied research and drew on different disciplinary approaches to address complex issues (Aldrich, 2014; Kane, 2016). At this time, private foundations provided the majority of funding for research, and these played a big part in the promotion of interdisciplinary approaches (Aldrich, 2014). A more epistemological approach was also emerging in the social sciences, in which interdisciplinarity was seen as a theoretical issue linked with the growing need for a more unified approach to generating knowledge. A certain amount of restructuring of disciplines along with the creation of “new integrative categories” (Klein, 1996) was characteristic of this period, with the emergence for example of the field of behavioral science as well as cross-cutting concepts such as “area, information, communication, decision-making, role and status” (cited in Klein, 1996, p. 11). Within the United States, the emphasis on interdisciplinarity declined in the late 1950s as federal research funding focused on disciplinary fields became more important (Kane, 2016), only to re-emerge a decade or so later.

HISTORY AND THEORY OF INTERDISCIPLINARITY: LATE TWENTIETH CENTURY

The late 1960s and early 1970s saw a considerable expansion of inter-disciplinary approaches in education, with the emergence of new fields of knowledge such as American Studies and Women’s Studies as well as universities founded on the basis of interdisciplinary principles (Klein, 1996). Multidisciplinary programs became very popular, but within these programs the disciplines were often taught quite separately, with little integration of their knowledge or methods. In 1979 the Association for Integrative Studies (now the Association for Interdisciplinary Studies) (AIS) was established. This was largely a response to the observation by the founders of the Association that many interdisciplinary academic programs involved no real integration of disciplines and that there was a need to actively promote the exchange of ideas between all the arts and sciences, both in the U.S. and internationally.

In general, the main focus of interdisciplinarity at this time continued to be on educational programs. The late 1960s and early 1970s were also a time in which a number of theories were put forward about the nature of interdisciplinarity, mostly from a systems and structuralist perspective. Bertalanffy (1973), for example, used a systems theory approach to argue for interdisciplinary theory formation (Faber & Scheper, 1997), while the developmental psychologist Piaget called for the use of transdisciplinarity

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that would allow research to be “placed within a total system without any firm boundaries between disciplines” (1972, p. 138). Two specific theories of interdisciplinarity, which later fell out of use for being too simplistic, nonetheless had an influence on the growth of interdisciplinary approaches at this time.

First, Campbell’s fish scale model (1969, p.4) was developed to show the ways in which “interdisciplines” develop to fill the gaps between existing disciplines and interdisciplines (Figure 1).

Each scallop in the bottom row of this model represents a different discipline while those in the higher rows represent an “interdiscipline”. Using this model, Campbell theorized that interdisciplinarity is a means of addressing knowledge gaps that existing disciplines or interdisciplines are not able to fill. The new interdisciplines draw information, methods, perspectives and theories from existing disciplines and integrate them into a new approach (Campbell, 1969).

According to Newell (2013) Campbell views interdisciplinarity as a systemic rather than an intentional approach, which “retains the reductionist mindset and the goal of producing basic knowledge ... that characterizes the disciplines” (p.27). This contrasts with more recent perspectives that have focused on interdisciplinarity as a deliberate approach to solving complex problems. Newell argues that the dominance among many leading academics of this conception of interdisciplinary was largely responsible for the discontinuation of many interdisciplinary studies programs in the early 21st century (Newell, 2013).

The second influential theory of interdisciplinarity put forward at this time was Jantsch’s (1972) Hierarchy of Studies Transcending Disciplinarity (1972).

As shown in Figure 2, this conceptualized interdisciplinarity as one of several cross-disciplinary ways of generating knowledge based on increasing cooperation and coordination. Jantsch (1972) defined

Figure 1. Campbell’s fish-scale model of interdisciplinary studies (reproduced from Newell, 2013)

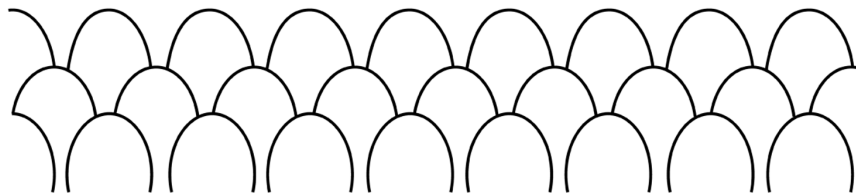
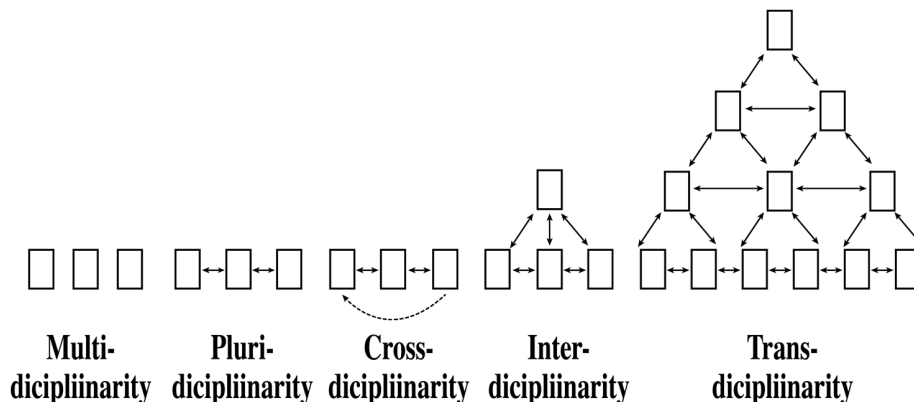


Figure 2. Jantsch’s (1972) Hierarchy of Studies Transcending Disciplinarity (reproduced from Newell, 2013)



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coordination as the deliberate control of a group of disciplines from a higher level in the hierarchy, and cooperation as involving collaboration between disciplines on the same level (Newell, 2013). Based on these definitions, multidisciplinary was viewed as a state in which disciplines work side by side to pursue their own goals, with no coordination or cooperation involved. Pluri-disciplinarity involves some collaboration between disciplines as they pursue their separate goals, but no overall coordination of this process. In cross-disciplinarity, one discipline imposes its goals and approaches to knowledge generation on others at the same level. Interdisciplinarity is defined as the situation that exists when a coordinating actor at a higher level modifies a group of disciplines so that they continue to pursue their own goals but also a shared higher level purpose, and adopt “compatible terminology” to facilitate this process (Newell, 2013). Finally, transdisciplinarity is seen to exist when the overall coordinating group makes further modifications to lower level disciplines so that they “think as well as speak compatibly” and in which the “bi-level interdisciplinary clusters are combined into a multi-level cluster of clusters that includes all disciplines and addresses all socially relevant problems”(Newell, 2013, p.27). In this way, the model viewed inter-disciplinary studies as an organizing principle, rather than a way of thinking. A key difference between this and Campbell’s model is that Jantsch viewed interdisciplinarity as an intentional activity focused on solving societal problems, and not on basic knowledge generation. The model thus distinguishes between interdisciplinarity as a way of organizing disciplines to address specific social problems and transdisciplinarity as a way of organizing disciplines and inter-disciplinary clusters to “address the full array of knowledge needs of society”. (Newell, 2013, p.28).

By the 1980s, interdisciplinarity was generally being equated with the integration of disciplinary approaches to create new knowledge. Newell and Green (1982) formalized this in theoretical terms by defining interdisciplinary studies as “inquiries which draw critically on two or more disciplines and which lead to an integration of disciplinary insights (Newell & Green, 1982, p.24). Klein (1990) put forward the idea of “disciplined interdisciplinarity”. stressing the important point that research should be “prospectively designed within the methodological paradigms of both fields.

In the early 1980s the concept of interdisciplinarity as a means of solving real world problem was also given a boost by the 1982 OECD declaration that interdisciplinarity *exogenous* to the university should be prioritized above *endogenous* university interdisciplinarity. This meant that academic institutions should use interdisciplinary approaches as a means of achieving their social mission of addressing real world problems, rather than working within traditional disciplinary boundaries. Klein (1996) argued that this view was oversimplified, since real life is not naturally interdisciplinary but a “neutral assortment of phenomena that are ordered through human thought and action” (p.12), and in the way that it narrowly equated “endogenous” with the unity of science. In any case, a number of interdisciplinary and multidisciplinary programs in education and research fell victim to economic pressures in the late 1970s and 1980s and were discontinued (Klein, 1996).

On the whole, however, interdisciplinarity continued to expand in the late 20th century, and the approach was increasingly seen as a means for improving the accountability of research to society especially as public funds were increasingly used to fund research programs (Barry and Born, 2013; Frodeman & Klein, 2010). Reflecting on this period, Nowotny et al. (2003) observed a shift from what they defined as *Mode 1 science* to *Mode 2 knowledge production*, involving a) the growth of transdisciplinary research, b) the emergence of new forms of quality control which undermine disciplinary forms of evaluation, c) the emergence of a “culture of accountability” which was gradually displacing the autonomy of science, d) the growing importance of applied research, and 5) an increasing diversity of sites from which knowledge was being generated.

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Many new interdisciplinary fields were also emerging at this time, in a process which Filemyr (1999) observes often reflected the “social, political and economic struggles of groups historically excluded or marginalized by the dominant discourse.” (p.8). These included, for example women’s studies, environmental studies, peace studies and African-American studies (Aram, 2004). There was a reported growth of almost 75% in the number of interdisciplinary programs at American colleges and universities between 1985 and 1995 (Payne, 1998) and a documented increase in numbers of graduates of these programs from 7,000 in 1973 to 30,000 in 2005 (Davidotch & Roman, 2015). It must be kept in mind, however, that “interdisciplinary studies” has often been applied within education as an umbrella term encompassing a broad range of programs, many of which are multidisciplinary rather than truly interdisciplinary in nature.

Although European countries such as the United Kingdom were lagging behind the U.S. in the adoption of interdisciplinary education, interdisciplinary research was becoming increasingly popular in these settings as a new century dawned. This was reflected in the publication of a number of important government publications promoting this approach, including a report of the German Science Council (Wissenschaftsrat, 2000, cited in Barry & Born, 2013) on restructuring the social sciences, and the United Kingdom’s HM Treasury report (2006) which put interdisciplinarity at the center of the government’s research strategy (cited in Barry & Born, 2013). In the United States, similar messages were conveyed by the publication of the Gulbenkian Commission’s report on restructuring the social sciences (Wallerstein, 1996, cited in Barry & Born, 2013).

Despite these important developments, many of the changes actually occurring were predominantly in the form of multidisciplinary, or juxtaposition rather than integration of the disciplines. Klein (1990) observed that the disciplinary approach to education and research remained dominant, and researchers were still working on problems originating from their own specialist perspectives rather than adopting the concepts and method of other disciplines.

RECENT DEVELOPMENTS

By the beginning of the 21st century, it was generally acknowledged that traditional disciplinary approaches alone are inadequate for understanding and resolving the types of complex social, economic and environmental issues we now face (Bader, & Zotter, 2012; Brewer & Lovgren, 1999; Lach, 2013). As a result, interdisciplinary approaches in both education and research have become “mainstream” and seen to play a role in generating real-world understanding and solutions (Hills & Richards, 2013; Holland, 2006; Szostak, 2008), and there are increased demands for research and funding organized on a multidisciplinary, transdisciplinary or interdisciplinary basis (Lach, 2013). Budget constraints also mean that funders are increasingly likely to favor research providers that offer integrated, multi-perspective approaches to generate practical usable solutions (Feller, 2004; Hills and Richards, 2013). Additionally, universities are now under pressure to adapt their academic programs to the skills requirements of today’s employers, which often include the ability to work effectively in multi-disciplinary teams and use holistic approaches to problem-solving (Higher Education Academy, 2015).

Another recent development that is driving the use of interdisciplinary approaches in research, as highlighted by Frodeman and Klein (2017), is the growing importance of knowledge processes in society as a whole. This is related to advances in information and communications technologies, which are taking knowledge production out of the traditional ivory towers of academia, and resulting in a the ubiquitous

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availability of knowledge or what Frodeman and Klein (2017) refer to as “Google in our pocket”. They observe that as many doctoral researchers are now employed in by some knowledge sector organizations as by Stanford, and that more knowledge is being produced by industry than by academic scientists. In 2013, the top ten companies in the U.S. reportedly spent more than 100 billion dollars on research, compared with a US National Science Foundation budget for the same year of just 6.9 billion dollars.

Indeed, in countries including the U.S. and the UK interdisciplinarity has in recent years been an explicit goal for governmental organizations, research councils, scientific and industry associations and academic institutions (Sá, 2008). In the first two decades of the 21st century, a spate of influential government-commissioned reports and initiatives in both the United States and Europe have formally promoted the use of interdisciplinary research and reinforced the importance of this approach for both improving the accountability of research to society and enhancing innovation. As Barry and Born (2013) observe, “the promotion of interdisciplinarity has come to be central to the government of research (and) seen as a solution to a series of current problems, in particular the relations between science and society, the development of accountability, and the need to foster innovation in the knowledge economy” (p.1988).

In the United States in 2004, for example, the National Academies of Science conducted a review of inter-disciplinary research in a variety of academic and non-academic settings, and developed recommendations for ways in which funding agencies, professional societies and academic institutions should work together in promoting the use of interdisciplinary research. This included funding problems rather than disciplines, and providing interdisciplinary education, training and professional development opportunities (Lach, 2013). The recommendations of this report were echoed in the similar findings of an initiative conducted in 2011 by the Massachusetts Institute of Technology (MIT) which examined the convergence of the life sciences, physical sciences and engineering, and a study by the Association of American Universities which highlighted the ways in which the academic sector can help promote interdisciplinary research (Creso, 2008). The National Institutes of Health and the National Science Foundation have also established a special category of funding for interdisciplinary research (Lach, 2013).

In 2016, the British Academy published “Crossing Paths” a detailed report on the current status and perceived value of interdisciplinary research in the United Kingdom (McLeish, 2016). Based on consultation with interdisciplinary researchers, this revealed a “broad and deep support for IDR” from within both the social sciences and humanities, and also the view that it can bring “increased rigour” to one’s own discipline. Respondents cited the importance of being a specialist and expert in one’s own discipline in order to collaborate effectively in any cross-disciplinary research. The previous year, the Academy of Medical Sciences had published a report on interdisciplinarity and in 2014 the Higher Education Funding Council for England conducted a major study on interdisciplinary research and reported that this approach is expanding in use in the UK, reflecting a global trend that often takes the form of international collaboration. A report on Interdisciplinarity for the Global Research Council’s 2016 Annual Meeting (DJS Research, 2016) reported thematic funding programs are a common top-down driver of interdisciplinary research, but identified the need to modify peer review procedures to make them better suited to this form of research.

Recently, there has been a growing focus in the literature on how to measure interdisciplinarity and its outcomes, reflected for example in an article in *Nature* (Rylance, 2015) stressing that funders need more data on their spending on interdisciplinary research and on its impacts. A study by Research Councils UK (2016) examined the consistency of indicators of ‘interdisciplinarity’ and explored best practice methodologies in this area. This revealed considerable inconsistencies in this area and even in what types of research activity are considered to be interdisciplinary.

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On the whole, recent developments in interdisciplinarity have been primarily in the sphere of practice rather than theory. This led Newell (2013) to highlight the importance of developing a formal theory of inter-disciplinary both to guide the future of this approach and ensure it is given academic credibility. He proposed a theory for the purpose of explaining as well as justifying interdisciplinarity, based on the central insight that “interdisciplinary studies deals only with phenomena ... that are complex, and all complex phenomena require interdisciplinary study” (p.31). In this way, Newell theorized, the interdisciplinary studies process is seen as the appropriate academic response to the nature of the complex phenomena it studies, while understanding of complex phenomena can only be achieved through the use of an inter-disciplinary process. Newell (2013) highlights the need for an “expanded theory” of interdisciplinarity, and the need to address the key questions of whether inter-disciplinary definitions and processes should be expanded to incorporate transdisciplinarity, or to distinguish between the two concepts.

CONCLUSION

This chapter has provided a theoretical and historical context for the discussion of interdisciplinarity in the remaining chapters of the book. It has highlighted the ways in which definitions of interdisciplinarity and the related concepts of multidisciplinary and transdisciplinarity have been used by different authors and over time, and developments in the use of interdisciplinary approaches in both education and research.

All this points to an increasing use of interdisciplinarity in future, particularly since governments, research councils and funders in both North America and Europe are actively encouraging this approach, at least in the realm of research. However, it remains unclear to what extent true interdisciplinarity, defined in terms of the integration or synthesis of ideas, knowledge and methods from different disciplines will be achieved. Despite evidence of an overall trend in the adoption of interdisciplinary and transdisciplinary approaches and the generation of *Mode 2 knowledge*, most education and research remains primarily organized by disciplines. When “interdisciplinary” approaches are adopted, largely in response to the top-down requirements of funders or pressures to make university education more relevant to the needs of society, these tend to be multidisciplinary in nature, with team members working primarily within their existing disciplinary paradigms and often involving dual rather than integrated agendas.

The remaining chapters of the book examine in more detail the case for interdisciplinarity between the social sciences and the natural sciences, and the factors driving the adoption of this approach, as well as hindering its use. Case study examples from around the world are included in each chapter to illustrate the key points. In this way, the book is intended to help promote the future adoption of interdisciplinary and help ensure that research and education are conducted in ways that generate the greatest benefits to society.

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KEY TERMS AND DEFINITIONS

Discipline: A field of academic study that has its own distinctive approach for identifying and solving problems, including data collection and analysis techniques.

Epistemological: Relating to the theory of knowledge and how knowledge is produced.

Humanities: The academic field incorporating those disciplines concerned with culture and the interpretation of human experience.

Instrumental: Intended for a particular purpose.

Interdisciplinarity: Cross-disciplinary activities that involve some integration of disciplinary approaches, knowledge or methods.

Mode 2 Knowledge: Knowledge that is produced from inter-disciplinary activity or through collaboration with non-academic actors.

Multidisciplinarity: Cross-disciplinary activity which involves complementarity or juxtaposition of approaches, but not integration.

Natural Sciences: The academic field incorporating those disciplines concerned with the study of natural phenomena.

Social Sciences: The academic field incorporating those disciplines concerned with the study of society and social relationships.

Transdisciplinarity: Cross-disciplinary activity which involves the creation of new forms of knowledge through synthesis of disciplinary approaches.

Chapter 2

Current Drivers of Interdisciplinarity: The What and the Why

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ABSTRACT

*Calls for interdisciplinarity abound across science and technology, social sciences, humanities, and arts. They also populate reports from professional societies, educational organizations, and funding agencies. Definitions of “what” interdisciplinarity is are entangled with justifications of “why” particular practices are important in a semantic web of purposes, contexts, organizational structures, and theoretical constructs. Citations to earlier literature appear throughout the chapter, but it is the first publication to present insights from the latest authoritative accounts in the 2017 edition of *The Oxford Handbook of Interdisciplinarity*. The chapter begins by describing four major drivers identified in a 2005 report on *Facilitating Interdisciplinary Research* and the current ascendancy of transdisciplinarity. It then examines controversies and problematics in three major faultlines of debate: the relationship of disciplinarity and interdisciplinarity, the status of interdisciplinary fields, and tensions between instrumentality and critique. The conclusion reflects on future directions and recommendations, noting patterns of increase alongside continuing challenges.*

INTRODUCTION AND BACKGROUND

Calls for interdisciplinarity abound. They appear across science and technology, social sciences, humanities, and arts. They also populate reports from professional societies, educational organizations, and funding agencies. In a recent account of funding agencies in particular König and Gorman (2017) reported websites of the US-based National Institutes of Health and National Science Foundation, the German Research Agency, the French National Center for Scientific Research, the British Research Councils, the European Research Council, the Japan Science and Technology Agency, and the recently formed Global Research Council all mention interdisciplinary research explicitly. The question of “what” constitutes

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interdisciplinarity cuts across all accounts. Introducing the second edition of *The Oxford Handbook of Interdisciplinarity*, Robert Frodeman (2017) calls the terms “interdisciplinarity” and “transdisciplinarity” boundary objects that have had different meanings at different times and for different groups. In the same volume Huuttoniemi and Rafols (2017) also contend multiple claims tend to paralyze debate on definition. Yet, clear patterns appear.

The most widely cited definition of current drivers appears in a 2005 benchmark report on *Facilitating Interdisciplinary Research* (National Research Council, 2005). After describing the four major drivers identified in the report, this chapter examines three major faultlines of debate: the relationship of disciplinarity and interdisciplinarity, the status of interdisciplinary fields, and tensions between instrumentality and critique. The conclusion then reflects on differing assessments of interdisciplinarity at this historical point. The overarching framework of the chapter is the concept of boundary work, a composite label for claims, activities, and structures by which individuals and groups work directly and through institutions to create, maintain, break down, and reformulate lines between knowledge units (Fisher, 1993, pp. 13–17; Klein, 1996, pp. 57–84). Definitions of “what” interdisciplinarity is are entangled with justifications of “why” particular practices are important in a semantic web of purposes, contexts, organizational structures, and theoretical constructs. Citations to earlier literature appear throughout the chapter, but it is the first publication to highlight insights from the latest edition of *The Oxford Handbook*. No single book can be definitive. However, the most recent accounts provide an authoritative overview of current drivers.

The task force that wrote the US-based National Research Council’s 2005 report on *Facilitating Interdisciplinary Research* identified four major drivers based on literature review, national surveys, and expert consultations (National Research Council, 2005, p. 2):

1. The inherent complexity of nature and society.
2. The desire to explore problems and questions not confined to a single discipline.
3. The need to solve societal problems.
4. The power of new technologies.

None of these catalysts is new. However, Driver #1–“complexity”–has become a prominent theme in the discourse of interdisciplinarity in recent decades. Older theories favored the idea of unity of knowledge. It is countered, however, by the view that unity is impossible given the current complexity of nature and society, in systems ranging from social organization and health care to the geosphere and the biosphere. Driver #2 is strongly associated with boundary crossing at the interfaces between disciplines, focusing on questions that lead to interdisciplinary investigations that range from the nature of the solar system to human cognition. Scientists in particular often link Driver #3 with discovery, including breakthroughs such as x-ray crystallography and the structure of DNA. Driver #3 prioritizes problem solving in a litany of challenges ranging from climate change and food security to peace and social justice. The line between fundamental understanding and pragmatics of problem solving, though, often blurs. Steve Fuller (2017) cites, for instance, Louis Pasteur’s efforts to prevent bacteria from destroying the silk, milk, wine, and beer industries and from killing troops suffering battlefield infections. While “applied” in nature, this research is now claimed to be a “scientific discovery” in biology and medicine.

Like complexity, Driver #3 has also escalated, prioritizing economic, technological, and scientific problems over epistemological questions of knowledge. Indicative of that trend, Frodeman (2017) reports the utility of interdisciplinarity and the word “innovation” stood out across the 46 essays of the updated *Oxford Handbook*. Driver #3 is not new either. It was the catalyst for problem-oriented research at the

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US-based Social Science Research Council in the 1920s and the Manhattan Project to build an atomic bomb during the 1940s. From the 1970s forward international competition fostered increased problem-focused interdisciplinary practices in science-based fields of high technology, engineering and manufacturing, computers, biotechnology, and biomedicine. The demand for universities to perform a pragmatic social mission also increased. In 1982 the Organization for Economic Cooperation and Development formally recognized the heightened priority of problem solving, proclaiming that interdisciplinarity “exogenous” to the university now took priority over “endogenous” university interdisciplinarity based on production of new knowledge. The exogenous originates in “real-world problems” of communities (Center, 1982, p. 130).

Driver #4—new technologies—has become more prominent as well, propelled by new information and communication technologies. Their impact is widespread, spanning areas as diverse as bioinformatics, geosciences, digital humanities, new media arts and cognitive science. Johannes Lenhard (2017) attributes the heightened relevance of computation for interdisciplinarity, in particular, to embedding of electronic computing machines into a scientific-technological context that is characterized by heterogeneous, collaborative, and networked activities. Since 2005, he adds, computation and simulation have also gained recognition as a subject matter and a field that defines problems in its own right. Lenhard also echoes Terry Shinn’s claim that four boundary-crossing elements characterize research technologies today. They are produced by interstitial communities, rather than single institutional, disciplinary, or industrial problems and uses. The devices are generic, not designed to respond to a specific industrial or academic demand. Technologies generate new ways of representing events and empirical phenomena, including expanding tools of visualization across disciplines. And, they are disembodied from contexts of invention, rather than being limited locally to one particular knowledge community (2001, p. 9).

Two recent movements document a further trendline—the heightened role of transdisciplinarity. In the first typology of terminology, devised for the first international conference on interdisciplinary research and education in 1970, transdisciplinarity was defined as a “common system of axioms” that transcends the narrow scope of disciplinary worldviews. The exemplar was anthropology as a comprehensive science of humans (Apostel, 1972, pp. 25-26). The concept is also linked with the idea of unity of knowledge though, to reiterate, belief in a single overarching theory has been supplanted by the realization that unity is neither pre-given nor universal. Transdisciplinarity also became associated with new overarching synthetic frameworks such as general systems theory, feminist theory, post/structuralism, and sustainability. The two recent movements, though, are aligning transdisciplinarity more closely with Driver #3.

Pohl, Truffer, and Hirsch-Hadorn (2017) trace the first movement to the early 1990s in environmental research programs in Switzerland, Austria, Germany, Sweden, and the Netherlands. The underlying concept—research oriented to problems of the “lifeworld” (*Lebenswelt*)—subsequently became coupled with the idea of “co-production of knowledge” by stakeholders in society. Two parallel concepts are also prominent in this connotation of transdisciplinarity: postnormal science and Mode 2 knowledge production. In 1993, Funtowicz and Ravetz based their theory of “post-normal science” on the premise that problems of modern society are interdependent and not isolated to particular sectors or disciplines. They are not simple, either. Characterized as “wicked,” they are driven by complex cause-effect relationships and marked by uncertainty, indeterminacy, value conflicts, unexpected outcomes, and lack of ready-made criteria and solutions. The following year Gibbons, et al. (1994) argued that an older Mode 1 form of knowledge production—characterized by hierarchical, homogeneous, and discipline-based work—is being supplanted by a newer Mode 2—characterized by complexity, non-linearity, heterogeneity, and transdisciplinarity.

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Hall, Stipelman, Vogel, and Stokols (2017) link the second movement to a change in the culture of science, marked by increases in cross-disciplinary collaborative research aimed at accelerating discovery and innovation and at achieving solutions to complex problems in science and society. Formulated as “team science,” the heightened profile of collaborative research is documented by increases in the number and size of teams as well as significant investments of research funding by public and private sources. Its transdisciplinary character lies in developing holistic approaches to problem solving that achieve a higher level of integration by not only synthesizing existing approaches but moving beyond them to generate new methodological and conceptual frameworks. Although the field only accelerated in the early 2000s, it is already producing an evidence base for practices, evaluation, training, resources, and frameworks including an ecological model of factors influencing collaboration, a four-phase scheme of research and translation, a model of integrative capacity, and an interactive web-based systems map of team science based on four content domains at individual, team, institutional/organizational, and policy/societal levels.

MAIN FOCUS OF CURRENT CONTROVERIES AND PROBLEMATICS

A number of faultlines of debate appear across all four of the drivers. Three, though, stand out: the relationship of disciplinarity and interdisciplinarity, the status of interdisciplinary fields, and the tension between instrumentality and critique.

Faultline #1: The Relationship of Disciplinarity and Interdisciplinarity

The relationship of disciplinarity and interdisciplinarity is a long-standing point of debate. The case for a complementary relationship is based on the growing heterogeneity of interactions with other disciplines and interdisciplinary fields. Biology is a case in point. Burggren, Chapman, Keller, Monticino, and Torday (2017) argue the domain of biological sciences is “constantly shifting as new technologies and theories arise, evolve, and mature and—sometimes—fade away.” Biologists are using computational algorithms that engineers developed to generate predictive models of complex biological processes and systems. Collaborations among biologists, physicians, and engineers have produced advances in regenerative medicine, such as replacement tissues. Genetics, molecular biology, and physiology have merged in the subdiscipline of genomics. And, the interdiscipline of biochemistry, which was advanced by discovery of structural features of macromolecules such as DNA and the genetic code, is going through further changes driven by interactions with information science and nanotechnology.

The case for an oppositional relationship is based on the belief disciplinarity and interdisciplinarity are fundamentally different. Interdisciplinarity, Stephen Turner (2017) asserts, is a response to disciplinarity. Disciplines are based on selected objects, subjects, and methods. They reinforce specialized expertise and autonomy through institutionalizing mechanisms of peer review, professional societies, meetings, and publication venues. And, they certify individuals for practice while reproducing themselves by virtue of an internal job market. The earliest critiques of disciplines included the threat they pose to synthesis and unity of knowledge, echoed in subsequent concerns about topic-based liberal education, and failure to produce “useful” knowledge. The dominant metaphors in criticisms of disciplines are a silo, signifying narrowness and isolation, and a border or boundary, signifying control and protection of a specialized domain. Disciplines differ, however, in the extent to which they are open to external influ-

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ences. Economics, for instance, patrols its borders more tightly than geography. Moreover, boundaries have a dual character. A boundary, Mae Henderson reflected in a book on the field of border studies, is both a dividing line and a zone of crossing. Within interstitial spaces, new questions blur and merge older distinctions, contributing to the larger project of rethinking culture, canon, and disciplinarity (1995, pp. 2, 5, 27).

Two recent books mark the poles of argument. In *Sustainable Knowledge*, Frodeman (2014) contends the disciplinary approach to knowledge production is breaking down due to a crisis of overproduction, lack of relevance and social applicability, and forfeiture of authority, autonomy, and status. These developments render disciplinarity “ineffectual” and “anachronistic.” Disciplines are not going away, he acknowledges, but their hegemony is eroding. He also aligns interdisciplinarity with Driver #3 and a problem-oriented connotation of transdisciplinarity. In his book, *In Defense of Disciplines*, Jerry Jacobs counters criticism of disciplines as narrow silos by highlighting their dynamism and extent of communication across boundaries. However, he places exchanges and diffusion of techniques and concepts in the “basement” of the “house of interdisciplinarity,” below multi-, inter-, and trans-disciplinary synthesis. Others view these activities as evidence of interdisciplinarity. Jacobs is particularly critical of interdisciplinary structures and topics that further balkanize knowledge, rather than building a broad bridge between intellectual terrains, and administrative reform efforts he claims shifts power from researchers and departments to centralized control and decision-making by deans and presidents. He would have administrators leave departments alone, letting interdisciplinary opportunities occur in centers or institutes with new appointments emanating within department structures (2013, pp. 78, 127, 147, 210, 213, 224).

The relationship between disciplinarity and interdisciplinarity forms a backdrop to the second faultline of debate, the conflicted status of interdisciplinary fields. At one end of the spectrum of argument, new fields are touted as proof disciplines no longer dominate the structure of knowledge. At the other end they are dismissed as superficial or, Louis Menand contended, interdisciplinarity becomes completely consistent with disciplinarity. Each field, he argued, develops a distinctive program of inquiry that results in increases in classes and even new majors, thereby ratifying the logic of disciplinarity (2001, p. 51; 2010, p. 119). The popular version of this generalization is a belief the interdiscipline of today becomes the discipline of tomorrow. The reality of interdisciplinary fields, however, is more complex. Women’s studies illustrates a more nuanced understanding of the relationship of disciplinarity and interdisciplinarity. In order to change the disciplines, one program coordinator remarked, women’s studies had to be “of them, in them, and about them” (cited in Boxer, 1982). The field offers intellectual community and an institutional site for feminists who do most of their work in disciplines, legitimating gender as a category of analysis (Addelson and Potter, 1991, p. 271). Within their disciplinary locations, they disperse centripetally into specializations. Within the shared space of women’s studies, they move centrifugally to cross-disciplinary research and teaching (Hartman and Messer-Davidow, 1991, p. 5).

Faultline #2: The Conflicted Status of Interdisciplinary Fields

Interdisciplinary fields arise for different reasons. In a typology of interdisciplinary approaches, Raymond Miller (1982) identified four catalysts. *Topics* are often associated with problem areas that form the basis for new domains such as “area” in area studies, “crime” in criminology, and the “environment” in environmental studies. *Life Experience* became a prominent catalyst in the late 1960s and 1970s with the emergence of identity fields that had strong ties with socio-political movements, such as ethnic/black/ and women’s studies. *Professional Preparation* led to new fields with a vocational focus, such as social

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work and nursing. And, *Hybrids* formed interstitial specializations or interdisciplines, such as social psychology and molecular biology. Their trajectories have differed, however. Area studies and molecular biology, for instance, attained discipline-like structure and authority. In contrast, social psychology and cultural studies lacked the same level of economic and intellectual capital. In a recent comparative study of interdisciplines, Harvey Graff (2015) also deemed Operations Research a successful interdiscipline because it was widely institutionalized and marked by robust collaborations between theoretical scientists and industrial engineers. In contrast, Social Relations failed to achieve a promised goal of unifying social sciences and was limited to a single institutional home.

Fields change over time as well. Area studies, which arose as a by-product of World War II, was initially centered on US interests and the theory of modernization. In an updated account of the field, Craig Calhoun (2017) recounts, emphasis shifted with decline of the paradigm of development and modernization, along with drops in funding in the mid-1970s and pressure to establish disciplinary credentials. A long-standing epistemological fault, Calhoun adds, also contributed. Disciplinary knowledge was aligned with abstraction, moving from specific cases and contexts to more universal laws. In contrast, area studies were more particularizing, focused on local conjunctures of history, culture, politics, and environment. Vogel, Cherney, and Lowham (2017) note a similar difference in the field of policy studies, which is problem-oriented, contextual, and multi-methodological in outlook rather than the traditional academic goal of theory development or description absent of normative and pragmatic imperatives. In area studies, particularizing tendencies fostered interdisciplinary discussions of development and underdevelopment, class and power, power and knowledge, states and nations. From the 1970s forward, though, many researchers began to conceptualize globalization as a universal theory overriding national or regional contexts. Today, in further contrast, area studies are being reimagined, including connections between regions and new geopolitical importance of areas previously classified as “underdeveloped.”

Even the same field may have plural identities. Sytse Srijbos (2017) describes systems thinking as “an innovation-oriented movement with a broad program rather than a sharply delineated field or discipline.” It arose in the mid-20th century in biology, economy, engineering, and management sciences in relation to postwar developments including cybernetics, information theory, game and decision theory, automaton theory, systems engineering, and operations research. Meta-level unification of sciences around general laws and principles governing has not emerged. However, systems ideas and concepts have been incorporated across disciplines. Srijbos echoes von Bertalanffy in distinguishing three types of systems thinking. The first—*systems science*—is a scientific exploration and theory of “systems” in various disciplines, with general system theory focused on principles applying to all of them. The second—*systems approach in technology and management*—focuses on practical problems in modern technology and society. The third—*systems philosophy*—aims to reorient not only science and technology but philosophy as well. Systems science today, he adds, is being perpetuated in newer developments such as systems biology, chaos theory, and the study of complex systems.

In accounting for Media and Communication studies, Briggie and Christians (2017) identify a further complexity. To the extent they remain elements of existing disciplines, they do not acquire a separate identity. Programs have appeared under differing terms such as “communications,” “communication studies,” “rhetorical studies,” “communication science,” “media studies,” “mass communication,” and “media ecology.” Some claim to be transdisciplinary, in the dual connotation of centering on real-world problems and generating new conceptual frameworks. Fields resemble disciplines when they form specialized communities around shared topics, problems, and questions. In a telling comparison, when the first PhD in communications was established in 1947 at the University of Illinois at Urbana-Champaign

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all faculty held PhDs in disciplines. Today, Briggie and Christians find, faculty in most degree-granting programs have doctorates from communication programs. Yet, disputes continue to create faultlines in the intellectual subsurface underlying varieties of the field. Mass communications, David Scholle (1995) recalled in another study, was constructed as a practical enterprise in schools of mass communications and speech departments. It also sits between liberal arts and instrumental interests of professional schools. An “antidisciplinary” formulation of the field would reject foundations, and a “disciplinary” response establish its own ontological grounding. Alternatively, a “radically interdisciplinary” conception would favor experiment, critique, and action.

Finally, context matters. Returning to the example of women’s studies, in comparing the nature of the field in the United States and India Ellen Messer-Davidow (2017) reports the field emerged in both countries from socio-political activism during the same decades. However, it was institutionalized, produced, and circulated differently in the two countries. In the US, academic legitimation required complying with performance norms in research, teaching, and service, distancing the field from extra-academic arenas. Women’s studies in India has proportionally fewer academic units, but its institutional forms are more integrated across sectors and hybridize academic and indigenous knowledges in social-change projects. Moreover, circulation of women’s studies discourse depends more heavily in India on in-person modalities to reach illiterate women. With the exception of websites, US publishing does not span sectors. Many scholars also rely on familiar disciplinary methods and topics, and the field was located within parameters of higher education. In contrast, in India the field’s multiple locations span academic centers, associations, unions, NGOs, government agencies, and grassroots women’s communities. This dispersion gave the field greater cross-sector reach, though did not free it from pressures within particular sectors.

Faultline #3: Tensions Between Instrumentality and Critique

Reflecting on the current state of interdisciplinarity today, Frédéric Darbellay identified two major strands of argument: an epistemological and theoretical orientation that transcends disciplinary boundaries, and a pragmatic and participative orientation to problem-solving (2015, p. 166). The epistemic approach is philosophical in nature. The instrumental approach is oriented to pragmatic needs, though a third imperative—critique—also appears. Three widely-read pronouncements exposed the faultline between instrumentality and critique. Jean-François Lyotard (1979) charged metanarratives with attempting to totalize knowledge around a new paradigm. The relationship to knowledge, he contended, serves users of a complex conceptual and material machine. In the absence of an emancipatory metalanguage or metanarrative, performative techniques of brainstorming and teamwork for instrumental production to accomplish designated tasks are prioritized. Jacques Derrida (1983), in turn, highlighted the rational calculus of programmed research on “applied” and “oriented” problems of technology, the economy, medicine, psycho-sociology, and military defense. Much of this research, Derrida noted, is interdisciplinary. Bill Readings (1996) extended the critique when linking interdisciplinarity with transformation of the Western university into a “transnational bureaucratic corporation” in service of the marketplace. (See Klein 2005 for a fuller discussion of these pronouncements as a theoretical foundation for a “new interdisciplinarity” in humanities.)

The faultline between instrumentality and critique is not absolute. Research on problems of the environment and health often combines problem solving and critique of existing approaches that compartmentalize aspects of complex systems. Nonetheless, tension exists between the two imperatives. Briggie and Christians (2017) report a basic divide in Media and Communication studies between the

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goals of serving mass media and critiquing it. The standard textbook in the field added critical theory and cultural studies to its fifth edition. However, its authors noted, despite the popularity of those approaches scholars remain committed to a scientific approach based on observation, evidence, logic and hypothesis testing. New technical capacities and the trend toward communication studies as a form of “big science” foster a transdisciplinary universal theory that prioritizes cognitive and natural sciences over social scientific and humanistic approaches that interrogate the underlying positivist model of a communication science.

Observing trends in the medical curriculum, Bryan Turner (1990) also reported a divide between instrumentality and epistemology. Pragmatic questions of reliability, efficiency, and commercialism take center stage when interdisciplinarity is conceived as a short-term solution to economic and technological problems. In contrast, interdisciplinarity emerged in social medicine and sociology of health as an epistemological goal focused on the complex causality of illness and disease. Researchers developed a holistic biosocial or biopsychosocial model that is critical of the traditional hierarchical medical model. Taking stock of more recent differences in interdisciplinary health science and interprofessional healthcare McMurry, Kilgour, and Rohse (2017) report both areas have grown in recent decades in response to a similar challenge: complex health problems are multifaceted, multilevel, and often chronic. Yet, interdisciplinary health science aims to develop shared conceptual and methodological frameworks that transcend disciplinary perspectives. The primary goal of interprofessional practice is pragmatic. Members of two or more occupational professions collaborate with the goal of improving outcomes for people suffering from disease.

Even with pronounced tensions between instrumentality and critique, though, new connotations of transdisciplinarity are bridging that divide. The field of sustainability illustrates the possibilities for bridging instrumentality and critique. Fernandes and Phillippi, Jr. (2017) associate sustainability with both political and epistemological approaches. It developed as a social paradigm and a field of knowledge involving diverse areas of science related to social, political, and economic problems of management at multiple levels. This complexity implies not only changes in models of disciplinary knowledge production. It also promotes transdisciplinary inclusion of Western science and traditional ecological knowledge, in a cooperative and contextualized rather than hegemonic form of knowledge. Merritt Polk contended the goal of making science more accountable to challenges of sustainability cannot be met within standard parameters. It must become subversive of science in three ways: practically, by disrupting established processes; epistemologically, by challenging conventional criteria of reliability and rigor; and contextually, by forging a neutral space between science and practice (2015). Scholz, et al. also argue that socially robust knowledge involves a form of epistemics that bridges scientific and experiential knowledge (2011, pp. 378-9; see also Scholz and Steiner, 2015, p. 532).

FUTURE DIRECTIONS AND RECOMMENDATIONS

Proclamations of increase paint a positive picture of the current state of interdisciplinarity. Karri Holley’s (2017) account of interdisciplinary education depicts a wide range of structures today, including degree programs, field studies, core facilities, departments and colleges with an interdisciplinary milieu, as well as cluster hiring initiatives. Other studies also document increase. In a longitudinal study spanning 1975 to 2000, Brint, et al. (2009) found the growth rate was strong, though uneven. The number of units in international relations/global studies and race and ethnic, and women’s studies, as well as brain

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and biomedical science, had more than tripled. Environmental studies nearly tripled, and cultural studies beyond the West more than doubled. Western studies also nearly doubled. Yet, civic/governmental studies and American studies grew more slowly. When prompted about future directions, respondents to the survey predicted brain and biomedical science fields such as cognitive science and neuroscience were more likely to be institutionalized in departments than other fields. Comparably, a survey of US-based liberal arts colleges and universities conducted by the Social Science Research Council revealed that more than half of the top 10 interdisciplinary majors were in international and global or area studies, two followed a “biology-plus” model, and the most popular were in “advocacy” or “activism” fields. Environmental studies and science, women’s and gender studies, neuroscience and psychobiology, and American studies were also top-cited majors. Moreover, two-thirds of respondents expected increases in the future, the most commonly cited reason being research while recognizing that the questions students and faculty are investigating today often require expertise of scholars from more than one field (Rhoten, Boix-Mansilla, Chen, and Klein, 2006).

Klein’s (2010) report on changing taxonomies also revealed comparable findings. The recommendations of a subcommittee charged with evaluating the National Research Council’s taxonomy of research-doctorate programs stood out. It recommended increasing the number of recognized fields from 41 to 57, including basic biomedical fields in medical schools and “emerging fields” of feminist, gender, and sexuality studies as well as nanoscience, bioinformatics, and computational biology. In addition, the category of “global area studies” should be expanded. Biology should be renamed “Life Sciences” while including agricultural sciences and merging mathematics and physical sciences into a single group with engineering (Ostriker, J. P., & C. V. Kuh, 2003; Ostriker, J. P., Holland, P.W., Kuh, C., & Voytuk, J., 2009). Even with documented growth, however, many institutions lag behind in accommodating new forms of knowledge production. The dominant structure of the academy, Crow and Dabars (2017) report, remains the discipline and the basis of academic organization is still the correlation of disciplines with departments.

Sheila Jasanoff’s (2017) genealogy of Science, Technology, and Society studies (STS) underscores the continuing challenge interdisciplinary fields face. After roughly 50 years, STS remains weakly institutionalized in upper tiers of the academy. Moreover, rather than self-identifying with STS young scholars often reverted to recognized disciplinary affiliations—such as anthropology, history, or sociology—or to topical subfields with a market demand—such as bioethics, environmental studies, science policy, and nanotechnology and society. Despite respected accomplishments, STS still needs to populate spaces between disciplines with well-trained scholars, new offerings in the curriculum, and long-term research programs. The challenge of interdisciplinarity, Jasanoff concluded, is strategic positioning. All fields need to establish relations to their objects of study and other disciplines, assert their boundaries and mission, and question the premise that disciplines are coherent and unified entities. They also demand organization for survival and continuity, to distinguish themselves from neighboring territories and to establish markers of originality, quality, progress, and contributions to knowledge. And, they need to define what makes them part of a common enterprise, making the case for what they have to offer and situating it within the larger academic agenda. All forms of interdisciplinarity, she concluded, require spaces where goals can be developed and sustained. Calhoun (2017) voiced a similar concern in area studies. Without institutional conditions for reproduction, they are “at the mercy of disciplines that may claim it, ignore it, or incorporate some ideas from interdisciplinary projects without providing ways of sustaining the intellectual conditions produced them.” Departments are also outnumbered by committee structures or centers that leave appointments and degree decisions to established disciplines.

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Pondering implications of current trends for the future, Frodeman (2017) concluded the overriding question for interdisciplinarity is its place in the political economy of knowledge. Will it become central to transformation of the 21st century university? Or, are other vocabularies signaling displacement of the academy from the center of knowledge production, such as "impact," "accountability," and "relevance"? Funders today, Calhoun reports (2017), bypass universities more often than their predecessors when seeking research from think tanks. In an overview of the history of knowledge formations, Peter Weingart argued the university has "lost its monopoly" on knowledge production and, following suit, evaluating quality in transdisciplinary research has become not only disciplinary but also social, political, and economic (2010, p. 12). Steve Fuller (2017) also reminds readers that war and commerce have long been drivers of interdisciplinarity, even if their conceptions of success differ based on victory in war versus monopoly in commerce. Both catalysts go against the established grain of academe in the name of "use-inspired basic research." The "triple helix" model of state-industry-university relations was a key transition in the evolution of interdisciplinarity. Most theoretical discussions of interdisciplinarity tended to treat it as internal to the academy, but the military-industrial route to interdisciplinarity challenges the assumption that academics have sovereignty over knowledge production.

In a three-part typology of drivers of transdisciplinary knowledge production Russell, Wickson, and Carew also raise three questions of purpose. Is the imperative of TD the knowledge economy, product innovation, commercial activity, and economic growth? Or an "environmental imperative" prominent in alignment of transdisciplinarity and sustainability? Or an "engaged populace" that breaks the boundary separating sanctioned expertise from other forms of knowledge (2008, pp. 460-62, 465). The first question prioritizes problem solving in the marketplace of products and services. The second and third questions underscore the heightened priority of problem solving but transgress the boundary of instrumentalism and epistemology in a broad conception of sustainability that encompasses not only the environment but also health and social justice. Read within the framework of current drivers of interdisciplinarity and attendant controversies and problematics, two lessons stand out for future directions. First, there is no universal model that can account for the variety and variability of activities. Further research into the role of context in shaping the dynamics of practice. Second, the large body of literature that has grown over the course of nearly a century furnishes valuable insights into patterns within and across initiatives, vital for planning, implementing, and sustaining both established and new efforts.

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KEY TERMS AND DEFINITIONS

Boundary Work: A conceptual framework for understanding the composite claims, activities, and structures by which individuals and groups work directly and through institutions to create, maintain, break down, and reformulate lines between knowledge units. Occurs across disciplines, interdisciplinary fields, and professions.

Collaboration: Proactive interactions of members of different disciplines and fields focused on a common goal such as a designated problem, question, or topic. Also entail both social and cognitive integration, and teams range in size from small projects to large-scale programs while appearing across academic and other sectors.

Complexity: A prominent theme in the current discourse of interdisciplinarity, supplanting older theories that favor the idea of unity of knowledge with the realization that “unity” is not pre-given and “unifying” approaches must be developed. Often framed by a systems approach to interdependent and interacting components.

Critique: An approach to interdisciplinarity grounded in interrogation of existing structure of knowledge and education and a conception of transdisciplinarity that shifts focus from “reliable scientific knowledge” to inclusion of “socially robust knowledge.” Also fosters inclusion of multiple forms of knowledge.

Disciplinarity: Research and education on selected objects, subjects, methods that reinforce specialization through institutionalizing mechanisms of academic departments, professional societies, meetings, publication, degrees, and a job market. Simultaneously, though, exhibits boundary control and permeation.

Instrumentality: Research and education that prioritizes pragmatic needs and criteria of reliability, efficiency, and use over questions of epistemology and critique as well as abstract knowledge over concrete and case studies. Weighs priorities differently, however, on a spectrum of economic and environmental concerns.

Current Drivers of Interdisciplinarity

Integration: Goes beyond “multidisciplinary” juxtaposition of separate disciplinary approaches to create a new holistic outcome that is greater than the simple sum of the parts. Typically emerges at the level of unifying approaches to particular problems, themes, and questions rather than a universal unity of knowledge.

Interdisciplinarity: Research and education focused on a complex problem, question, theme or topic. Links approaches of more than one discipline or body of knowledge though they tend to remain their original identity and the purpose, scope, mix of disciplines, and degrees of integration differ across programs and projects.

Problem Solving: Like complexity a prominent theme in current discourse of interdisciplinarity with increasing emphasis on economic, technological, and scientific problems over epistemological questions of knowledge. Also aligned with transdisciplinary movements in co-production of knowledge and team science.

Transdisciplinarity: Research and education that foster synthetic theories and conceptual and methodological frameworks transcending disciplinary approaches. Also connotes participation of stakeholders in society in problem-oriented research, transgression of existing boundaries, and transformative approaches.

Chapter 3

The Role of Translation in Forming Interdisciplinarity in Arab Medieval Times: A Historiographical Review

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ABSTRACT

Medieval Arabic translation (MedAT) played a crucial role in the formulation of the Islamic and Arab civilization. For the first time in the history of medieval Arabs, materials related to an array of multi-disciplinary fields were translated, allowing the Arabs to import and master disciplines they did not have or never bothered about, and to subsequently become exporters of knowledge and their language, Arabic, the global donor of such knowledge for centuries. The glorious history of Arabic translation at medieval times put translation at the heart of society, but there is little written about the role translation in forming an interdisciplinary unique Arab culture, bringing various disciplines together. This chapter investigates the role of translation in the formation of the interdisciplinary role of translation in the Arab culture during its medieval times, particularly the Umayyad and Abbasid dynasties. It examines the position medieval Arabic translation had in transferring and diffusing new disciplines and in creating an interdisciplinary environment which nurtured the production of native knowledge.

INTRODUCTION

The term Medieval Arabic translation (MedAT) generally refers to translation activity that took place in the Arab world during the eighth and ninth centuries. Within the cultural history of Islam, the emergence of MedAT started in the eighth century A. D. during the times of the Umayyads and Abbasids under the rule of very influential Caliphs. It is linked to what has become known as the glorious Arab translation

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history in medieval times, especially after the successful spread of Islam and the move of the centre of power from Arabia to Damascus and later to Baghdad.

It is also generally agreed that the spread of Islam to regions beyond the confines of the Arabian Peninsula allowed the Arabs and Arabic language to embrace new sciences and attract scholars from different countries with different scholarly and cultural backgrounds. MedAT was seen as an awakening move as the Arabs came into contact with new disciplines which were beyond their basic intellectual genres. MedAT was considered, within this context, as an interdisciplinary base from which intellectual, social and economic activities took off and continued prospering for the years to come. Although MedAT started in Damascus, it spread further to other countries, such as Iraq.

The Caliph Khalid bin Yazid bin Mu'awiyah, a leading ruler during the times of Umayyad dynasty, became the first ruler to officially sponsor translation and make it one of the goals the state with the objective of domesticating different Greek disciplines into the Arab-Islamic world and import the knowledge the Arabs needed at that time. His move was seen as the beginning of an activity that later reached its golden era in the history of the Arabs. Some researchers argue that had translation not been initiated by the Caliph Khalid bin Yazid bin Mu'awiyah, his successors, Umayyad and later Abbasid rulers, might not have had the solid basis on which translation stood since subsequent efforts were built upon the success story of achievements in bringing new disciplines through translation by him. In other words, they had to follow his footsteps (Al-Jumaily, 1986).

Within this period of Arab history, MedAT, according to Al-Ma'ani (2011:25), covered various dominant scholarly works of the time, which the Arabs and their scholars needed to boost a culture of importing multidisciplinary knowledge and creating an interdisciplinary intellectual environment. Through translation, the acquisition of knowledge provided a genuine understanding of foreign materials, and offered at the same time a very valuable contribution to the development of the field of knowledge into the hosting Arab culture. Translations from Greek, Syriac into Arabic on topics ranging from sociology and history to military were made possible, triggering what researchers call nowadays the greatest translation activity that ever happened in the Arab world.

The areas targeted by MedAT were new to the Arab culture. This is evident from the fact that less weight and attention were given to other areas since a few, if not rare, cases of Greek literary works were translated into Arabic then. The books translated by medieval Arab translators were not of a poetic and religious nature, but of a scientific and technical one and not only from one language or culture but rather from all great cultures, Greek, Syriac, Farsi, and Hindi. Translation was a great contributor to the development of knowledge disciplines such as chemistry, astronomy, and others in Arabic and later in other languages, particularly Latin

The importance accorded to MedAT by the Caliphs in how translators were treated. They were considered as both translators and scholars at the same time, in the sense that they were not mere transferors, but also educators and researchers. The outcome was that medieval translation generated a unique inter- and multi-disciplinary culture that involved the transfer of sciences; new to the host Arabic culture, encouraged learning beyond the traditional Arab poetic and religious spheres and boosted the culture of research investigation and innovation (Faiq, 2000).

To this end, a number of schools were set up during the medieval times but the most important of which was a school-cum-translation bureau called *bait al hikma* (the House of wisdom). It was the firm belief in the contribution of translation to the development of various disciplines in the Arab-Muslim world that such schools were established, attracting scholars from different countries to translate sciences and transfer them to Arabic, but also to produce native Arab-Islamic knowledge in Arabic (Al-Namla, 1991).

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However, although MedAT started during the times of the Umayyads, some still argue that the real progress of this activity took place during the times of the Abbasid rule. But, generally speaking, it was through the two stages, Umayyad and Abbasid, that translation was initiated and mostly strengthened. Therefore, it is important to look at the role of translation in producing a multi- and inter-disciplinary environment during the golden age of medieval Arabic translation, namely both the Umayyad and Abbasid times, during which the Arabs and Muslims were able to embrace new sciences in the fields of philosophy, logic, medicine, chemistry, and mathematics from different languages and cultures, Farsi, Hindi and Greek, and to develop them based on a solid platform (Al-Jumaily, 1986). The relatively new activity that did not have an established infrastructure nor did have the tradition from which it would progress, translation soon became a fundamental activity which was an inseparable part of the then Arab culture.

As with regard to the translation approaches adopted by MedAT translators, recent studies of the medieval Arabic period include Faiq (2000b; 2007), Al-Namla (1991), Abdulaziz (1990), Al-Jumaily (1986), and Kruk (1976). These studies, and more specifically Faiq (2007) treatment of translation in the Islamic world in the past and present, suggest that translation in those early times took two approaches: direct and indirect. The adoption of one of the two approaches medieval Arabic translators had to follow in their rendering of texts was based on the socio-cultural communicative situation of the time and the desire of the Arab/Islamic state and the Caliphs to bring new and various disciplines into the Arab culture.

The aim of the direct approach, mainly adopted during the Umayyad times, was to transfer and preserve the content of the original Greek message. Here the source content was given priority over the natural form of the Arabic target texts. Within this approach, medieval Arabic translators opted to follow in their translations the style of the source writer. Problems of obscurity of meaning and lexical incompatibility were normally features of this approach especially during the early days of MedAT; a matter that required later during the Abbasid rule a revision of some of these translations (Faiq, 2007).

The second approach was an indirect one where Arabic grammatical and lexical categories as well as Arab readers were given priority over the source language (SL) counterparts. This can be attributed to a number of factors, including:

- Increased competence in both source languages and Arabic.
- Knowledge of subject matters.
- The use of previously translated material for further research in Arabic.
- Ability to introduce and easily use Arabic technical terminology as knowledge expanded in the Arab and Muslim lands.

In what follows, the interdisciplinary role of translation in the medieval Arab-Islamic culture of the Umayyad and Abbasid dynasties is examined.

TRANSLATION DURING THE UMMAYYAD DYNASTY

The first cultural impact of MedAT in bringing interdisciplinary areas together was seen during the early rule of the Umayyads. Dimitri (1998, p. 17) argues that the Umayyad Caliphs' desire to create the required social, political and scientific infrastructure, which the Arabs obviously lacked, to run the nation

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meant they had to rely on translation as an intermediary and essential tool, thus allowing new disciplines to leave their original points of departure and land in a new territory that provided the necessary means for it to grow and develop..

During the Umayyad times and according to Dimitri (1998, p. 17), MedAT was inevitable as the Arabs came into direct contacts with the Greeks especially after the Umayyad Arab rulers and tribesmen moved into Greek-speaking areas. The Arabs had to know the new disciplines the Greek had in these regions realizing that knowledge had to be transferred into their own mother tongue, the Arabic language. It goes beyond doubt that what translation did was to facilitate the communication between the different segments of the new Umayyad society descending from the Arab and Greek origins, a role traditionally known to be played by translation throughout the history.

Within this sphere, early medieval translators during the Umayyad times played a unique communicative role in attempting to convey materials to the Arabs who did not share the culture and language of the Greek original texts. To cross the barrier, both languages, Arabic and Greek, had to be used in both government circles and in everyday life and thus translation became an indispensable communicative tool (Al-Maani, 2010). As the Umayyads had to keep in their administration Greek language and Greek-speaking people, there was a growing demand for translation especially into Arabic. The demand for translation was bound to increase because of the continuing strive to use Arabic in the government apparatus and to acquire knowledge the Arabs did not possess till then. The use of Arabic along with Greek during the Umayyad rule meant that translation remained an essential means of communications and became a reality in the Umayyad's daily life.

The whole process of choosing texts to be translated and translating itself were not limited to a specific field, but covered an array of diverse and broad fields: legal, scientific, economic, military, etc. It was the Umayyads' openness to the outside world that made the contribution of translation possible to the development of various disciplines in Arabic during that period, exposing the language and culture of the Arabs to disciplines beyond their traditional poetic and religious spheres in which Arabic was extremely rich especially in the early days of Islam. By the use of Arabic along with Greek during the Umayyad's rule, translation remained as an essential means of communications and became a reality in the Umayyad's medieval daily life by playing the role needed to fulfill this communicative role.

This kind of interaction further subsumes that translation in medieval times was not a transit point where various fields of knowledge stopped for a short period of time before leaving to other destinations without benefiting from them. Rather it was a solid base on which interdisciplinary knowledge was not only transferred but was further enhanced and developed. Within this context, MedAT's approach during the Umayyad times was direct and basically viewed as source oriented in the sense that medieval translators' aim was to reproduce several formal elements, including the grammatical and lexical units. This justified the MedAT translators' attempt to borrow many foreign words without attempting to change or look for their Arabic equivalents. This resulted in many Latin and Farsi terms entering Arabic (Abdulaziz, 1990, p. 98).

This MedAT direct approach involved an attempt to reproduce as literally as possible the source texts. Although translations produced through this approach can be regarded as 'stilted and odd' (Faiq, 2000b), it was adopted by some medieval translators such as Yohanna ibn al-Batriq and ibn al-Na'ama al-Homsy to keep pace with the increasing demand for translation in disciplines that were badly needed by the Arab host culture. Because the expansion of the Arab-Islamic state beyond the Arabian Peninsula meant that the Arabs had to meet with Greek speaking people of different intellectual backgrounds, a

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considerable intellectual movement prevailed in the Umayyad state, which would not have been successful unless translation works relayed new disciplines into Arabic.

It was the firm belief of the Umayyads that translation had to play a very communicative role by not only making sciences and innovations cross borders to the new Arab state, but rather contributing in forming an interdisciplinary environment in which native Arab-Islamic sciences were developed.

TRANSLATION DURING ABBASID DYNASTY

There is an overwhelming opinion that MedAT was in its nascent stage during the Umayyads, who primarily linked the growing demand for translation to their political achievements represented by their strive to expand the boundaries of their new state of Islam (Faiq, 2000a). That is why Al-Mansur's and al-Rashid's eras can be seen as the beginning of MedAT golden age during the Abbasid rule.

Al-Mansur became the first Abbasid Caliph to expand the translation activity and create a very solid base on which various disciplines were brought together and developed. During his rule, MedAT targeted different books of astronomy and engineering from Greek, Syriac, Hindi, and Farsi into Arabic, and the Arabs started to 'read, research, and write. This resulted in the greatest cultural renaissance that characterized the civilization of Islam' (al-Jumaily, 1986, pp. 683-684).

The early days of the Abbasid saw a sharp rise in the amount of material translated, largely because the growing demand for translation not only for government purposes, but also for technical and scientific aims. One of the reasons was that translators, most of whom were Christians, Jews and those who converted to Islam, widely contributed to the development of MedAT activity. Another reason was that the Abbasid rulers were so determined to surpass the achievements made their Umayyad predecessors by encouraging scholars and translators of different races or religions to contribute in MedAT, allowing translation to prosper in an unprecedented pace.

However, researchers, according to Faiq (2007, p. 53), agree that al-Ma'mun was the chief champion of translation, despite the fact that translations first appeared to have started at the turn of the seventh and eighth centuries. But it was for the first time in the Arab-Islamic world that a specific institution *bayt al-Hikma* (House of Wisdom) was established to deal with MedAT matters. Various sections at the *House* were established so that each was designated for a specific area of research and placed under the leadership of a scientist. This created a unique interdisciplinary culture where various disciplines were brought together under one roof and through a medium of communication, i.e. translation.

Post-al-Ma'mun era also witnessed some remarkable progress in MedAT. The main reason for the rapid development of the movement can be ascribed to the efficiency of the translators of that time and the support of rich families as they became involved through sponsorship of translation projects and the establishment of private translation bureaux, boosting interdisciplinary translation and research (Al-Ma'ani, 2010, p. 136). It can be generally said that MedAT at the time of the Abbasids gained a more visible status and was characterized by:

- The contribution and support of the Caliphs,
- The huge amounts of translated materials, and
- The availability of competent translators.

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One of the direct interdisciplinary impacts that MedAT had was the ability of the Arabic language to account for technical terms, boosting its position beyond the poetic and religious genres. Arabic, as the target language, became, according to Al-Jumaily (1986), an important means for expressing scientific and artistic works of Aristotle and the Neoplatonists in philosophy, the masterpieces of Hippocrates, Galen, and Paul of Aegina in medicine, the major treaties of Euclid and Archimedes in mathematics, and the principal composition of Ptolemy in geography (Al-Jumaily, 1986). During this stage, MedAT helped Arabic by consolidating its status as the native language fostering the Arab and Islamic cultural identity, and covering a broad and multidisciplinary area, including:

- The use of Arabic instead of foreign languages;
- The expansion of Arabic to account for new terminology;
- The use of Arabic in all government departments; and
- The use of Arabic as a language of communication in daily life activities.

Many translators became visibly involved during the rule of the Abbasids. 'Abdullah ibn al-Muqafa', al-Hajaj ibn Yusuf ibn MaTar, al-Batriq and his son Yahya. Hunayn ibn Ishaq, Yohanna ibn Masawayh, Ya'cub ibn Ishaq al-Kindi and 'Umar ibn al-Farqan were particularly prominent translators during the reign of al-Ma'mun. Post al-Ma'mun age included many outstanding translators like Thabit ibn Qurrah, Abu Bishr Matti ibn Jonah, Yahya ibn 'uwayd and Yusuf ibn Ishaq.

Several factors strengthened MedAT during the Abbasid rule. One of these was that experienced and competent translators were at the forefront of the subject matter in which MedAT was carried out as medieval Arab translators had solid backgrounds in the sciences, particularly in those fields desperately needed by the Arab/Islamic state. In addition, the role of MedAT in creating an interdisciplinary environment at that time was not only confined to the transfer of science and knowledge, but also to the teaching and spreading of translation and the subjects involved to others through centres in many parts of the Arab-Islamic world. Through translation, many centres of education, research and knowledge acquisition were established and greatly contributed in their turn to translation work. Rather than shelving the books translated, translation served as a catalyst for an educational enterprise. One of the prominent Abbasid translators was Hunayn ibn Ishaq, who was both a translator and translation instructor, and a doctor.

On the institutional front, Al-Namla (1991) argues Judershapur was the first hospital to be established in south-west Persia and the first centre of medical learning. It was headed by Hunayn. So, Muslim doctors were trained in this hospital and exposed to translated materials of foreign cultures. This later led to the establishment of thirty similar hospitals across the Muslim world, in which Muslim and non-Muslim doctors worked and trained.

Further, all members of the medieval Arab society regarded themselves as being players in a team, each with a specific function. A large part of those who contributed to the development of translation and Arab-Islamic culture in medieval times spent their times gathering information and seeking knowledge from other civilizations and cultures in order to make it possible in Arabic:

Medieval Arabic translation was not an end in itself. It was the beginning of the 'real' beginning; the first step towards scholarship and the production of Arab-Islamic works. In this way translated texts were often used to stretch intellectual capabilities. Through appropriation of the scientific and philosophical heritage of others, medieval Arab translators helped to develop an Arab-Islamic culture. They were not mere conduits of knowledge. (Faiq, 2000b, p. 90)

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Adopting an indirect approach, translations were carried out through the additions the translators had to make from their own knowledge or omissions of certain parts which did not conform to their belief system; thus encouraging creativity and the creation of knowledge development in the recipient Arab culture. This approach was adopted by a number of medieval Arab translators including Hunayn ibn Ishaq and al-Jawhary and gave the medieval translators more freedom; but nonetheless it put pressures on their wits and skills to produce Arabic texts that were acceptable in the Arabic target texts, while preserving the content of the source. MedAT translators had the capacity to assume responsibility and were keen to learn continuously about the fields earmarked for translation. Their hard work guaranteed the flourishing of Arab-Islamic culture and its language, Arabic.

MedAT translators had to compare the contents of the translation with similar Arabic texts written before (from the Umayyads period) on the same area of knowledge. This gave them the chance to verify the contents, while the original Arabic texts (translations) provided them with a background that enabled them to make any necessary changes to the text. Hazim (1996) argues that Arabic borrowed many words from Farsi, Hindi and Greek, and has long proved to be able to borrow from other languages in the fields of philosophy, logic, medicine, chemistry and mathematics. Hunayn ibn Ishaq, for instance, borrowed many medical Greek words into Arabic such as *taraxis*, *chimos*, *asarona*, etc., (cited in Abdulbaqi, 1990, p. 123). Medieval Arabic translators were able to provide Arabic equivalents to a vast number of foreign terms into the language (Qunaybi, 1991). They used a number of methods to achieve this end: Literal correspondence, i.e. finding one-to-one equivalents in Arabic; *ishtiqaaq*, i.e. the derivation of terms from Arabic word roots; *majaaz*, i.e. the use of existing Arabic words to refer to the meanings of new terms; *naHt*, i.e. the merging and contraction of two words to mean a new concept; and *arabicisation*, i.e. the borrowing of foreign terms until Arabic ones are found. It is through these methods that Arabic was able to develop and as a result many new words were introduced into Arabic. Without these methods, it was not possible to translate and account for many foreign terms in the medieval times.

MedAT translators were not only proficient in their working languages, but were also familiar with and had an affinity for technical subjects as well as familiarity with technical and scientific terms (Al-Ma'ani & Faiq, 2015). In short, medieval Arab translators possessed:

- A broad and deepened knowledge in scientific texts.
- An understanding of how to coin new Arabic concepts to account for many foreign words.
- Competence in both source languages and Arabic.

One of the essential interdisciplinary platforms generated by MedAT was that during the sessions held within *bait al hikma*, seminars and panel discussions on the training of translators were held to foster clearer and more informative cultural communication and to improve the relationships between translators and those who possess the languages, transfer competence and knowledge of the subject matter. The result of this translation-oriented society had been the introduction of many translation houses like *bait al hikma* into a number of major cities of medieval Arab-Islamic nation, similar to what nowadays can be called majors in specific disciplines. These institute-like houses provided ready panaceas for translation pitfalls as translators were kept up to date on then practices, appealing to already known translators and experts.

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CONCLUSION

Translation is often seen as an intercultural apparatus through which innovations and inventions are passed from one culture to another, creating a platform of interdisciplinary nature in the host culture into which translation is carried out. Early translation impacts on medieval times were seen in the desire of the Umayyad dynasty to use translation to establish an administrative system in Arabic. Translation was not used as a mere transfer tool, but an inseparable policy by the ruling dynasty to bring through translation disciplines the Arabs lacked and needed for development especially from the Greek speaking world.

Similarly, translation was vitally important to the scientific and technical development that the Arab-Islamic world needed during the Abbasid times. The sheer volume of MedAT works on technical disciplines enabled the Arabs to read and further develop these disciplines in their own fashions. Because of MedAT, the Arabic language became a global medium of technical disciplines. Within this framework, it can be said that MedAT created an Arab-Islamic interdisciplinary hub in medieval times.

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KEY TERMS AND DEFINITIONS

Arabicization: Refers to the use of Arabic as a language of thought, education and communication in all walks of daily life in Arab countries. It has also become in some contexts synonymous with translation, in an attempt to emphasize the Arabs' desire to transfer sciences, arts and literature into Arabic.

Culture: Refers to a set of beliefs, values, traditions that make a society distinguishable from another.

Interdisciplinary Impact: The effect the various disciplines had on the recipient culture.

Medieval Arabic Translation: Refers to translation activity that commenced in the Arab world during the seventh and eighth centuries.

Translation: An activity that involves the transfer of knowledge from one language/culture to another.

Chapter 4

Interdisciplinary Solutions for Tertiary Education Institutions and a Stagnating Labor Market in Jordan: A Case Study at a Public University

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ABSTRACT

In the late 1980s, the Jordanian economy suffered a depression; consequently, public higher education institutions started receiving less government funding. To contain the economic crisis, Jordan underwent an economic reform which changed labor market needs. In response to these developments, Yarmouk University (YU) established global partnerships in an attempt to face the new challenges. An exceptionally successful example was the first joint program between the University of Arkansas (UA) and YU which was initiated in 1996-1999. The cooperation resulted in the establishment of the Department of Conservation and the Management of Cultural Resources which was an interdisciplinary program, faculty exchange, training programs, and collaboration on interdisciplinary research and grant proposals. This innovative endeavor helped Yarmouk University keep abreast of global changes while providing a demanding and continually changing marketplace with the best possibly trained specialists and professionals. The study explores how such a model can solve problems with stagnant specialties.

INTRODUCTION

The University of Arkansas (UA) and Yarmouk University (YU) were awarded a College and University Affiliations Program grant in 1996 to fund a three-year cooperative program titled *Preserving the Past*,

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Building the Future: A Program in Civil Administration and Archaeology. The program had set two goals: the development of a new curriculum in cultural resource management at both YU and UA and the creation of professional development training programs in geographical information systems (GIS) and in cultural resource management for civil administrators, planners, and antiquities personnel in Jordan and the United States. This program set out to address a common problem in Jordan and the US: the destruction of the cultural heritage by urbanization and economic development. The program was built on the growing relationship between the two institutions that resulted from faculty visits, student exchanges, and the creation of UA's and YU's joint Bioarchaeological Field School. Further, the strengths of the programs offered by the two institutions in anthropology, archaeology, public administration, sociology, and geographical information systems (GIS) through the Center for Advanced Spatial Technologies (CAST) contributed towards the initiation of this project. In the year 2000, the project had successfully created graduate degree programs in CRM at both institutions--the first in both nations--and had also established a CRM training program for civil administrators in Jordan.

Among the most important achievements was the creation of two graduate programs at UA and YU in the management of cultural resources. Another important accomplishment was the development of teaching modules in CRM for interdisciplinary use to educate different stakeholders. In addition, both UA and YU contributed to the transfer of advanced technology and knowledge which incorporated technical training workshops for faculty and graduate students at both institutions in addition to stakeholders in the local communities in both Arkansas and Irbid city. Last but not least, the human relations and friendships which continued to grow during the grant period and turned into long lasting friendships were among the most stimulating of the successes the joint cooperation achieved.

As there are successes, there are also difficulties to overcome and problems to be solved. The wide ranging and recurring administrative changes at both institutions had caused complications during the grant period. Another serious problem which was not to be controlled was the growing political instability in the Middle East during the grant period and beyond. These crises have been having serious impacts on the continuing cooperation between UA and YU.

The two main insights which were gained during the first phase of the YU and UA cooperation were firstly, when it comes to commitment, there are no gray areas. The success of any joint project depends on the support of the administration and the full commitment and cooperation of the participating faculty members. Secondly, in order to create sustainable programs, they must be institutionalized. Then strategies for maintaining and implementing them to preserve their effectiveness and build on their successes need to be carefully planned and applied.

ORGANIZATION BACKGROUND

His Majesty King Hussein Bin Talal issued a royal decree in 1975 in which he stressed the need for a second national university in the Kingdom of Jordan—the first being the University of Jordan (UJ) in Amman. The location of the new university would be Irbid city, about 90 km north of Amman, the capital. The next year, YU was established, named after a local river of great significance in Arab history. On the 16th of June 1977, the late King Hussein inaugurated the university during the country's silver jubilee celebrations of the King's accession to the throne.

Ever since the establishment of YU, its growth has been steady and systematic. In 1986 it was decided that this higher education institution be divided into two campuses: the Yarmouk campus located

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in the heart of Irbid, only one km from the city center and the new campus at a distance of about 20 km to the east forming a new fully-fledged national university—The Jordan University of Science and Technology (JUST). All applied sciences faculties were transplanted to the new campus: Engineering, Pharmacy, Medicine, Public Health, Supporting Medical Sciences, Dentistry and Nursing. This new campus would become the heart of the Northern Economic Zone to be announced by His Majesty King Abdullah II on May 1st 2007.

Currently, YU has fifteen faculties. The first faculty which was established in 1976 was the Faculty of Science and Arts which included specializations in science, arts, economics, administrative sciences, and education. This faculty was the nucleus of the Faculty of Arts, Humanities, & Social Sciences and the Faculty of Science which both became separate colleges in 1981. The former included five academic departments: Arabic, English, Journalism and Mass Media, History, and Modern Languages, and Education. The Departments of Sociology and Political Science were added in the academic year 1991/1992, and at the turn of the century, the Department of Geography started to offer classes to meet the needs of the local community. The latter includes the departments of Chemistry, Physics, Mathematics, Biological Science, Statistics, and Earth and Environmental Sciences and B.Sc. degrees are awarded in all specialties. In 1981, M.Sc. programs were initiated in all departments. Until 2002, the department of Computer Science was part of the Faculty of Science, and then became the main department in the newly established Faculty of Information Technology. The two most recent programs founded in the Faculty of Sciences are the Medical Physics program in the physics department leading to a B.Sc. degree in medical physics, and Biotechnology program in the Biological Sciences department leading to M.Sc. degree. These started to offer degrees in 2003.

In 1991, the Department of Education became a separate faculty. Seventeen years later in 2008, the Faculty of Mass Communication was founded. This entity is a natural continuation of the Department of Journalism and Mass Media which had initially been part of the Faculty of Arts, Humanities, & Social Sciences. His Majesty King Abdullah II laid down the corner stone of the faculty on the twentieth of April of 2008.

In 1988 the Departments of Fine Arts and Physical Education which had been part of the Faculty of Arts and Humanities since 1980 were incorporated into the Faculty of Education and Fine Arts. In 1993 the Council of Higher Education decided that it was to become an independent faculty under the name of Faculty of Physical Education. A few years later, the Department of Fine Arts became the College of Fine Arts in 2000/2001.

The Faculty of Shari'a and Islamic Studies was established in 1990. In 1992/1993, two departments were created: the department of Fiqh & Islamic Studies and the department of Islamic origins; which includes the Quranic Studies and Al-Sunna, and Islamic Comparative Studies. In 2001, the departments were restructured to include the departments of Al-Fiqh, Islamic origins, and Islamic Studies. In addition to the undergraduate studies, the faculty awards MA and PhD degrees.

The Faculty of Economics and Administrative Sciences was set up as an independent faculty in 1981 after it had been part of the Faculty of Science and Arts. It offers five different programs and includes a graduate program. Soon after, Hijjawi Faculty for Engineering Technology was established in 1984, with a generous donation from Hisham Hijjawi Scientific Foundation. The Department of Public Law was part of the Faculty of Economics and Administrative Sciences from 1992 until 1999. With the turn of the century it began to function as an independent faculty.

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Due to the essential role creativity and the arts play in the process of individual growth, the Department of Fine Arts was established within the Faculty of Arts and Humanities in 1980 and in 1988 it became part of the Faculty of Education and Fine Arts. In 2001 Fine Arts was established as a separate faculty.

Despite the revolution in Information Technology in the 1990s, it wasn't until 2002 that the Faculty of Information Technology and Computer Sciences was established. It is important to mention, though, that the Department of Computer Sciences was founded in 1977/1978 and began offering a complete program towards a B.Sc. degree in Computer Science in 1980/1981. In 2002, it naturally became part of the new faculty. The delay in the establishment of this faculty was a result of budget cuts.

Since Jordan is not only known for its modern advancements, but is also well-known for its rich history and heritage, the preservation and conservation of its historical treasures and the promotion of its cultural heritage has gradually gained in significance until it became a national priority. Out of the university's concern for archaeological sites and cultural resources, the Institute of Archaeology and Anthropology was established in 1984 as a research and teaching center in the fields of archaeology, epigraphy, and anthropology. The different departments of the Institute offered a number of graduate programs. The Department of Archaeology offered five Masters degree programs: Pre-history, Classical Archaeology, Islamic and Numismatic Archaeology, and Applied Archaeology. The Department of Epigraphy offered a graduate degree in epigraphy, and the Department of Anthropology offered initially two programs: Socio-cultural Anthropology and Physical Anthropology. In 1998, a third graduate program in Tourism Guidance was added. In the year 1999, a new department specializing in cultural resources management (CRM) was established which offered a graduate program in the specialty. The Department of Conservation and Management of Cultural Resources would on the one hand solve some internal problems with teaching loads and on the other would provide opportunities for the training of and collaboration between faculty members from different institutions and across departments. The new program benefitted the Faculty of Pure Sciences, the Institute of Archaeology and Anthropology, and the Faculty of Economy and Administrative Sciences at YU. Faculty in departments at the faculty of Science did not have full teaching loads. This was a result of a new university policy which decreed the increase of the number of students in sections. Course loads were determined by students registered in sections rather than the number of courses an instructor taught. In addition, professors of economy would teach courses related to economy, management, and administration and professors from the sciences taught courses in material sciences, dating of archaeological finds using scientific methodologies, & analysis of archaeological materials. The market was in dire need for students who had knowledge in archaeology, preservation, conservation, & CRM with their knowledge founded on solid scientific bases. It is notable that the department was successful in attracting a good number of teaching staff who had their BAs and MAs in the sciences and their PhDs in CRM. This marriage between the pure sciences and the humanities had a positive effect on the quality of the graduates.

In the academic year 2000/2001, new programs were introduced in the department namely: Archaeometry, Museum Studies, and Preservation & Conservation. Since faculty members in the Faculty of Science had low course loads, they participated in teaching these graduate programs as part of an interdisciplinary approach to the courses offered at the Institute of Archaeology and Anthropology. This method was impressively successful and YU became known for its distinguished graduates who were highly qualified and knowledgeable in their specialties. The department of Conservation and Management of Cultural Resources was the first department of its kind established in the Kingdom which offered a graduate program in the preservation and conservation of cultural heritage. Upon their graduation, students who had been on scholarships from their institutions initiated similar CRM programs in their universities.

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By 2003, the number of graduate students had decreased considerably due to a stagnating job market. Consequently, Yarmouk University decided to turn the Institute into a Faculty which could offer undergraduate degrees. According to the university regulations, an Institute cannot offer undergraduate studies. The new faculty has since then expanded to include undergraduate programs in Archaeology, Anthropology, Conservation and Management of Cultural Resources, and Tourism. 2459 students have graduated to date from various specialties since the establishment of the Institute of Archaeology and Anthropology: 476 received bachelor's degrees in Conservation and Management of Cultural Resources; 4 diplomas, and 69 were awarded master's degrees.

More recently, the Faculty of Tourism and Hotel Management was established in 2011-2012 in an attempt to meet the increasing demand of qualified graduates in the competitive tourism sector. The Faculty has two departments: The department of Travel and Tourism and the Department of Hotel Administration. Two programs were moved to this new Faculty: The B.A. in tourism guidance which had been part of the Faculty of Archaeology and Anthropology since 2006 and the M.A. in tourism which had been a program in the department of Anthropology since 1999 did also naturally become part of the new faculty. These programs had always been unique in their kind due to their interdisciplinary nature in the Faculty of Archaeology and Anthropology as students studied courses from these fields as part of the faculty requirements and electives. Currently, the programs more focused are taught by tourism specialists who produce qualified candidates for the local and also regional markets since it is the only tourism graduate program in Jordan. The undergraduate program in Tourism Guidance aims at training students to become qualified guides for local and international guests. The study plan focuses on foreign language proficiency and the theoretical and practical knowledge and skills necessary for employees in the tourism and hospitality sector to ensure a competitive quality of services in an attempt to enhance the image of Jordan.

The last two faculties which were founded are the Faculty of Medicine which was established on the basis of Jordanian High Education Council resolution in March 2013, and its activities started at the beginning of the academic year 2013/2014 and the Faculty of Pharmacy which was established in 2013. The decision to establish these two faculties at Yarmouk University despite the fact that Pharmaceutical Sciences and Medicine are taught at the JUST campus was taken mainly to create additional income for YU in an attempt to help the university decrease the budget deficit which it has been struggling with since governmental funding has dwindled and other university investments have not been able to relieve the budget deficit.

The student population at the university approximates 35 thousand of which around 5000 students are international students coming from 50 different nations in the world.

SETTING THE STAGE

Higher education in Jordan started in the 1960s as the demand for trained teachers for school education increased. The first university, UJ, was established in 1962, the second, YU, in 1976 aimed at serving the northern parts of Jordan and nine more public universities followed suit in different parts of the country. In 1989, the Higher Education Council authorized the establishment of private universities (MOE, 2004, p. 12). These higher education institutions offered higher education to students whose qualifications did not allow them to secure subsidized seats in public universities. Today, according to the Ministry of

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Higher Education and Scientific Research of Jordan (MOHE), 19 private and 10 public universities offer undergraduate and graduate programs for students in Jordan and the region (MOHE website).

Those Jordanians, who had the financial means to study abroad in the 1970s and 1980s, pursued graduate studies in English speaking countries like the United States, Canada, and England mainly because degrees from these countries were in high demand and some specializations were not available nationally. Others studied in Egypt, Syria, the Arabian Gulf, Russia, Western Europe & the Balkans. The number of students flocking to regional and international universities started to decrease rapidly after the collapse of the Jordanian dinar in the late 1980s which dramatically increased the cost of international higher education. Furthermore, the Jordanian government put forth initiatives which aimed at preserving its foreign exchange reserves. Hence, according to George (2005), the country witnessed a rapid expansion in higher education programs which started offering students wider options locally. In addition, the low cost of Jordanian higher education, its excellence, and the kingdom's reasonable cost of living attracted substantial numbers of foreign students (p. 228). Thus, Jordan's monetary policy aimed in the beginning at preserving the country's assets in foreign currency by encouraging local higher education for Jordanians and, subsequently, attracting international students to its high quality higher education institutions to increase foreign reserve assets as a preventive measure to buffer possible future market shocks.

Public universities witnessed a rapid increase in the number of accepted students in their undergraduate programs. Numerous specialties and undergraduate programs were opened in public universities to meet the growing demand for tertiary education in Jordan. YU was established as the second national university in Jordan in order to accommodate the growing number of qualified students seeking higher education in the 1970s and thereafter. It also aimed at providing Jordan with specialized and well-trained graduates needed to further the social, economic, scientific, and vocational progress and development in both Jordan and the region. Nijem (1980) affirms that the university was planned to serve all sectors of society and adopted the policy of education for life (p. 38). This approach would help enrolled students to develop the skills and the knowledge they would need to achieve success in all walks of life.

The increased demand for higher education caused enrollments in public universities to grow steadily (Khader, 2011; Mahafzah, 2017). This called for action. Soon after, the government allowed the private sector to establish higher education institutions. Also, an amendment to the Jordanian Universities Act was approved and endorsed the autonomy of these universities. Both public and private universities were provided with the necessary financial resources (UNESCO-IBE, 2006). Ever since, the number of private universities has been growing steadily in an attempt to accommodate the increasing numbers of undergraduate students in the country. YU came to be known as a distinguished higher education institution in Jordan in the specialties of English Language and Literature, Economics, Business Administration, and the Sciences which provided highly skilled graduates for the Jordanian labor market and the marketplace in the region YU's graduates were known to get hired almost immediately upon graduation by local and regional institutions and companies. This continued to be the case until the end of the 1990 when the university, compared to other regional institutions, was gradually falling behind on implementing information technology. To stay competitive in the marketplace, high ranking academic institutions like Yarmouk University were expected to employ and put into practice the new technologies faster than businesses and companies in the marketplace. This reflected negatively on Yarmouk University's graduates who were poor in up-to-date technological competence, thus rendering them less able to meet the labor market needs.

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The delay in the implementation of technology innovations had reasons. The country had suffered an economic crisis in 1988/1989. The severing of Jordan's official ties with the West Bank, growing external debt, declining foreign aid due to the political stance of the Jordanian government toward the Gulf crises, and the shrinking foreign currency reserves made foreign investors and Jordanians worry and resort to exchanging their savings in Jordanian dinars for foreign currencies and deposit them outside of Jordan. The Central Bank took action and restricted the transfer of foreign currency out of Jordan to an annual 5000 Jordanian dinars. Consequently, the value of the dinar dropped significantly. According to Harrigan, El-Said, and Wang (2006), within one year, the dinar had depreciated around 50% (p.6). The subsequent massive inflow of returning Jordanians because of the Iraqi occupation of Kuwait 1990/91 increased economic pressures further. This had effects on public universities.

The economic turmoil weighed heavily on the budgets of public universities which were increasing in number. The previously state controlled and state financed public universities suffered from the cuts to the state budget for higher education (Cantini, 2016; Al Emam, 2016). As the government decreased funding to cut its increasing expenditures, universities had to find ways to cope with the new situation. Yarmouk University is one of the public higher education institutions which were affected by the reduction in governmental financial support and had to find alternative funding sources to lower its growing budget deficit and debts. These circumstances forced YU at the time to delay its riding the waves of the burgeoning IT revolution. Technology was only slowly updated; computers started replacing electronic typewriters, web services, although limited, became available for faculty and staff, and in due course computer labs were opened for students. Teaching techniques in the classrooms, however, stayed largely traditional with overhead projectors, traditional whiteboards, and T.Vs with video recorders available for use. These audio-visual aids were supplemented with photocopied materials in form of handouts given to students in classes. Most students at YU coming from low-income families did not have the financial means to invest in PCs or in the rather costly laptops. This resulted in computer illiteracy among students of a number of cohorts of the 1980s and the 1990s. Added to this, the local job market was stagnating. Some specialties were no longer in demand, because their graduates not only lacked literacy in information technology, but also lacked interdisciplinary skills which would have made them more competitive candidates in the job market.

Despite YU only gradually updating and integrating information technology, the university had developed strong programs in archaeology, anthropology, and the pure sciences among others. YU had also always valued cooperation and international partnerships. This paved the way for the development of a cooperative program with the University of Arkansas which included faculty exchange, training programs, research collaboration, and curriculum & program development. At the core of this program was a philosophy of fostering relationships; relationships among civil administrators, professionals in the field, students, and academics. The program's curriculum reflected the needs of professionals and aimed at preparing students for their professional careers. Further, the expertise of academics was brought to bear on the problems of cultural resources management.

The establishment of the joint program goes back to the early 1990s when UA created the King Fahd Middle East Studies Program (MEST) in 1994. As part of this program, a group of faculty toured Saudi and Jordanian universities. According to Rose, el-Najjar, and Burke (2016), the Institute of Archaeology and Anthropology at YU responded by expressing an interest in joint projects. In 1995, UA's and YU's joint Bioarchaeological Field School was born and has been sponsored by MEST ever since (p. 419). The same year, the Associated Dean of the Arkansas Fulbright College, who taught a study abroad course at YU, shared an apartment with an anthropologist from UA who was the director of the

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field school. Over their stay at YU, they discussed common issues with their Jordanian colleagues at the Institute of Archaeology and Anthropology including the administration of the Institute. They found that both Arkansas' and Jordan's heritage assets were being systematically destroyed through economic development activities and rapid urbanization. Through a series of meetings the idea of a joint program emerged and outlines for new degree programs at the two institutions was developed. All that was left was to find a source of funding. The director of the field school had mentioned the idea of the project to the Executive Director of the Jordanian-American Commission for Foreign Exchange in Amman and he suggested applying for funds from the College and University Affiliations Program. Subsequently, a proposal was submitted in 1995. A year later, YU and UA were awarded a College and University Affiliations Program grant. Funds for the program were received from this grant, from the King Fahd endowment which offered financial support for what was not covered by the grant money, and also from both YU and the UA administrations in the form of housing, cars, drivers, receptions for visiting faculty and administrators.

CASE DESCRIPTION

In 1996, YU and UA were awarded a grant which led to the signing of a memorandum of understanding between the two institutions to exchange faculty members and students for interdisciplinary training, the establishment of programs, and the writing of proposals to national and international agencies for research funds. International exchange of civic leaders, educators, and students lies at the heart of the mission of the J. William Fulbright College of Arts and Sciences at UA which comes from the writings of Senator J. William Fulbright: "...the highest function of higher education is the teaching of things in perspective, toward the purposes of enriching the life of the individual, cultivating the free and inquiring mind, and advancing the effort to bring reason, justice, and humanity into the relations of men and nations" (p. 40). Accordingly, the curricula and professional development programs which the grant financed aimed at 1) curricula development for graduate degrees in CRM at both institutions and 2) the training of current and future strategic stakeholders in the process of cultural resource management at the national, regional, and local levels. A total of eleven faculty members were involved in the grant.

Activities

Faculty exchange and training was a crucial part of the grant. Four faculty and one staff member from the UA visited YU. Six faculty members from YU visited the UA. Working groups of visiting faculty members were created at each host institution. During each visit, the status of the program was discussed and a work schedule developed. Exchange faculty members were then partnered with participants from the host institution. During the course of the semester, regular meetings were scheduled to discuss the work in progress. During their stay at the host institution, visiting faculty members were treated as regular faculty: their offices were in their partners' departments; they attended college and departmental faculty meetings, taught courses and seminars, gave invited class lectures, and made presentations to campus honorary and scholarly groups. A number of the Yarmouk's faculty members also attended the annual meetings of national and regional scholarly associations in the US. Papers were collaboratively written, grant proposals drafted, and faculty members were trained in the use of advanced technology.

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YU visiting faculty members were trained in Geographical Information Systems/Geo Positioning Satellite (GIS/GPS) technology. It is worthy to note here that Arkansas' Center for Advanced Spatial Technologies (CAST) is a world leader in this technology. It is one of Oracle's World Centers of Excellence. Yarmouk's faculty took semester-long courses or intensive week-long workshops in GIS/GPS at CAST while in Arkansas. Additionally, since the Institute of Archaeology and Anthropology at YU and the Jordanian Department of Antiquities needed a site and artifact database system, the archaeologists in the program received training in the use of the Arkansas Archaeological Survey's site and artifact registration system (AMASDA). Two Arkansas faculty members then developed similar systems for YU's Institute of Archaeology and Anthropology and Jordan's Department of Antiquities.

As to curricula and program development, host institutions invited faculty for one semester to work together in creating program outlines and course descriptions for graduate degrees in CRM for both institutions. Teaching responsibilities in this new CRM program were planned to be done collaboratively with two instructors for each course; one Jordanian and one American faculty member. Instructors met on a monthly basis and evaluated their teaching techniques. If modification were necessary, faculty had to review and adapt them to their needs.

Achievements

One of the most important achievements of the cooperation between UA and YU is the creation of two Master's level programs concerning cultural resources management at UA and YU. The former accepted their first batch of students in 1999, the latter in 2000. YU offered a thesis and comprehensive examination track in its new CRM program (see the Appendix). Since textbooks for this new specialty were scarce at YU, UA generously gave core CRM and GIS texts to the library of YU's Institute of Archaeology and Anthropology.

Another important accomplishment was the development of teaching modules in CRM for courses in other disciplines, for civil administrators, and for public and private school teachers as they are stakeholders as well. The first chair of the Department of Cultural Resource Management and Tourism at YU, the Director of the Arkansas Archaeological Survey, and participating faculty members from YU coordinated efforts to accomplish this task in the spring of 1998. The former director of the Master's degree in public administration (MPA) and graduate program coordinator at UA in the Department of Political Science presented daylong CRM workshops with colleagues in public administration at the YU College of Economics and Administrative Sciences which sponsored the workshops. She also developed a Website for the CRM project.

The first chair of the Department of Cultural Resource Management and Tourism at YU also continued work on CRM with the Educational Consultant to the Ministry of Education on the inclusion of CRM topics in the national curriculum of Jordan.

The cooperation between UA and YU brought about the transferal of the Geographical Information Systems (GIS) technology from UA to YU. This was absolutely of paramount importance for YU faculty members, administrators, and students at the time when academics were in need of training in the advanced technology used in CRM. Jordanian participants received intensive training at the Center for Advanced Spatial Technologies (CAST) in Global Positioning Systems (GPS), Geographical Information Systems (GIS), Digital Photogrammetry (DP), Geomatics, Geo-Media, Grass 4.1, Grassland Data Structure, Arc/Info and Arc/View, and Database Management Systems (DBMS).

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Likewise, the archaeology preservation technology and management techniques for large-scale archaeological sites was transferred from YU to UA during the grant period. Staff at the Arkansas Archaeological Survey was trained in state-of-the-art techniques for the conservation and preservation of archaeological materials. The director of the Institute of Archaeology and Anthropology at YU with the help of a number of faculty members provided training and technical assistance to the Arkansas Archaeological Survey on managing large-scale sites. They provided consultative services at the Menard Hodges Site, Gillette, Arkansas and on the preservation of metal objects found at this site.

Jordanian participants also received intensive training by the staff of the Arkansas Archaeological Survey in the Automated Management of Archaeological Site Data at Arkansas (AMASDA) system. Training seminars on this technology were also presented to the faculty and staff at the Institute of Archaeology and Anthropology at YU. Several Jordanian participants received intensive training in Digital Photogrammetry from the staff at CAST and training in Remote Sensing from a specialist in the Department of Geology at UA. Further, several Jordanian participants received intensive training by the staff of the Arkansas Archaeological Survey in the Toltec Delos Artifact Inventory Systems, and Oracle software. Subsequently, UA's (CAST) entered into a formal agreement with the Royal Jordanian Geographical Center (RJGC) to provide regularly scheduled training programs at RJGC. Yarmouk's faculty members were included in this training. CAST and RJGC continued to plan additional exchanges of faculty, staff, and students between Jordan and the United States after they saw the success of the training and the enthusiasm the participating staff and faculty members from the Institute of Archaeology and Anthropology and Tourism at YU showed during the training sessions.

Cooperation between UA and YU was also fruitful with respect to the Department of Epigraphy. Faculty members collaboratively developed a relational database for inscriptions. Grant proposals were also prepared to obtain funding for hardware, software and the staff necessary to construct the database.

In addition to the above achievements, Yarmouk's Institute of Archaeology and Anthropology agreed to provide technical training to UA Master's level students in conservation and preservation. This materialized in the second phase of the cooperation in the year 2000. Workshops were conducted and archaeological site visits were arranged as part of this intensive training. The Institute of Archaeology and Anthropology at YU and the Department of Geography at Arkansas then jointly supported a research project on stone weathering at Petra by a master's level student from UA. YU and UA administrations continued to cooperate with respect to student training and exchange. YU provided a scholarship for a Jordanian student to pursue graduate training in CRM at UA. UA, in return, provided three Yarmouk students graduate assistantships in education and arts and sciences. The interdisciplinary nature of the grant was paying off for graduate students from both participating institutions as they were able to engage in unique experiences during their stays in the two host institutions.

FINDINGS

The general goal of the College and University Affiliations Program was to foster a partnership between UA and YU and meet the need for outreach and training. The grant was highly successful in achieving these goals by enriching both campuses and creating lasting networks. Higher Education for Development (HED), a consortium of development programs, considered the grant among the most successful in the region. First and foremost, UA and YU initiated two graduate programs in CRM. YU pioneered the establishment of the Department of Conservation and Cultural Resources Management in Jordan; the

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department was the first of its kind in the country which offered a graduate program in the specialty. Both universities also improved their curricula, exchanged resources, facilitated professional development of faculty and staff, trained students and public servants, transferred technology and knowledge in the areas of site and artifact registration, spread public awareness about CRM, and strengthened the relationship that had been developing between the institutions since 1994. Interdisciplinary cooperation between different faculties at UA and YU involved three colleges--Arts and Sciences, Business, and Education--and two additional programs, Middle East Studies and the Center for Advanced Spatial Technologies.

Teaching and research activities in addition to the exchange of faculty and students created an impressive web of personal and professional relationships that was sustained through time. Sabbaticals, jointly authored papers, publications, grant proposals, and other projects continued beyond the grant period. The grant opened up more opportunities for collaboration and the building of a rich, multi-stranded relationship between the two institutions that would continue for years to come.

What was crucial to the success of the exchange and interdisciplinary programs was that firstly, throughout the grant, both institutions provided strong administrative support. Secondly, the participating faculty members had common professional and research interests which aided the success of their collaborative efforts. Thirdly, the programs were institutionalized in budgets, programs, and curricula.

What also contributed to the success of the programs was treating the exchange faculty member as a regular faculty member. The participating faculty's offices were in their partner's departments (the Institute, public administration, sociology, or anthropology). The visiting faculty members attended college and departmental faculty meetings, taught courses and seminars, gave invited class lectures, and made presentations to campus honorary and scholarly groups. A number of the YU faculty attended the annual meetings of national and regional scholarly associations with their Arkansas colleagues while they were in the United States. Several Jordanian faculty members presented papers to these organizations. Participants in the program also collaborated on papers and grant proposals. The changes made possible through the grants continue to influence the campuses of both institutions to this day.

CHALLENGES THAT FACED THE PROGRAMS

The programs faced a number of challenges and problems throughout the grant period. Some problems were that Jordanian students in the CRM program at YU had difficulties with the language level used by University of Arkansas instructors. There were also problems with resources such as research accessibility, lack of computer labs, lack of GIS labs for locating sites or the mapping of facades.

The high turnover of administration and faculty at both institutions was a problem. At Arkansas, the Chancellor who was a strong supporter of the programs retired. The Dean of the Fulbright College resigned and the Co-PI at Arkansas left his position as associate dean to become chair of the sociology department. At YU, the position of Director of the Institute of Archaeology and Anthropology changed four times during the period of the grant. There were changes in the offices of the Dean of the Research and Graduate Studies, the Vice President of Academic Affairs, and the President. Some of the faculty members could not dedicate their whole time to the programs, because they accepted administrative positions at different levels. Out of the six professors who originally participated from the Jordanian team, four were administrators by the time the grant came to an end. This is not to say, though, that personnel changes cannot benefit collaborative programs. What happened at YU was that participating

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faculty members were people who were deeply committed to the principles of CRM. It chanced that grant participants accepted key university and government positions and were able to ensure the institutionalization of CRM in Jordan.

On the political arena, September 11, the two Gulf Wars, and changing priorities in the US federal government have had a profound impact on the continuing cooperation between the two institutions. Currently, the political climate does not encourage exchange or development programs between the US and the Middle East. Visa and travel restrictions to the US would most possibly impede the exchange of Jordanian faculty, staff, and students.

SOLUTIONS AND RECOMMENDATIONS

The grant which was awarded to establish collaboration between UA and YU provided several valuable insights. First, cooperative programs are difficult to design, and even more difficult to sustain. The programs faced a special challenge due to the high turnover of administrators and faculty at both institutions during the grant period. Maintaining the commitment of faculty and departments to the grant after key participants leave for other jobs is a challenge. Strong commitment is needed to meet such challenges.

The second important lesson involves the process known as *institutionalization*—a process whereby an activity becomes a normal and necessary part of an organization. A sustainable program must be institutionalized; it requires more than individual commitment to survive. The strategy both UA and YU used to institutionalize the program was by 1) creating a graduate program in CRM and tourism and 2) building strong relationships among faculty, professionals, and communities—a network of players and institutions—that have a vested interest in continuing and promoting CRM.

Additionally, the fragility of the political environment that exists in many developing societies represents another challenge—maybe the greatest one. During most of the grant period, there was on the one hand the continuous threat of an international conflict in the region and, on the other, two heads of state died, plunging their respective countries into political uncertainty. Currently, the future in the Middle East is once again uncertain as the spectre of war continues to hover ominously on the horizon. The involvement of international commissions, embassies, or government agencies in grant projects like the one UA and YU were part of may provide institutions with the necessary support to weather such storms.

Lastly, to help faculty see exchange/interdisciplinary programs as a way of furthering their careers, enough incentives ought to be present. Interdisciplinary research can be impeded by promotion and tenure policies. Institutions that wish to promote interdisciplinary teaching & research and collaborative efforts crossing disciplinary boundaries need to show supportiveness by revisiting their academic support systems and alter policies and procedures that may hamper interdisciplinary activities. Since the success of interdisciplinary collaboration depends on institutional support, institutional leaders should remove barriers to interdisciplinary research and provide more flexibility in promotion procedures at a time when many institutions unfortunately continue to give credit only to research done in the discipline of the faculty members' home department.

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KEY TERMS AND DEFINITIONS

Cooperation: Partnership between two entities or institutions.

Cultural Heritage: Tangible and intangible manifestations of human achievements with which a group of people identify and which is inherited from previous generations and preserved for future ones.

Cultural Resources Management: The coordination and careful planning of activities to protect the historically, archaeologically, and culturally important heritage.

Exchange: Giving and receiving something or someone such as faculty, students, technology, or knowledge for a specific purpose.

Interdisciplinary Research: The marriage of two or more disciplines in conducting systematic observations, investigations, or analyses of phenomena, problems, or issues to reach an in-depth understanding or to find solutions beyond one single body of knowledge.

Interdisciplinary Teaching: The integration of knowledge, methods, and analytical frameworks from different academic disciplines in teaching.

Technology Transfer: The dissemination of technology to a group of people or an institution to widen its distribution and its application.

Training: Professional development through teaching, research, and workshops funded by the grant program.

University of Arkansas: First public university established in Arkansas in 1871. A coeducational, research intensive flagship institution located in Fayetteville.

Yarmouk University: A coeducational higher education institution in Northern Jordan. The second public university established in the country in 1976.

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APPENDIX

The following study plan for the YU graduate program was prepared by the faculty who participated in the American and Jordanian teams during the grant period. The plan was approved by YU councils and implemented in the year 2000.

Study Plan for the MA Degree in Conservation and Management of Cultural Resources

A. Study Plan for the MA Degree in Conservation and Management of Cultural Resources / Thesis Track

The Master’s degree in Conservation and Management of Cultural Resources is awarded after the satisfactory completion of the following:

1. The requirements and conditions stated for the Master program at Yarmouk University No. 2 for the year 2001.
2. The remedial courses determined by the Higher Studies Committee at the Department
3. 24 credit hours distributed as follows (Tables 1-3).

B. Study Plan for the MA Degree in Conservation and Management of Cultural Resources / Comprehensive Exam Track

The Master’s degree in Conservation and Management of Cultural Resources is awarded after the satisfactory completion of the following:

1. The requirements and conditions stated for the Master program at Yarmouk University No. 2 for the year 2001.
2. The remedial courses determined by the Higher Studies Committee at the Department:
3. 33 credit hours distributed as follows (Tables 4 and 5).

Table 1. Obligatory courses (15 credit hours) as follows

Semester	Credit Hours	Course Title	Course No.
First	3	Cultural Heritage Management: theories and methods	CM 640
Second	3	Cultural Heritage documentation and Presentation	CM 641
Second	3	Cultural Heritage Planning and Development	CM 642
Second	3	Information Technology in Heritage Management	CM 660
First and Second	3	Research Methods	Arch 601 A

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Table 2. Elective courses (9 credit hours) to be chosen from the following list

Credit Hours	Course Title	Course No.
3	Museum Studies	CM 621
3	Land Use Planning	CM643
3	Preventive Conservation/Advanced	CM651
3	Conservation projects Management	CM 657
3	Structural Conservation	CM 658
3	Public Archaeology	CM 661
3	Special Topics in Cultural Heritage Management	CM 691
3	Tourism Resources Management	An 604
3	Tourism Industry in Jordan	An 606
3	Tourism and Local Community	An 607
3	Human Resources Management in the Public Sector	PAD 660
3	Promotion and Marketing of Cultural Resources	MKT 627

Table 3. Submission and successful defense of a thesis in the field of specialization (CM 699 equivalent to 9 credit hours)

Semester	Credit Hours	Course Title	Course No.
All	000	MCH Thesis	CM 699A
All	3	MCH Thesis	CM 699B
All	6	MCH Thesis	CM 699C
All	9	MCH Thesis	CM 669D

Table 4. Obligatory courses (24 credit hours) as follows

Semester	Credit Hours	Course Title	Course No.
	3	Museum Studies	CM 621
First	3	Cultural Heritage Management: theories and methods	CM 640
Second	3	Cultural Heritage documentation and Presentation	CM 641
Second	3	Cultural Heritage Planning and Development	CM 642
Second	3	Information Technology in Heritage Management	CM 660
First and Second	3	Graduation Project in Cultural	CM690
Second	3	Tourism Resources Management	An 604
First and Second	3	Research Methods	Arch 601 A

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Table 5. Elective courses (9 credit hours) to be chosen from the following list

Credit Hours	Course Title	Course No.
3	Land Use Planning	CM643
3	Preventive Conservation/Advanced	CM651
3	Conservation projects Management	CM 657
3	Structural Conservation	CM 658
3	Public Archaeology	CM 661
3	Special Topics in Cultural Heritage Management	CM 691
3	Tourism Industry in Jordan	An 606
3	Tourism and Local Community	An 607
3	Human Resources Management in the Public Sector	PAD 660
3	Promotion and Marketing of Cultural Resources	MKT 627

Passing the Comprehensive Exam (CM 698) (0 credit hours).

Section 2

Benefits and Opportunities of Interdisciplinarity

Chapter 5

Fostering Innovation and Creativity Through Systemic Design

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ABSTRACT

Based on empirical studies carrying a common thread of design creativity as well as systemic analysis, interdisciplinarity's fostering of innovation is exemplified. The studies illustrate contexts for systems perspectives in design. A lot of transformation in socio-economic systems is taking place, individuals have a choice to either react to it as it happens or attempt to take the lead on change and position themselves in the frontline or ahead of the fundamental changes that are bound to occur. Designers are well versed in the knowledge and skills necessary to lead this transformational process, requiring forward looking, focusing on problems, working across disciplines, participating in teams and leading by example and inspiration, while adopting a systems perspective and focusing on people. Systemic analysis triggers design work, through the development of solutions, as illustrated in the two cases. One concerns sustainable solutions for water management in a community. The other focuses on the production system for a Portuguese semi-artisanal certified cheese.

INTRODUCTION

Contemporary ecology has emphasized the importance of boundaries and their role in the landscapes, as urban climate and urban watersheds studies demonstrate (Spirn, 2014; Cadenasso et al., 2003). Since the 1970s, Systems Theory and Complexity has been explored in science to provide a new framework for nonlinear, non-rational decision making and planning (Furlan & De Meulder, 2014). Nevertheless, this thinking has often been adopted superficially (Berger, 2009). The original systemic method, proposed by Alan Berger, entails that large-scale territorial dynamics, if properly understood, could guide design

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projects and strategies, going beyond the traditional schemes (Furlan & De Meulder, 2014). Systemic design merges the existing territorial dynamics, with multi-layer strategies and historical transformations, understanding how natural and artificial systems dynamically operate at the regional and local scale, and how these are interrelated providing the basis for an innovative design (Berger, 2009). The theories about complexity assist the management of the entire communal and industrial systems and the design approaches support the planning of different divergent elements (Barbero & Tamborrini, 2015).

Some scholars have affirmed the need for innovative visualization and mapping techniques to identify and portray the interplay of natural and social processes that shape and structure the artificial environment and the territory. “For designers, new techniques of notation and representation are required. Conventional techniques are inadequate to the portrayal of time and change, and they encourage the continued focus on visible and static form” (Spirn, 1988). The construction of causal maps is a key instrument in a systemic design approach (Furlan & De Meulder, 2014).

Even though systemic innovation is not amenable to simple recipes or toolkits, given its complexity and its multi-faceted process, it may be driven by awareness in order to achieve the best possible result. Such is the scope of the systemic innovation process. Starting from the analysis of the complex interactions relationship between different actors (individuals, society, enterprise, culture, territory, etc.) and the related cultural, economic and community area or territory the aim is to unlocking and exploit the innate value of the context as a starting point (Gaiardo & Tamborrini, 2015). Given information and communication technologies and in particular, the ability to gather, analyze and disseminate large swaths of data and connect large numbers of people over broad areas a greater understanding of complex systems can be achieved (Coelho, Carrola & Covuvinhas, 2017). There is now a range of tools for mapping and better understanding systems that can give useful insights leading to innovation of those systems (OECD, 2014). This approach is a strategic way to face the design innovation activity, defined as the process comprising all essentials steps that lead to innovations generally involving all the internal sources of knowledge generation and learning and the organizational structure and processes of the people and organizations committed in the process (Filippetti, 2011).

The two case studies reported in this chapter illustrate diverse contexts for systems perspectives in design. A lot of transformation in socio-economic systems is taking place at a growing pace; hence, individual professionals have to choose to either react to it as it happens or to attempt to take the lead on change and position themselves in the frontline or ahead of the fundamental changes that are bound to occur. Designers are well versed in the knowledge and skills necessary to lead this transformational process, requiring forward looking, focusing on problems, working across disciplines, participating in teams and leading by example and inspiration, while adopting a systems perspective and focusing on people (Coelho, 2016). This chapter aims demonstrating how systemic analysis triggers design work, through the development of solutions, and this is practically illustrated in the two cases covered in this chapter. The first one concerns sustainable solutions for water management in a community. The other one focuses on the production system for a Portuguese semi-artisanal certified cheese: *Serra da Estrela* PDO cheese.

BACKGROUND

Biologist Edward O. Wilson has argued that consilience - the “jumping together of knowledge” across disciplines “to create a common groundwork of explanation” - is the most promising path to scientific advancement, intellectual adventure, and human awareness (Wilson 1998, p. 8). In a review by Rhoten

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(2004), it was found that some analysts claim that academic science has already embraced the idea of consilience and that a transformation is well underway from the traditional manner of doing research - homogeneous, disciplinary, hierarchical - to a new approach that is heterogeneous, interdisciplinary, horizontal, and fluid (for example, Cooke, 1998; Etzkowitz & Leydesdorff, 1998; Gibbons et al., 1994). Others, however, suggest that the university's metamorphosis toward interdisciplinarity is nowhere as far along as those in the first camp maintain (for example, Hakala & Ylijoki, 2001; Hicks & Katz, 1996; Slaughter & Leslie, 1997). In fact, some would even argue that there is no empirical evidence of any fundamental change encompassing the university science system (Shinn, 1999; Weingart, 1997). Aboelela et al. (2007) conducted a systematic review of literature leading to their proposal of the following definition of interdisciplinary research: "Interdisciplinary research is any study or group of studies undertaken by scholars from two or more distinct scientific disciplines. The research is based upon a conceptual model that links or integrates theoretical frameworks from those disciplines, uses study design and methodology that is not limited to any one field, and requires the use of perspectives and skills of the involved disciplines throughout multiple phases of the research process."

In this chapter, interdisciplinarity is approached from a systems perspective in design. The International Council of Societies of Industrial Design has recently (in 2015) updated its definition of Industrial Design: "Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences". An extended version of this definition is as follows: "Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences. Industrial Design bridges the gap between what is and what's possible. It is a trans-disciplinary profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system, service, experience or a business, better. At its heart, Industrial Design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology, research, business, and customers to provide new value and competitive advantage across economic, social, and environmental spheres". What this definition demonstrates is that designers are potentially well versed in the knowledge and in the skills necessary to lead transformational processes, requiring forward looking, focusing on problems, working across disciplines, participating in teams and leading by example and inspiration, while also adopting a systems perspective and focusing on people. Systemic analysis embedding an interdisciplinary perspective and making use of an ethnographic approach from its start, may trigger design work, through the development of design solutions, as illustrated in the two empirical studies described.

THE SYSTEMIC DESIGN APPROACH

The methodology of Systemic Design (SD) looks at making better use of material and energy flows in order to model our production and energy systems after Nature (Bistagnino, 2009). Material and energy loops are open in order to decrease environmental impacts and resource depletion. Living systems are "open" in the sense that they continually draw upon external sources of energy and maintain a stable state of low entropy that is far from thermodynamic equilibrium (Shrodinger, 1943). Many industrial ecosystems have come about ad hoc for better business, while others have been facilitated through external actors. However, as these theories and ventures may be innovative for the industries, they are still no more than solving problems that arisen from environmental pressure and economical revisions. Systemic theory is the study of how complex entities interact openly with their environments and evolve

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continually by acquiring new, “emergent” properties (Heylighen et al., 2000). Rather than reducing an entity to the properties of its parts or elements, systems theory focuses on the relationships between the parts that connect them into a whole. Complex systems are generally dynamic, nonlinear and capable of self-organization to sustain their existence. This approach is patterned after the self-organizing behavior of living systems. This type of reasoning leads to the “Gaia hypothesis”, which claims that the world is a single giant organism (Lovelock, 1988). SD proceeds with constant awareness of related systems, boundary conditions, external effects and potential feedback. SD plans entities with inherent “resilience” by taking advantage of fundamental properties such diversity (existence of multiple forms and behaviors), efficiency (performance with modest resources consumption), adaptability (flexibility to change in response to new pressures) and cohesion (existence of unifying forces or linkages) (Fiksel, 2003).

To encourage systems design that incorporates sustainability thinking explicitly, it is useful to have clear principles. The theory of SD offers a scientific method that derives from generative science and evolves from industrial ecology, symbiosis, ecosystem and cluster theory. It can be summed up by its five basic principles (Bistagnino, 2009):

1. Man at the center of the project: the product has become fulcrum of a paradigm of values and actions, as the economical wellness, the quantity of currency resources, the wish of belonging to a social status, that shape negatively consumption choices. The systemic approach, instead, questions the present industrial setting and proposes a new paradigm where at the center of each productive process there are social, cultural, ethical and biological values that every man shares.
2. Output becomes input: as in Nature what is not used by a system becomes a raw material for the development and survival of someone/something else, in the production process the waste (output) of a system become an opportunity (input) for another one, creating new economic opportunities and new jobs.
3. Relationship: it is important to consider, more broadly, all the networks of components that make the food system, including materials (resources) and energy, which are used, captured and stored through different stages of the product life cycle. Understanding the pattern of materials and energy flow and investigating where it can be improved can allow us to find entry-points for designing more sustainable food system.
4. Towards *autopoiesis*: in Nature self-maintaining systems sustain themselves by reproducing automatically, thus allowing them to define their own paths of action. In this way the system is naturally led to balance and to preserve its independence. If in the analyzed system one were to also start in terms of *autopoiesis*, it could be possible to efficiently allocate and distribute material and energy flows.
5. Act locally: an eco-system is deeply influenced and shaped by its habitat, the same happens for any other type of system. Based on the opportunities provided by the local context, new opportunities can be created by reducing the problems of adaptability due to “general” solutions and increasing people’s participation.

On an industrial level, the logical linear process and development affect the perception of reality, as these are based merely upon cause-effect relationships, which generate huge quantities of waste, starting with the manufacturing process until the product’s “end of life”. With such on-growing complexity, it is necessary to withdraw from the exclusive focus given on the product and its life cycle, moving toward achieving greater competence in the context of the complex relationships which spring from the

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production process. Bring back within the total planning equation, the variable represented by those resources (generated as a result product or waste) would otherwise be unused. The cultural and practical skills should be regained to outline and plan the flow of matter, running from one system to another, in an on-going metabolizing process which diminishes the ecological imprint and generates a remarkable economic flow. Currently, rejects generated during the manufacturing process, are only a cost. In order to go through a project with the systemic design approach, it is essential to start from the current state and to make a peculiar observation of all the aspects which are part of the system (input), what occurs inside it and what comes out of it (output). The analysis of these inputs and outputs will have to be done in two different ways:

1. Quantitatively so as to know the quantities that we move around and we avail of;
2. Qualitatively to know exactly what we have at our disposal.

These simple steps enable developing a clear idea of: the resources needed, their features and origins; rejects or processing waste, their specific qualities and their final destination; what occurs throughout the processes, comparing the specific differences of inputs and outputs. The vision holistically embraces the whole process and makes one perceive the relationships interwoven within the analyzed system. This shows how the mere focus on individual parts, oblivious of the links with its component parts, is utterly useless, and forms a dichotomy with the dynamism of the whole. What is explained so far aims to make one understand the actual cause of the malfunction in the current cultural and productive approach of society, only geared towards achieving products and solving specific problems, ignoring the connections occurring among the constituent parts or the cause-effect relationships of the choices we make. For an overall vision, it is necessary to arrange a graphic scheme, allowing retracing both with eyes and mind, the flows of matter and energy of the system we have looked at until now. From the analysis of the problems and the configuration of the starting scheme, the quality of the outputs is highlighted, so that they can be turned into inputs for other productions or systems, looking for possible links with other territorial realities which, despite their great differences, can be integrated within the analyzed production. This process usually leads to an exponential growth of the productive capacity of a territory, as a result of which, it is able to produce new material goods, to offer new services to the citizens and to ultimately increase the number of jobs. Yet, contextual surveys show a demand actually exists but it is met by imports or external resources. By exploiting the resources of the territory, the development has a local dimension and new self-sustained realities are spawned, both in terms of energy, production and supply.

The logics of linearity presents itself in the industrial sector through phenomena such as the cause-effect relationship; technical problems are solved and strategies are drafted step by step in order to improve the product and innovate. However, a simple change of perspective on how the various situations taking place are looked upon can lead to more straightforward innovation. The key is to observe production processes in a systemic way, considering waste and residue together with scarcity of raw material, from the onset of analysis, while taking preventive rather than corrective action to transform shortcomings in strengths and create situations where the outputs of a system become new inputs for the same or another system (Bistagnino & De Morais, 2009).

The most common production models that can be found generate a lot of waste and have a general tendency to focus on the product, keeping other aspects dimmed. The methodology of systemic design traces the path of materials and energy during production, monitoring transition from one stage to another, throughout the cycle. As a result, it creates an important economic flow progressively eliminat-

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ing polluting parts. However, the focus is not only on environmental issues, but also on an economic model that encompasses both the development of the productive system and of society (Bistagnino & De Morais, 2009).

Systemic design strives to make better use of material and energy flows, shaping our production and energy systems according to Nature (Bistagnino, 2009). Scrap generated by manufacturing processes is typically viewed as a cost. In order to go through the SD approach, it is essential to start from the current state and make a peculiar observation of all aspects which are part of the system (input), what occurs inside it and what comes out of it (output). The analysis of these inputs and outputs should be done both quantitatively and qualitatively. The result is a vision that encompasses the whole process and enables perceiving the relationships interwoven within the analyzed system. By exploiting resources in the territory, development has a local dimension and new self-sustained realities are spawned, in terms of energy, production and supply (Couvinhas et al., 2012).

CASE STUDY OF THE PERIPHERIES OF MINDELO, SÃO VICENTE ISLAND, CAPE VERDE

This project demonstrates an intervention in a social community, sought to transform the qualifications and motivational climate, supporting increased self-esteem and the pursuit of an upward spiral for this community. The study unveiled a perspective on the mindset and problematic societal domains of an economically challenged habitation community in the periphery of Mindelo, Cape Verde. Solutions that might be created to reach the goals of sustainable development were sought through a design method that embeds a systems approach, put into effect in order to support the attainment of these goals. Selected aspects of this case study were previously reported in conference proceedings by Couvinhas et al. (2011).

Extensive and Holistic Research of the Local Community (Mindelo)

The project reported in this chapter was based on extensive research of the local community, carried out by Ana Filipa Couvinhas, who lived with Capeverdean people in Mindelo's peripheries for four months (April-July 2010), thus using an ethnographic approach. This process enabled drafting solutions deemed easily acceptable, improving the way of living of people in the communities investigated. The project was integrated in the culture, and was not an imposition of European ways of living or mindset.

In order to make the local research possible, collaboration was established between two associations: an Italian one named "COL'OR" (a non-governmental organization that deploys several initiatives in developing countries, especially in the educational field), and a Cape Verdean one, named "Espaço Jovem", based in Ribeira de Craquinha, Mindelo's periphery. The latter plays a very important role in local development, creating several activities in order to improve intellectual skills, offer job opportunities and give local people the opportunity to develop artistic abilities, which contribute to fight violence and improve self-esteem. An example of local activities are extra-curricular lessons, where school teachings are revised and pupils learn how to study in an efficient way. In addition, people of all ages have the opportunity to take part for free in creative groups like theatre, gymnastics, an orchestra and to use the association structures to study or to use computers that are connected to the Internet.

To develop the project reported herein, a holistic approach to research was needed in order to understand all the connections between different domains that are seemingly unrelated. Several of the existing problems probably originated in a specific ambit, but their consequences appeared in a different context.

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Consequently, on one hand, using an ethnographic approach, the research was based on registering the ways of living of the periphery families (with whom the third author lived and gained familiarity), their behavior and beliefs. On the other hand, several interviews were made (some of them in Capeverdean Creole, others in Portuguese) to different people of all ages who had different knowledge to share (e.g. engineers, clerical people, artists, professors, political people, policemen, architects, musicians, farmers, journalists, house wives, students and numerous local associations that work in the human and environmental development fields). These unveiled contrasting opinions which allowed a different sided interpretation of local reality.

The difference between the city of Mindelo and its suburbs is enormous. In Mindelo it is possible to do almost everything that citizens of developed countries can do in a small city. By contrast, periphery habitants live in precarious conditions, frequently in tin houses, without running water and with risky accesses. One of the biggest problems found is that potable water vanished from the local natural environment due to both global causes, like global warming, and to local causes, e.g. the introduction of foreign plants that consumed lots of underground water, the soil's lack of permeability and the removal of coastal sand that increased sea water osmosis transforming underground water in saltwater. Now-a-days, desalination processes are needed to obtain drinking water for use in any activity that cannot be carried out with saltwater. This is the reason why even public fountains don't offer water but sell it.

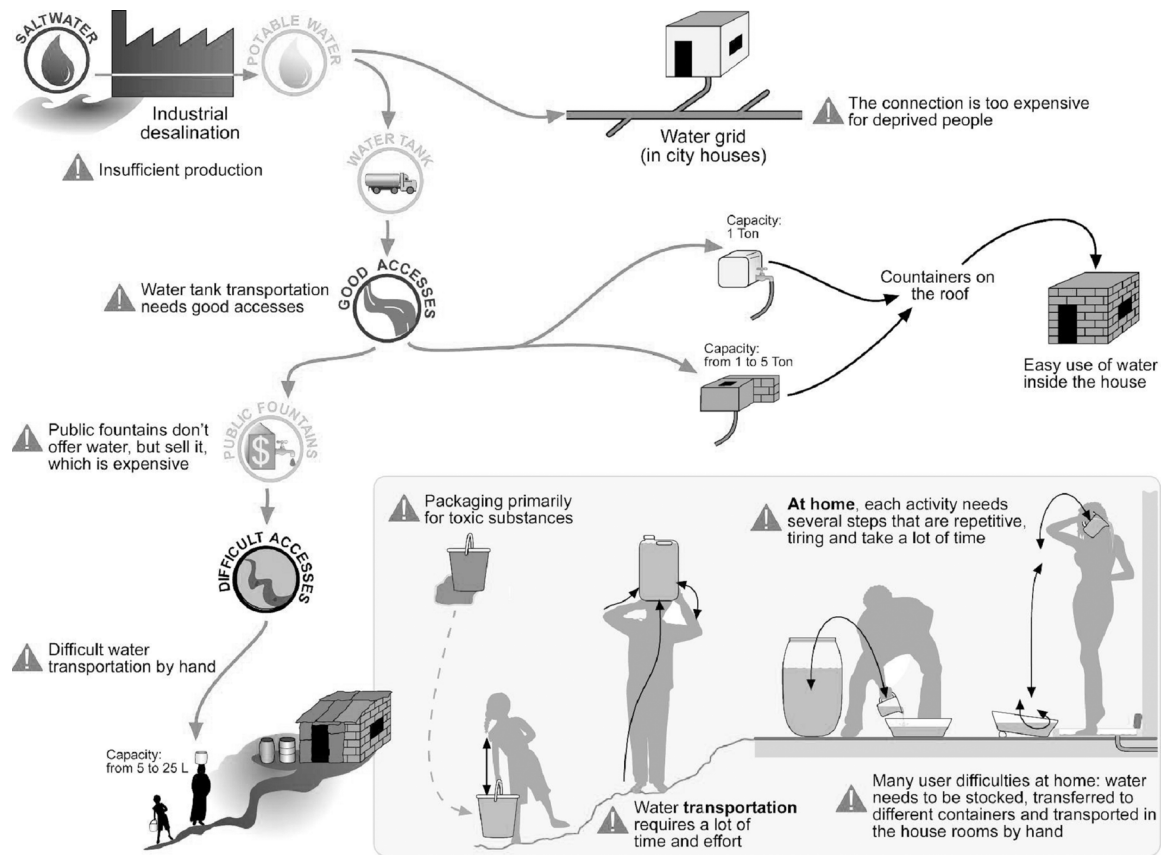
Unfortunately, during the dry months, S. Vicente's residents are forced to buy every single drop of water, which is very expensive, especially for economically challenged people. In order to buy less water, suburban residents are deprived of using basic services including toilets (even if they have one in their home, they don't use it, so they do dejections outside) which originates health problems and reduced self-esteem. Rainy days are very few and appear only in August; even if local people collect some rain water, storms damage houses, soil and accesses due to the absence of trees and other plants to fix soil. Periphery houses are the most damaged ones, as they are constructed by their residents; furthermore, they are usually placed along mountain slopes. Living in higher places brings other problems like the complexity of connecting the house to the water grid; without this there are many user difficulties at home, because water needs to be stocked, transferred to different containers and transported in to the house rooms by hand. Each activity needs several steps that are repetitive, tiring and that take a lot of time. However, the biggest difficulty concerns water transport by hand from the public fountain to the house, requiring a lot of time and effort. In addition, this can even cause health problems because inappropriate containers are used to transport drinkable water: many had been primarily used as packaging for toxic substances, such as wall paint or detergents. With the previous description, illustrated in Figure 1, it is easy to understand that both water scarcity and abundance originate several problems in different fields that can be partially reduced through the design project intended as one of the outcomes of this study.

Project's Contribution to Local Development of the Community (Mindelo)

The project's contribution is composed of two phases: one took place during the third author's local residence and the other through her final diploma project in sustainable design. In loco, it was possible to inform and teach young people in order to enrich their knowledge on the environment through non formal discussions and a conference given to architecture students at the local university. In addition, in order to foster the creation of new work opportunities in the suburbs, a free monthly course of Photoshop was delivered (an essential tool for graphical work that is in demand in Cape Verde) that had positive results. During children's Summer vacations, it was possible to give support to "Espaço Jovem" activities teaching artistic techniques and logical games. Finally, some support was given during the development

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Figure 1. Some local water related problems for residents that have no water grid connection



and organization of several required information for “Espaço Jovem” in order to attain improved management of its activities. The benefits of the final diploma project will emerge when the project (designed solution to enable system change) is implemented locally. It was developed, with cooperation of multi-disciplinary members, in the water field, in order to partially overcome problems that were described in previous sections. The two paths of the project were defined as the design of objects and containers for water use within the home and the systemic management of water, its treatment and its possible uses.

CASE STUDY OF THE SERRA DA ESTRELA PDO CHEESE

The long history and symbolism carried by the *Serra da Estrela* (SE) PDO (Protected Designation of Origin) cheese make it more than just cheese into a token for an industry and specific geographic region of Portugal. It might be considered the most important legacy of a way of life, part of a system that was gradually developed and adapted to the adversities found in the *Serra da Estrela* Mountains. The different processes associated with the manufacturing and distribution of *Serra da Estrela* PDO cheese were mapped based on a systemic approach. The process relied on systemic analysis, and on application of techniques from ethnography, which resulted on a substantial data collection and provided the immersion of the authors in real-life situations. Critical points were identified in the resulting systemic map in order

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to encourage initiatives to overcome detected gaps and inefficiencies. From this sprang an analysis aimed at creating an alternative logo for the *Serra da Estrela* PDO (Protected Designation of Origin) cheese. This case study is the result of research carried out during the course of the second author's Masters thesis (Carrola, 2013). Selected aspects of this case study have previously been presented in conference proceedings (Carrola, Couvinhas & Coelho, 2014; Carrola et al., 2014) and in a journal article (Coelho, Carrola & Couvinhas, 2017).

The *Serra da Estrela* PDO cheese is one of the main results of a way of life that is part of an ecosystem, since Nature is integral and an active part of it, gradually developed and adapted to the local constraints over generations. Presently, new challenges emerge requiring to steadfastly follow the path of adaptability and flexibility. Thus, the features that make the *Serra da Estrela* PDO cheese an unparalleled product and so appealing to connoisseurs were investigated, noting strengths and weaknesses. An investigation was carried out to unveil the requirements needed to obtain "*Serra da Estrela* PDO cheese" certification, in order to understand the performance space available for future development of benefit enabling innovations that would not clash with the existing set of rules.

The case study imbedding an interdisciplinary approach reported in this section of the chapter sought weaknesses in terms of perception, market positioning and manufacturing process of the *Serra da Estrela* PDO cheese. This research aimed to enhance the deployment of solutions with increased efficiency among all activities of the *Serra da Estrela* PDO cheese universe. There were several methods applied throughout the process, such as systemic design analysis, and deployment of ethnographic methods derived techniques, which led to in loco data collection and thus provided the necessary immersion in real and genuine work situations as well as direct contact with key stakeholders. The researchers mapped all the processes involved in the *Serra da Estrela* PDO cheese setting from a systemic design standpoint. After processing all the collected data, critical points were identified and a systemic map was assembled where the aforementioned were pinpointed enabling different industry stakeholders to adopt a holistic view and encourage the setting-up of initiatives to address and overcome the gaps and inefficiencies of the process. At the same time, a procedure to overcome one of the previously highlighted weaknesses was set in motion.

Combination of Ethnographic and Systemic Design Methods (*Serra da Estrela* PDO Cheese)

A holistic perspective was adopted, by means of a systemic analysis based on data collected from observations (Couvinhas et al., 2012), an ethnographic approach and interviews, under a macroergonomics lens (Coelho et al., 2012). The approach to design employed in the development work reported herein was presented by Coelho (2010) and by Figueiredo and Coelho (2010), based on work by Lewis and Bonollo (2002) and early work by Hales (1991). The process embedded in this approach is comprised of five sub-ordinate processes (task clarification, concept generation, evaluation and refinement, detailed design of preferred concept and communication of results). In the particular case at hand, detailed design was fed by user trials, and was to be completed, at the time of writing this chapter. Task clarification was developed during the ethnographic observations carried out by the first and second authors. Concepts were generated and evaluated and refined, leading to the detailed design of the preferred concept. This was then prototyped and used by cheese makers in a user trial, which provided information to serve as input for the next iteration of the design of the new hand tool.

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Ethnographic Approach (*Serra da Estrela* PDO Cheese)

A method based on ethnographic data collection, yields information compiled from field observations in order to support design research. A survey was carried out to acknowledge challenges and difficulties currently faced, in order to uncover points of action to make the product more competitive and appealing. This was done considering the product's market penetration, compared with competition, and taking into account considerations and concepts within the systemic design method. Relevant information about the subject of study was collected through analysis of resources readily available, observations at cheese making dairies, at ewe milking pavilions and places of grazing, and interviewing several stakeholders involved in the process, while performing photographic, video and audio documentation.

A compilation of all relevant information was made to support subsequent research developments. When performing this type of work, on-site observation is considered a mandatory requirement, enabling gathering of raw material that will later be processed and analyzed. A project meant to gather this type of information can be split into three stages: conducting a background investigation in preparation for fieldwork; actually carrying out fieldwork; and, finally, processing, organizing and systematizing information (Bartis, 2002; Fetterman, 2010).

Fieldwork followed market research focused on the commercial availability, packaging and sizes available in a sample of general and specialty stores (7 stores visited). Fieldwork entailed 5 events, summarized in Table 1. Additionally, a focus group session was carried out, described in detail by Vieira (2013).

As an example of outcome of fieldwork, consider the first field activities listed in Table 1. These enabled identifying relationships between pasture improvement and ewe's milk quality improvement, as well as the proposed benefits and challenges involved in mechanical milking of ewes. Further outcomes of the ethnographic observations and analysis of requirements in the specification for the product certification are shown in the remainder of this section.

Production of *Serra da Estrela* PDO cheese must satisfy the conditions laid down in Annex II to the Portuguese Law Decree No. 38/2002 of 27th May, in addition to the conditions set out in documents provided by the certifying authority (ESTRELACOOP). Firstly, only producers authorized by ESTRELACOOP may use the protected designation of origin on their products. For this, producers must comply with certain conditions, exercising their activity exclusively in the production territory defined in Annex I to Portuguese Law Decree No. 38/ 2002 of 27th May. Only milk from *Bordaleira Serra da Estrela*

Table 1. Fieldwork events supporting the Serra da Estrela PDO cheese systemic analysis project

Date	Fieldwork Events and Field Observations
Feb. 2, 2013	Participation in the regional <i>Serra da Estrela</i> Cheese Fair in Fornos de Algodres; visit to a traditional cheese dairy owned by Joaquim Albuquerque de Sousa, in Vila Ruiva (Fornos de Algodres).
Apr. 12, 2013	First meeting with ESTRELACOOP's certifying authority chief executive officer in Celorico da Beira; visit to the museum hall of the Cheese Manor in Celorico da Beira.
Apr. 23, 2013	Visit to the agriculture society of Vale do Seia, observation and registration of the cheese manufacturing processes, interviews and contact with shepherds in Santiago, Seia; visit to the Fernandes Pessoa dairy in Carragozela (Seia); visit to Casa Matias to meet the company's CEO and discuss market challenges.
May 7, 2013	Observation of manual milking in a herd owned by Joaquim Nunes in Monte do Bispo, Belmonte.
May 20, 2013	Second meeting with the CEO of ESTRELACOOP in Celorico da Beira.

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and, or, *Churra Mondegueira* sheep breeds, from farms in the defined geographical area can be used. These must necessarily produce cheese according to the conditions laid down in Annex II of the above Ordinance and be willing to accept the system of control and certification provided, complying with it.

Producers must consider health, hygiene and management conditions of the herds, taking into account the necessary conditions for milking, collection, transport and storage of milk. Producers must control the quality of raw materials and follow the rules and hygienic procedures for cheese manufacturing. Each producer has an obligation to keep a record, which contains information on the origin of the milk and on the production conditions and by applying casein tags provided by ESTRELACOOOP. They must also hold updated records of suppliers of raw materials, of the quantity of milk received and of the quantity of cheese produced.

Cheese that does not conform to the production rules stipulated may be sold with the designation of sheep cheese, but may not be given the *Serra da Estrela* PDO cheese designation. The herds of origin of the milk must be officially disease free. When it comes to milking it is advisable to milk each animal properly and the place where the milking takes place should be clean. After milking, milk should be immediately filtered into a pitcher in order to avoid possible contamination. If, by chance, milk is not used within a time window of 2 hours after milking, it must be properly cooled to a maximum of 8 °C if used up to 12 hours or less, to 6 °C if the delay is more than 24 hours and to less than 4 °C for up to 48 hours.

For the manufacture of cheese, milk is coagulated at a temperature of 27 °C to 32 °C. The amount of thistle flower (*Cynara cardunculus*) used to coagulate the milk should not exceed 0,3 grams per liter of milk and the salt content should not exceed 30 grams per liter of milk. Milk coagulation should take at most 60 minutes, followed immediately by cutting the curd and slow draining the whey. The weight of the cheese should be in a range of 0.5 kg up to a maximum of 1,7 kg with a diameter which can range from 9 to 20 centimeters, and a height between 4 and 6 centimeters. During the forming process of the curd, the casein mark must be applied, while the cheese remains in the “cincho” for up to 18 hours (Figure 2). After the curd is completely squeezed and has the appropriate diameter, it may continue subjected to pressure in order to almost completely deplete the whey (an average of 5 kg per cheese).

The ripening or maturing process should be carried out in an appropriately controlled environment, particularly with respect to temperature. An acceptable interval lies between 6 and 12 °C, while required relative humidity lies between 80 and 95%. The minimum ripening time is 30 days, but it may extend up to 45 days. During the ripening period the cheese must be regularly turned and cleaned, keeping the crust clean and smooth.

Once manufactured and certified, cheese must be kept in storage until its distribution. Storage temperature lies between 0 °C and 5 °C. During transportation as well as at points of sale, temperature is accepted to rest between 0°C and 10°C.

Results of Systemic Analysis (*Serra da Estrela* PDO Cheese)

Careful analysis revealed the existence of relevant critical points that act as stifling factors to some system operations, and as such, requiring attention. The development of proper solutions for each one of them will certainly be beneficial for the entire system, resulting in improvements in efficiency and economic benefits. The systemic map developed is shown in Figure 3.

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Figure 2. a) Mortar steeps where the thistle flower is crushed b) utensils for cheese production; c) cheese with “cincho”; d) traditional manufacturing utensils

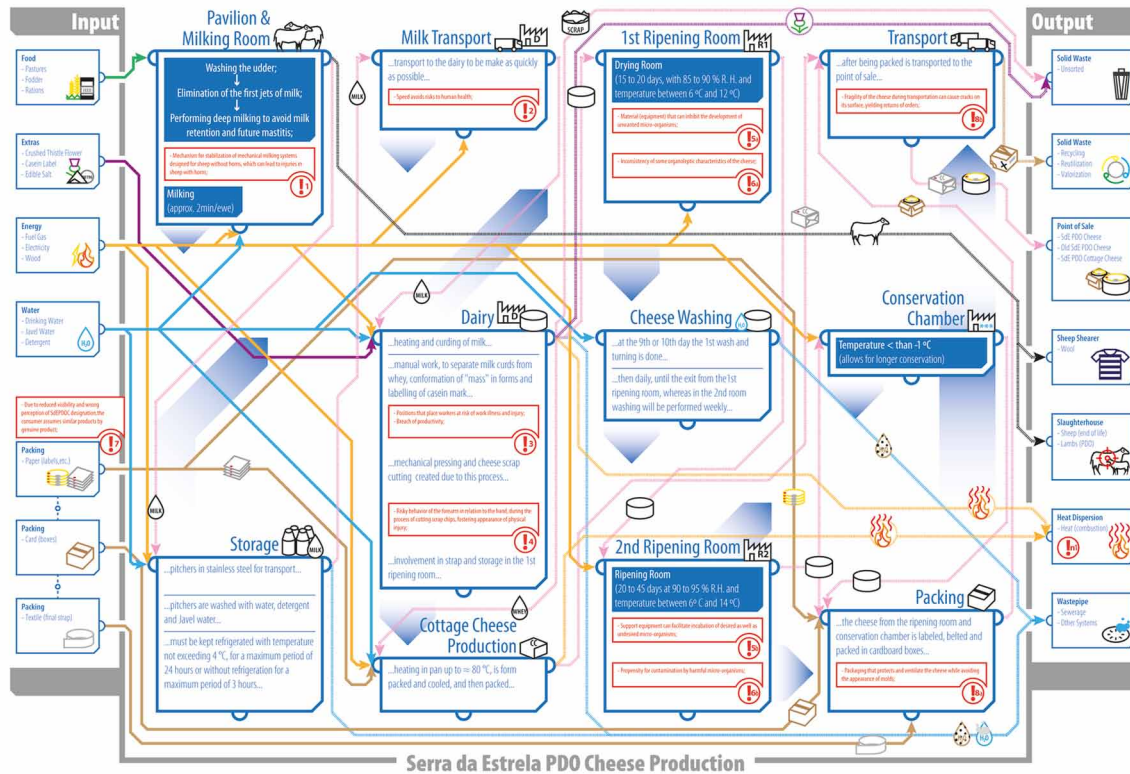


Critical Points Identified (Serra da Estrela PDO Cheese)

1. Lock mechanism for milking systems designed for sheep breeds without horns, which can lead to injuries in sheep with horns. According to the description given in the *Serra da Estrela* PDO cheese production rules milk can only originate from two breeds: *Bordaleira Serra da Estrela* breed with helical, elongated, strong, rough horns with a triangular section, and *Churra Mondegueira* breed with thin horns of an open spiral shape, elongated in the horizontal plane, and with a slightly elliptical profile. Thus, this little anatomical detail turns a procedure that would otherwise be simple in something considerably difficult.
2. Avoid any source of potential risks to human health. In cases where the same producer of cheese depends on dozens of small milk producers scattered in an area where there are several types of terrain and reliefs, gathering and transporting milk becomes one obstacle to overcome, which translates to the producer as increased cost. Moreover, there is the matter of ewe's milk, which does not undergo any kind of conservation procedure, in addition to the increased care with temperature and the time it takes from milking until production, the fact that the milk has to be transformed raw, as a requirement of the specification, further contributes to increase risk.

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Figure 3. Overview of systemic mapping of the Serra da Estrela PDO cheese production © T.Carrola



3. Postures that place dairy workers at risk of injuries at work and cause productivity loss. The design of the “francela”, which acts as a table to support the process of whey draining, forming the resulting mass in molds called “cinchos” and other minor tasks, has a slope in relation to the horizontal plane, which makes it useful for an uninterrupted fluid flow of the whey but at the same time contributes to erosion of the task’s ergonomic qualities. This task hence places cheese makers at risk of injuries associated with task repetition at the level of the upper limbs and vertebral spine.
4. Development of musculoskeletal injuries of the hand and forearm during the cheese chip or barb trimming process. After removal of the cheese molds from the mechanical press, the resulting cheese cylinders present a barb, which manifests itself in the top edge, as a result of the contact area between the “cincho” and its lid. For the surface of the cylinder to coincide with the description contained in the *Serra da Estrela* PDO cheese specification rules, regarding the characteristics of the outer shell, it is necessary to trim excess material. Currently this activity is done manually using a cutting tool, an ordinary kitchen knife, requiring expertise for it to be done in a short time, while bearing the load of 0.5-2 kg cheeses.
5. Equipment that can facilitate incubation of preferred microorganisms but also unwanted ones. The equipment that is used to store and support cheese during its entire ripening process should be composed of stainless steel or plastic suitable for food use, and may be alternatively made of unspecified wood. This being an option, each producer’s decisions are based on what is deemed best.

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6. Inconsistency of the organoleptic characteristics of the cheese and propensity for contamination by harmful microorganisms. During the entire ripening time, various microorganisms, fungi and bacteria contribute to and are also essential to the success of the process. Although tests and analysis of quality control for screening of pathogenic microorganisms are performed, the type of microorganisms responsible for the ideal characteristics that are wanted in the *Serra da Estrela* PDO cheese is not known with accuracy. This allows for variation in the product, taking into account variables such as the dairy where the cheese is produced, the season it is produced, as well as slight variations in humidity and temperature.
7. Due to reduced visibility and distorted perception of the *Serra da Estrela* PDO cheese, the consumer accepts similar products for the genuine product. The fact that there is no uniformity in some of the features of the label (Figure 4) that identifies the product as a *Serra da Estrela* PDO cheese prevents consumers from developing stronger recognition. Competition from similar products, which in the eyes of the consumer is considered a product of the same category and quality as the SE PDO cheese, and the fact that those alternatives are more affordable, is the result of an inability to provide a communications strategy to underline and emphasize the *Serra da Estrela* PDO cheese as unique.
8. Packaging that enables safety and ventilation of the cheese, preventing the appearance of molds (additionally, while it is transported some cracks may appear in its surface due to its fragility, resulting in retailer returns). One of the problems felt by producers focuses exactly on the number of orders that are returned from retailers due to issues in which the structural integrity of the product is called into question, as well as the manifestation of molds, which appear naturally in the cheese, an issue seen as a consumer deterrent at sales points.

Context Note: When it comes to heating of milk during the coagulation process and later during production of cottage cheese, heat is generated which is dispersed into the atmosphere of the dairy. This heat is considered a waste product, and as such, an output of the system. This waste is currently not used; however, the possibility for development of solutions and processes in order to make good use of it should be pursued. The production of this heat has its source in the combustion of gases (butane) that occur

Figure 4. a) Label Casa Matias; b) label Casa Matias premium; c) label Casa Matias selection



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during heating of the milk. The fact that the combustion takes place in spaces with limited ventilation in which the workers perform the various functions required raises the question of the existence of a health risk, with respect to them, since it creates uncontrolled oscillation of carbon dioxide levels and oxygen concentration present in the working space atmosphere. There is also a situation where the production room is located adjacent to the cold room where the ripening process of the cheese is developed. These chambers are required to have controlled temperature and humidity. Direct contact with the work room in which the temperature varies in a random manner during the time in which the production takes place interferes with the ripening chambers. Due to practical reasons of ease of work, the latter are kept with the doors open so that a fluid traffic of workers may accrue, as they transport various cheeses simultaneously and are unable to make immediate alternative use of their upper limbs.

The mapping of process and critical points developed can serve as a starting point for the development of future design work. The critical points unveiled represent challenges for improvement that reverberate in several domains, including the organoleptic qualities of the cheese, the cheese making process and respective tools, the well-being and safety of workers, as well as food safety, and visibility of the Protected Denomination of Origin certification. Systemic analysis has started to come to the forefront of production process analysis, given the pressures for sustainability. In the region of Beira Interior, where the study was developed, and particularly *Serra da Estrela*, traditional cheese making is undergoing many challenges. There is a need for innovation while respecting the requirements brought by the certification granted as part of the Protected Denomination of Origin label. The results of this study represent opportunities for efficiency gains, keeping in strict respect to the certification requirements and at the same time looking to satisfy the interests of all stakeholders of the *Serra da Estrela* PDO cheese sector.

The domains of agricultural production and microbiology turned out to be aspects of high importance for the issue under focus. If it were not for the systemic analysis, which served as a link between the boundaries of the various domains, new bridges between these various problems might not have opened, as these are usually tackled in specialized disciplines and predetermined by the restrictions of each specific area of knowledge.

This case study demonstrates the deployment of systemic design analysis within an activity centered and ethnographic approach. As a consequence of the development of this research, based on an analysis that sought possible connections between various disciplines and trying to constantly maintain a holistic perspective, design seeds have been laid out for the development of a plan to tackle the critical points identified by the systemic analysis reported in this chapter. One of these critical points (number 4, listed in the previous section) is tackled in the following sections.

Requirements for the Design of a New Chip Cutting Hand Tool (*Serra da Estrela* PDO Cheese)

As a consequence of the fieldwork carried out in the form of observations and interviews to a myriad of actors in the SE PDO cheese universe, as well as visits to several cheese making facilities, systemic analysis was performed and the critical points emphasized. This led to the consideration of the need for a device or utensil that is better suited to the task at hand was to be designed, to better support the cheese chip cutting process shown in Photographs in Figure 5. The need to trim the cheese barb that is formed as a consequence of the cheese pressing, to remove excess whey, has not only aesthetic grounds, but also functional ones. During the cheese ripening process, molds form on the outer surface of the cheese. As part of this process, washing of the cheeses is done regularly. This process is more efficient

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Figure 5. Cheese chip cutting process using a regular knife and supporting the full weight of the cheese

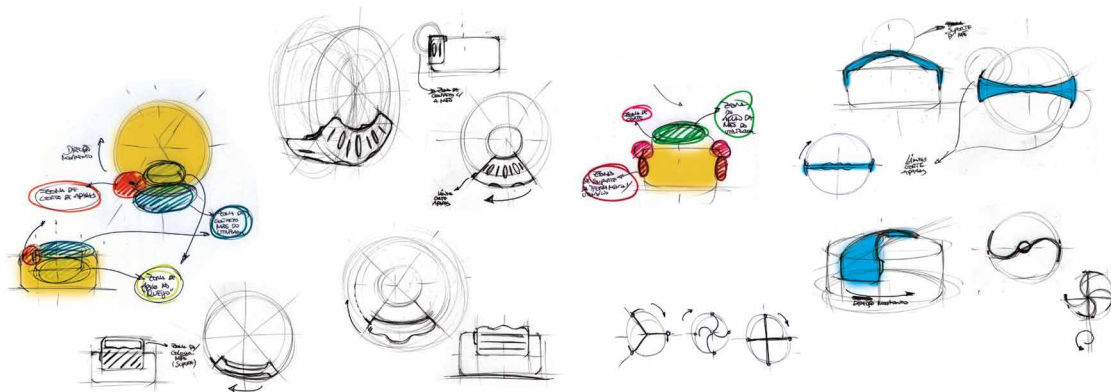


once the trimming is made. Task clarification yielded the following goals for the new hand tool: Cutting cheese chips in the upper face of the cheese in a hygienic manner; enabling easy repair, maintenance and cleaning of the hand tool; preventing the development of musculoskeletal disorders in the upper limbs of the cheese makers.

Alternative Concepts and User Trials of Prototype

Several design concepts were generated (Figure 6) and these were rated against evaluation criteria derived from the initial goals set for the project. Upon the first iteration of evaluation, the alternative concepts were crossed with one another, producing a new design that combined the best features of each of the original concepts generated by the second author. This concept was then designed in detail and proto-

Figure 6. Alternative conceptual sketches. © Tiago Carrola



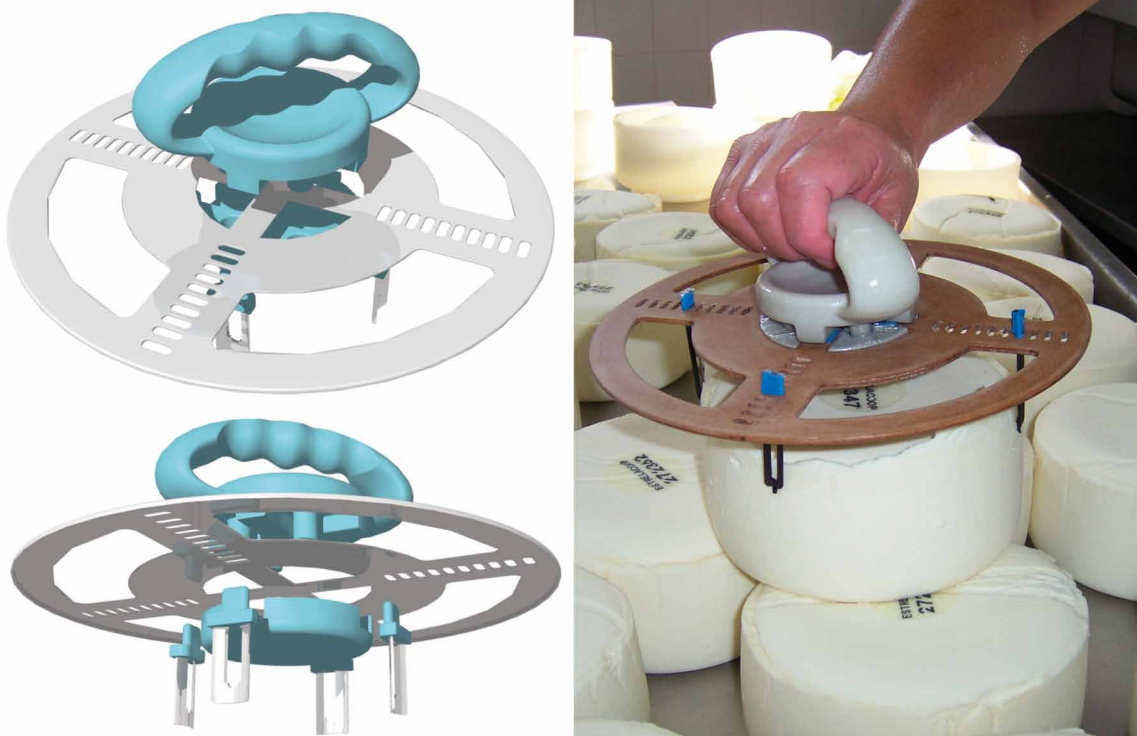
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typed in order to undergo user trials (Figure 7). The trials showed the need for an improvement in the prototype, in order to make the cheese cutting blades more versatile by angling them in relation to the disc shaped part of the design. Alternative handle designs are also to be developed in order to enable a more neutral posture of the wrist, when using the tool for cheese chip cutting. At the time of writing the project is awaiting funding to proceed to the next iteration of redesign of the hand tool and user trials.

SOLUTIONS AND RECOMMENDATIONS

The interdisciplinary case study developed in Mindelo, Cape Verde, embedded a systemic design approach for sustainable development, based on an analysis developed from an ethnographic study carried out during four months. The intervention that was designed and implemented was two-fold. On the one hand, the development project aimed at the transformation of the qualifications and motivational climate of an economically challenged community and the pursuit of an upward spiral for this community. On the other hand, the project sought the design and provision of objects and containers for water use within the home and the systemic management of water, its treatment and its possible uses. The intervention hence tackled ergonomic and systemic goals simultaneously; combining the satisfaction of fundamental needs (access to water for domestic consumption and irrigation of prospective vegetable gardens) with support and development of education and communal engagement. High-technology was not deployed in order to give local people the possibility to implement their own water purifying systems without

Figure 7. Detailed design and user trials of the new hand tool. © Tiago Carrola



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depending on Non-Governmental Organizations (NGOs) and, or, resources from other countries, thus contributing to achieving a self-sustaining system.

The different processes associated with the manufacturing and distribution of *Serra da Estrela* PDO cheese were causally mapped based on a systemic approach. The process relied on systemic analysis, and on application of techniques from ethnography, which resulted on a substantial amount of data collected and provided the immersion of the researchers in real-life situations. Critical points were identified in the resulting systemic map in order to encourage initiatives to overcome detected inefficiencies and at the same time to develop well suited environmental and sustainable solutions. Relevant critical points act as stifling factors to some system operations, and as such, require attention. The development of proper solutions for each one of them will certainly be beneficial for the entire system, resulting in improvements in efficiency, environmental sustainability and economic benefits.

FUTURE RESEARCH DIRECTIONS

Maintaining technology intensity low may well increase the chances of resilience and self-reproduction of the solutions, enabling more people to increase their well-being. In the past, many projects in industrially developing countries failed because high-technology solutions were implemented, while the use on a large scale and, or, the maintenance of those advanced technology products or services was impracticable. Overall, the project reported in the first case study sought to improve the quality of life of the people in the community focused, while adopting a sustainable approach. In order to achieve this overarching aim, an initial set of activities were fostered and supported, which are expected to contribute to achieve results that meet human needs at several levels (subsistence, self-improvement and self-esteem). By improving water management and contributing to mitigate water shortages, the project contributed to meet both subsistence and self-esteem needs, with a solution that fosters its dissemination given its low technology intensity. The support provided to education and training activities in a community setting, while improving job prospects for young people and hence increasing overall sense of safety in the community (meeting safety needs, by reducing the propensity for violence and crime among youngsters), also contributes to the satisfaction of individual self-actualization needs and added comfort and communal engagement. It is expected that further focused research and development of the systemic analysis further will bring about solutions enabling additional progress to the community

The mapping of processes and critical points developed in the *Serra da Estrela* PDO Cheese interdisciplinary case study can serve as a starting point for the development of future work. The critical points unveiled represent challenges for improvement that reverberate in several domains, including the organoleptic qualities of the cheese, the cheese making process and respective tools, the well-being and safety of workers, as well as food safety, and visibility of the Protected Designation of Origin certification. Systemic analysis has started to come to the forefront of production process analysis, given the pressures for sustainability. In the region of Beira Interior, where the study was developed, and particularly *Serra da Estrela*, traditional cheese making is undergoing many challenges. There is a need for innovation while respecting the requirements brought by the certification granted as part of the Protected Designation of Origin label. Hence, the results of this case study represent opportunities for efficiency gains, keeping in strict respect to the certification requirements and at the same time looking to satisfy the interests of all stakeholders of the *Serra da Estrela* PDO cheese sector. The domains of agricultural production and microbiology turned out to be aspects of high importance for the issue under focus. If it

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were not for systemic analysis, which served as a link between the boundaries of the various domains, new bridges between these various problems might not have opened, as these are usually tackled in specialized disciplines and predetermined by the restrictions of each specific area of knowledge. In this domain, future research should consider a design research approach, focusing on the dichotomy of problem and designed solution, and bringing the systemic design principles to a wider set of processes, simultaneously improving sustainability in economic, environmental and societal terms.

CONCLUSION

As a consequence of the development of the two pieces of interdisciplinary research reported in this chapter, based on an analysis that focused on a well-defined territory and that sought possible connections between various disciplines while trying to constantly maintain a holistic perspective, design seeds have been laid out for the development of a plan to tackle critical points identified as a consequence of the systemic analyses reported in this chapter. The sustained and informed development of the proposals carried out, as well as the possibility of highlighting other opportunities for action, was in good part only possible due to the intersection points that arose during the process of observation, research and project-development. The latter sprang from systemic analysis of the communal and production systems focused.

This chapter, focusing on two empirical studies carrying a common thread of design creativity as well as systemic analysis, exemplified how interdisciplinarity can foster innovation. Both studies illustrate contexts for systems perspectives in design, as transformational processes, requiring forward looking, focusing on problems, working across disciplines in teams and exercising creativity in solution generation, while focusing on people.

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KEY TERMS AND DEFINITIONS

Causality: The agency that connects one process (the cause) with another process (the effect) by means of a relationship that is fundamental to science, implying that an effect cannot take place without a cause.

Consilience: An agreement between inferences or inductions drawn from different academic subjects, often including the humanities and science, or from different sets of data.

Design: An activity aimed at making or drawing plans for the intended creation of something, that involves making decisions about what is being created.

Interdisciplinarity: The employment of multiple disciplines (two or more disciplines that are usually considered distinct) in the analysis of a specific problem, which tends to expand the boundaries of conventional (compartmented) knowledge.

System: A regularly interacting, interrelated or interdependent group of items (the system components) forming a unified complex whole and operating together.

Systemic: A system-wide characteristic of an activity or concept that is relating to an entire system, especially as opposed to a particular part or sub process.

Systems Perspective: A mental view or outlook taking into account all of the behaviors of a system as a whole in the context of its environment, enabling an encompassing approach to describing the properties of the system, including the interactions and relationships between the system and the environment.

Chapter 6

Adapting to New Labor Market Characteristics

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ABSTRACT

In this chapter, the author describes the education for the professions in the nineteenth century, with particular emphasis on the extent to which professional education relied on the apprenticeship model rather than on formal, university-based education. The author describes how such non-standardized education was eventually brought under control after the establishment of professional associations which sought to standardize such education. With the establishment of such standards, the education of professions was eventually brought into a higher education setting where disciplinary education programs co-existed within a standardized education environment. This coexistence or colocation enabled professional education efforts to begin interacting with each other and gave rise to interdisciplinary, multidisciplinary, and transdisciplinary efforts in the preparation of professionals for the workforce. The author reports on the variety of interdisciplinary educational programs that have emerged in higher education and demonstrates the availability of professional positions that exist in the work force for new graduates with interdisciplinary and multidisciplinary educational preparation. Routes to attaining an interdisciplinary education are discussed, including student-designed interdisciplinary educational programs as well as predesigned interdisciplinary programs in which students may enroll. The role of higher education program directors and student advisors is considered as well as their importance in enabling students to transition into interdisciplinary careers. The concepts of problem passing and problem solution are described as a means of enabling various disciplines to work together (particularly in localized settings) to generate new interdisciplinary solutions to problems, particularly in the area of the applied sciences. Suggestions for further reading are provided.

COMING IN FROM THE COLD

The so-called “silo effect” dominated academia for years and – by extension – the practice of the professions and knowledge-based career paths pursued by graduates of the academy. The IGI Dictionary defines the silo effect as the “lack of information exchange between data base systems within an entity or with outside entities. The silo may be limited to the technical deficiencies of the system, but the effect encompasses the larger human problem of the silo mentality, which includes a predisposition away from sharing such information.”

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In the silo effect knowledge – both pure and applied – is created and grown vertically within the knowledge category without significant exchange with other silos of knowledge or supporting input from other silos. This phenomenon is at least partially rooted in the pre-20th century tradition of professional preparation through apprenticeship wherein professions and professional practice were learned by associating oneself with an established practitioner. This professional preparation occurred outside the university so that would-be lawyers, physicians, librarians, etc. rarely came into contact with other learning communities. It was not until the rise of professional associations in the late 19th century that standards for education for professions began to be established and these standards eventuated into the establishment of learning environments dedicated to meeting these standards. The results are today's schools of library science, colleges of engineering, and faculties of medicine. In the words of John le Carre, the professional disciplines had “come in from the cold,” (*The Spy Who Came in from the Cold*, p. iv) where interdisciplinarity could take root and eventually flourish.

The interdisciplinarity that has grown up in academia is now a robust landscape of interdisciplinary areas of study such as programs in area studies (e.g., Latin American Studies) which originally grew from various disciplines (language, history, religion, etc.) focusing their inquiries and problem solving abilities on a specific geographic region. These interdisciplinary efforts have by now become so institutionalized that they form their own discipline.

A report produced by the North Carolina State University expands upon this idea:

“Area studies appeared as a strategy in American universities in the late 1930s and was predicated on a belief in comprehensive, integrated knowledge. A ‘doctrine of concentration’ professed that ‘the mind advances when wholly immersed in one interest but connections should be made with related subjects’ (Klein, 1990, p. 27). It sought a restructuring of fields through theoretical perspectives regarding what disciplines had in common (for example, behavioral sciences or cultural geography). This approach altered the methods of social inquiry, but never impacted the cumulative science.

“World War II was the impetus for applied interdisciplinary work in research, and by the middle of the twentieth century the ‘hyphenated sciences’ (biophysics, biochemistry, etc.) were well established. Unlike earlier work, this research was mission driven. The Manhattan Project was a prime example of specialists needing to work together to accomplish a specific goal that could not be addressed by a single discipline (Klein, 1990, p. 32-34). Established in 1969, the National Science Foundation further reinforced this new definition of interdisciplinary research through its funding practices.” (NC State Task Force on Comprehensiveness and Interdisciplinarity, 2011, p.2).

Focusing on the applicability of interdisciplinary studies for students preparing to enter the work force, the North Carolina State University report recommended that (NC State Task Force on Comprehensiveness and Interdisciplinarity, 2011):

- Undergraduate students “seek out interdisciplinary experiences, such as courses at the interfaces of traditional disciplines that address basic research problems, interdisciplinary courses that address societal problems, and research experiences that span more than one traditional discipline.” (p. 3).
- Master’s and doctoral students should “explore ways to broaden their experience by gaining ‘requisite’ knowledge in one or more fields in addition to their primary field.” (p. 3).
- Postdoctoral scholars “should actively exploit formal and informal means of gaining interdisciplinary experiences during their post-doctoral appointments through such mechanisms as networking events and internships in industrial and nonacademic settings.” (p. 3).

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The report goes on to note that in addition to these student/scholar initiated strategies that there is an increasing number of institutionalized interdisciplinary programs for students to choose from in a variety of areas such as heritage management, museum science, and sports health, which prepare students for specific professional fields by offering them degrees grounded in multiple disciplines.

PREPARING NEW PROFESSIONALS TO ENTER THE LIBRARY PROFESSION: THE CASE OF CLARION UNIVERSITY

An analysis of the jobs and research positions literature related to interdisciplinarity reveal that not only are there abundant opportunities in the field, but that the dimensions of the field are limited only by the imagination. As a first step in the consideration of this issue one can look at established disciplinary programs. Library Science (this author's own field of research and teaching) is a good example. Library science is an established discipline, and the faculty and researchers who populate the field have historically been trained in that profession and discipline. However, in recent years the accreditation standards have encouraged a diversity of backgrounds for faculty and students; this has resulted in great diversity among both faculty and students.

Another good example of the availability of employment positions which indicate a need for interdisciplinary qualifications is the listings available positions with the United States government. A recent search of its USAJOBS website indicated the availability of more than 1,800 positions in which interdisciplinary abilities were listed as qualifications. (USAJOBS).

Clarion University of Pennsylvania, Department of Information and Library Science (where this author is a faculty member) is a good example. Of the eight faculty in the Department of Information and Library Science, two have terminal degrees in history (PhD in Russian History, University of Minnesota, and PhD in Middle Eastern Studies, University of California, Los Angeles), two have terminal degrees in education (PhD in curriculum, University of the Pacific, and PhD in education leadership, Barry University), one has an interdisciplinary doctorate (PhD in interdisciplinary studies [education/history/library science], University of North Carolina at Greensboro) one has a terminal degree in communication (PhD in communication studies, University of Tennessee), and two have terminal degrees in library science (PhD in library science, Rutgers University, and PhD in library science, Emporia State University). Further, one of the eight – the one with the Barry University PhD -- has a terminal degree in law (JD, University of Colorado), for a total of nine terminal degrees among the eight faculty members; together the faculty members hold terminal degrees in five major disciplinary areas: law, education, library science, history, and interdisciplinary studies. Each of the faculty members has an American Library Association accredited master's degree in library science which serves to bond them as a unit in the professional discipline in which they all teach. In addition to this several of the eight have additional masters' degrees in various other fields, including business education, parks and recreation, theology, and history.

Together these faculty members and the disciplines they constitute a powerful interdisciplinary/multidisciplinary team, each member of which brings his or her unique insights into managing and evolving the department and its programs for the preparation of the next generation of professional librarians. This interdisciplinary approach to preparation for professional participation is inculcated into the graduates of the program who themselves represent the foundations of interdisciplinarity as a basis for gaining

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positions and achieving success in the profession. The Committee on Accreditation, the accrediting arm of the American Library Association, encourages interdisciplinarity throughout its standards for master's degree programs, the entry level credential for professional librarians in the United States, Canada, and Puerto Rico. In the "Curriculum" standard, for instance, accredited programs are advised that "The curriculum includes as appropriate cooperative degree programs, interdisciplinary coursework and research, experiential opportunities, and other similar activities." (American Library Association, 2015, p. 5). In the faculty standard programs are advised that faculty should "interact with faculty of other disciplines" in an effort to "nurture an intellectual environment that enhances the accomplishment of program objectives." (American Library Association, 2015, p. 6).

An emerging approach to interdisciplinarity as it is applied in the professions, academic/research environments, and work places is that of "problem feeding" Thoren and Persson (2013) argue that this type of interdisciplinarity is particularly important in the sciences where researchers in one discipline "feed" problems to researchers in another discipline for the identification of a possible solution. For this to be successful mechanism among independent (if related) disciplines and professions, there must be an intentional effort to "feed" the solutions back into the originating discipline or profession so that they can inform that body of knowledge as well.

PROBLEM FEEDING

In their article, "The Philosophy of Interdisciplinarity: Sustainability Science and Problem Feeding," Thoren and Presson (2013) explain that they "discuss two varieties of problem-feeding: unilateral and bilateral. Which of these is at issue depends on whether solutions to the problem are fed back to the discipline in which the problem originated.

"Since the early 1970s...the type and degree of conceptual or, broadly speaking, theoretical integration of the participating disciplines has been the primary basis on which to sort types of interdisciplinary encounter. This focus on conceptual or theoretical relationships defines what might be called the traditional perspective on interdisciplinarity" (Thoren & Presson, p. 338).

Thoren and Presson (2013) conclude that problem-feeding as a type of ad hoc relationship is local groups of professionals work to solve specific problems. "The interdisciplinarity resulting from problem-feeding between researchers can be local and temporary and does not require collaboration between proximate disciplines. By contrast, to make good sense of traditional integrative interdisciplinarity we must arguably associate it with a longer-term, global form of close, interdisciplinary collaboration." (p. 354).

In their study of the preparation of new interdisciplinary professionals to enter fields of practice, Graybill, Dooling, Shandas, Withey, Greve, and Simon (2006) conclude that "collaboration among the natural sciences, social sciences, and humanities is critical for addressing current complex issues facing society and the environment." (2006, p. 763). While the preparation of professionals who can draw on multiple disciplines to discover and implement answers to these transdisciplinary problems, it is also critically important to enable them to identify and achieve (or even create) professional positions that will provide them the environments and platforms to achieve these goals. As they note, "the process of defining our intellectual homes, navigating multiple requirements, and meaningfully describing our experiences to future employers are as much a part of our training as are conducting and completing interdisciplinary research projects and disciplinary requirements" (Graybill, Dooling, Shandas, Withey,

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Greve, & Simon, 2006, p. 763). The students were all PhD students in various interdisciplinary graduate programs at the University of Washington, Seattle, at the time of this article's authorship.

Borrego and Newswander (2011) expand upon the foregoing ideas regarding that part of the workforce comprised of truly interdisciplinary faculty members in universities committed to preparing interdisciplinary professionals to enter the workforce. "The apparent lack of truly interdisciplinary faculty positions at most universities necessarily has implications for interdisciplinary graduate education and postdoctoral training. Those involved in training interdisciplinary graduate students ought to be aware of the number and types of faculty positions that may be available to them upon graduation, and work more proactively to publicize the unique skills of interdisciplinary graduates." (p. 30). They go on to emphasize that part of the responsibility for achieving rests with the graduate students themselves who "should be trained to adapt not only to different disciplinary ways of knowing, but also to different ways of applying knowledge in academic and other settings." (p. 30).

CONCLUSION

Interdisciplinarity in educational training programs which prepare graduates to work in an increasingly interrelated and globalized environment are both needed and in demand by the workplace. Searches of job availability websites provide remarkable evidence that graduates who work in such environments are both needed and sought after. Ideas about interdisciplinarity such as those developed by Thoren and Persson (2013) suggest a new level of practicality for interdisciplinarity, particularly as it is expressed in local research and problem solving settings and may partly explain the new robustness of graduates whose training and skills transcend disciplinary lines and boundaries. Training programs at all levels for the interdisciplinary workplace are being challenged to become more innovative and, as the increasing number of such programs suggest, academia is responding to the challenge.

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KEY TERMS AND DEFINITIONS

Interdisciplinarity: Interdisciplinarity studies links among disciplines to understand their coordinated ability to better understand problems or situations.

Multidisciplinary: Utilizes knowledge from various disciplines but remains within disciplinary boundaries.

Problem Passing: The submission of a problem from within one discipline to another discipline for solution within the receiving discipline.

Problem Solution: In relationship to “problem passing,” the return of the solution of a problem to the originating discipline to enrich the original discipline’s knowledge base.

Transdisciplinary: To transcend or go beyond disciplinary boundaries.

Chapter 7

Benefits of Interdisciplinary Teaching at an Omani Public University: The Undergraduate American Literature Classroom Revisited

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ABSTRACT

During the last two decades, the pros and cons of applying interdisciplinary approaches in teaching have been debated endlessly. Many scholars have pointed to the favorable impact of interdisciplinary teaching on the quality of education; others have expressed reservations. In the context of an undergraduate Western literature classroom in Oman, teachers are challenged to make literary texts comprehensible and appealing to Omani English majors who have no familiarity with the Western literary tradition when they enroll in literature courses. This chapter explores the possibility of applying interdisciplinary teaching approaches in the undergraduate American literature classroom at Sultan Qaboos University (SQU). It discusses some innovative teaching methods which help create an effective teaching and learning environment. The study found, among other things, that the application of interdisciplinary methods can contribute to the development of higher order cognitive skills, broaden students' knowledge base, and heighten their sensitivity to global problems.

It was an initiation into the love of learning, of learning how to learn . . . as a matter of interdisciplinary cognition - that is, learning to know something by its relation to something else. - L. Daniels "A homecoming for Bernstein"

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INTRODUCTION

In an age where technology has come to be a powerful catalyst in the lives of most university students, one cannot but notice that students have become more exposed to different areas of knowledge, cross-cultural opinions, and global news than was the case before portable internet connectivity was available to most at a relatively low cost or even free of charge on university premises. Accordingly, students' world views have been changing as have their expectations of undergraduate courses. There is no doubt that digitization has helped students in their studies and research with the diversity of information readily accessible to them and has opened doors wide for students to read cross-disciplinarily, but the sheer volume of available information has complicated matters tremendously for both teachers and students. Students, on the one hand, may feel that teachers have lost their pivotal role as the sole source of knowledge in the classroom and teachers, on the other, have been confronted with the new realities of classrooms where their roles have changed significantly. Despite the changed teaching atmosphere in higher education institutions, undergraduate students are still largely dependent on their teachers. With the continuous increase in the volume of online information, students need guidance to focus and filter knowledge when asked to prepare selected topics for discussion from a more specialized viewpoint or from an integrative one.

Teaching American literature to foreign language learners with little or no background knowledge about the Western hemisphere is one of the most challenging of jobs in the field of higher education in the Middle East. Not only are students expected to be taught a foreign language through a largely unfamiliar literature, but they are also supposed to comprehend the historical, social, and political contexts of selected literary texts. Since the information revolution has changed students' perspectives of the world, one can notice that they have become more inquisitive, more critical of their surroundings, and less interested in traditional classroom experiences which used to focus on mere textual and contextual analyses. Since students often experience difficulties in understanding Western cultural traditions, many English majors question the significance of studying Western literature which is based on a system of values significantly different from theirs. They frequently show their disinterest by ignoring study questions, preparation requirements, or failing to perform well in extensive reading activities. Most entertain the preconceived notion that reading Western literature is irrelevant to their contemporary concerns and interests and, above all, their culture. Hereby, the responsibilities of Western literature teachers have become manifold. They have come to assume the roles of educators, facilitators, guides, and cultural interpreters for an audience ever more influenced by the spread of globalization and international knowledge. Thus, teachers are challenged to tailor and apply teaching approaches that will successfully address the new interests and needs of English students. Students in the GCC region, specifically in Oman, are an interesting case to study.

Undergraduate students in Oman are only poorly acquainted with Western literature when they join the Department of English Language and Literature at Sultan Qaboos University (SQU). Despite the fact that the role of English as a world language is recognized by the Omani Ministry of Education as students start studying English in the first grade and some even before in kindergarten, public school curricula almost entirely lack English literature and it is only through individual efforts of teachers and students or extracurricular activities encouraged by some schools that students study some English literature at the primary or secondary levels. This has historical reasons. Never having been a formal British colony or protectorate, Al-Busaidi (1995) states that the Omani educational system "had no foundations for English ... there were no English-medium schools in Oman ... there was no British inspired

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education” (p.90). However, from 1970 and onwards, English became an officially taught language in public schools. Oman realized the significance of introducing English as it needed to strengthen bilateral relations with other countries in the region and internationally. English has also become the medium of communication between Omanis and foreigners within the country. Hence, English has been receiving political, economic and legislative support from the government since it is considered “a resource for national development and as the means for wider communication within the international community” (Nunan et al. 1987, p.2).

Students of English usually encounter Western literature for the first time in the university and many are daunted by reading, interpreting, and analyzing English texts. Their unfamiliarity with the Western literary tradition and its culture at the tertiary level usually results in initial confusion and anxiety as they are overwhelmed by the amounts of information presented to them. Only gradually do they learn how to synthesize the newly acquired knowledge and apply it critically. For Omani students, learning to understand Western literature is a long and winding road. A number of teachers in Oman at the college level indicated that the weak performance of students may be due their lack of cultural awareness (Derbel & Al-Mohammadi, 2015, p. 226). Rarely do teachers find undergraduate students who have read any Western literature, whether in its original language or in translation. Most of their contact with the Western tradition, if any, comes from TV shows, series, or movies which are aired by the Middle East Broadcasting Center Group (MBC) and a few other less popular channels or from video-sharing websites. This situation creates a special demand for teaching approaches that will take Omani students of English literature beyond the assigned literary texts to pursue implications in local, national, and global contexts. Such an approach facilitates their understanding of English literature by bringing the texts to the world.

Scholars have been intensively negotiating the best approaches to teaching Western literature in non-Western contexts for more than two decades now. Some hold the opinion that even when measures are taken to censor Western texts that are taught at higher education institutions to minimize cultural and religious sensitivity in a conservative Muslim society (Kuwait), the divides between Muslim-Arab students and Western literature are so wide that students may not be able to appreciate texts which contain values that are contrary to those upheld in their own culture (Haggan, 1998). This, according to Haggan, may have an inhibiting effect on their studies of English literature and its language. In an attempt to tackle such problems, Alkire & Alkire (2007) suggest a bicultural approach for teaching literature in the Arab world which may help bridge the cultural divides and reconcile conflicting values between the Muslim and Western worlds. They recommend a number of texts which may help introduce Muslim students to Western literature with a minimum of cultural conflicts. Denman (2012) explains that teaching Western literature can help students understand the values, beliefs, and perspectives underlying the foreign culture and may enhance their knowledge of Western traditions. He cites research that shows that this can be either an unsettling experience resulting in feelings of estrangement or a fruitful one leading to the reaffirmation of their own values and beliefs (p.2). Hassan (2013) calls for an Islamization of English literary studies from a post-colonial perspective. He emphasizes that since Islam encourages Muslims to seek knowledge from different sources including non-Islamic ones, there is no harm in approaching English literature to increase one’s knowledge of Western cultural practices and knowledge systems provided that “Muslim practitioners of English literature should discriminate between useful and harmful elements when studying and teaching the subject” in order to protect themselves from negative cultural influences and preserve their distinctiveness and identity as Muslims.

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Others believe that the age with all its technological advancement and need for multi-skilled individuals in addition to the increased impact of globalization demand a more integrated approach to teaching and learning. Interdisciplinary programs and courses have been increasing in popularity in various fields of specialty. While numerous scholars have expressed a preference for approaches that move beyond the boundaries of one discipline (Jacobs, 1989; Clark, 1997; Fogarty, 1991; Sill, 2001; Klein, 2005), others have expressed a cautious reserve about interdisciplinary practices with the justification that their application does often do not do justice to the disciplines and may dilute important outcomes (Benson, 1982; Burton, 2001; Eisner, 2002). This brings us to the question: “What is Interdisciplinarity?”

Nissani (1997) defines interdisciplinary education as one that “merges components of two or more disciplines in a single program of instruction.” In their paper “Advancing Interdisciplinary Studies” Klein and Newell (1997) define inter-disciplinary study as “a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession” (p. 395). Another critic explains that “interdisciplinarity involves *openness* to the application of *all* theories and *all* methods to *any* set of phenomena” (Szostak, 2003, p. 30). All these definitions suggest that interdisciplinarity seeks to integrate knowledge. In other words, the interdisciplinary approach does not simply transfer knowledge from different disciplines, but seeks to synthesize this knowledge to find common ground. Thus, integrative teaching approaches suggest going beyond one academic discipline in order to gain insights from related disciplines to adequately address the complexity of an issue, theme, question, or topic that requires the integration of different perspectives. This study argues that in a Western literature classroom in the Omani context, the preferable approach is the inter-disciplinary one, because it opens doors wide to the world beyond the the assigned text and provides students with a unique opportunity to examine topics and issues from multiple perspectives systematically integrating these while bringing the text to the world.

In certain parts of the world, interdisciplinary teaching had become popular in the 1980s and has regained popularity more recently due to contemporary educational reforms. The more traditional higher education systems in the Middle East commonly tend to restrict teaching literature to textual and biographical analyses, resulting in a very limited appreciation of texts. Applying an integrative approach in the analysis of a literary text surely enriches its study as it brings students closer to the reality of everyday experiences. The very discipline of literature requires awareness of other disciplines. Whether poetry, prose, fiction or non-fiction, drama or narrative; they all become more meaningful when connected to the real world. Authors and their background, the age, and its sensibilities, manners, and morals cannot be ignored, but relating it to recent research, discoveries, and other current findings will make takes more interesting and get students more engaged. The nature of the text usually helps teachers decide into what disciplines they should delve. Whether it is history, psychology, philosophy, the sciences, or even theater, music, art, or film; the field or fields of knowledge which are most relevant to the text under scrutiny are the ones which should be chosen to help achieve the course learning outcomes. Taking a holistic approach to the text and delving into more than one discipline in teaching is expected to encourage students to view literature from more than one perspective and will make them appreciate the complexity of texts and their contexts rather than isolating texts within their discipline at a time when the significance of literature is being questioned. This prominent method of pedagogy has secured the support of a great number of educators who believe in broadening students’ knowledge base to create a generation of open-minded critical thinkers.

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BACKGROUND

Many have regarded interdisciplinary teaching as an affective approach that provides students with meaningful and relevant learning experiences (Christie, 2000; Hatch and Smith, 2004). However, its application in the Omani EFL context needs to be considered carefully as it may cause anxiety among students or may even overwhelm them. Even though the interdisciplinary approach maybe “initially discomfoting” to students, as Toynton explains, “this is outweighed by the learning and empowerment it provides” (2005, p. 106). Kaur and Sidhu (2010, p. 148) explain that “... the interdisciplinary approach encourages one to look at things from a new perspective. Moving out of one’s comfort zone can be seen as both challenging and enriching, for not only students but also faculty.” As long as one stays in the so called ‘comfort zone,’ one stays comfortable with a certain routine. As soon as this routine is replaced by something new and challenging, the anxiety levels rise and performance increases. As long as anxiety stays within limits, the learning process continues successfully. Pushing too far into the panic zone, the performance will drop drastically. Uncertainty makes us do new things and, therefore, we learn. Alina Tugend (2011) affirms that what we should ideally be looking for is productive discomfort.

Generally, the interdisciplinary approach causes discomfort as it aids university students to break out from within the traditional confines of a specialty in to the wider arena of disciplines. Many researchers support the theory of productive discomfort as they believe that students develop skills and abilities as they are pushed into a more challenging learning environment. More specifically, Repko (2008, p. 174) asserts that interdisciplinary instruction furthers advances in cognitive abilities. He asserts that interdisciplinary learning helps students develop an appreciation of the differences between disciplines and how to use evidence from different fields of knowledge to understand an issue or a topic. He further explains that students gain a wider knowledge and more insights into a problem as they form different insights by using approaches and utilizing knowledge from alternative disciplines. This, in turn, teaches students how to integrate ideas from a host of disciplines and encourages them to synthesize knowledge.

According to Fink (2003, p.8) ‘significant learning’ takes place when memorable classroom experiences occur which contribute to more student engagement and a lasting learning experience. He stresses that when students are able to see the connections and understand and remember what they have learned, they start realizing the importance of life-long learning. This ongoing, voluntary, and self-guided pursuit of knowledge leads to self-development and individual growth. This is the type of learning which should be the target of every serious and dedicated teacher—whether in schools or in higher education institutions.

Achieving the goal of significant learning can be a daunting challenge for teachers since they must find the most suitable approach for teaching their course materials. In a university like SQU, the only governmental university in Oman which accepts only the top students of the country, it is only natural to encounter students who have diverse backgrounds, varied experiences, distinct interests, and special skills. To engage such a mixed group of students affectively can be an overwhelming task. Psychologist Howard Gardner (2011) affirms that students who are heterogeneous in their learning styles are best to be taught drawing on a wide array of methodologies. Accordingly, this may be achieved by interdisciplinary instruction that aims at engaging all students by opening academic conversations across disciplines and areas of interest. When selected literary texts reach back in history hundreds if not thousands of years and are neatly compartmentalized and stripped of any real-life experiences or up-to-date-knowledge, students are more likely to voice concerns about the significance of studying such ‘ancient’ texts and frequently become disinterested.

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Newell (1994) states that “students in high-quality interdisciplinary courses are consistently reported to develop the traditional liberal arts skills of precision and clarity in reading, writing, speaking, and thinking; to confront challenges to their assumptions about themselves and their world; and to develop the habit of asking why instead of merely memorizing accepted facts” (p. 35). Other important educational outcomes are: an appreciation of a variety of perspectives on a topic, increased sensitivity to ethical issues, enlarged horizons, and encouraged more authentic and unconventional thinking. Interdisciplinary teaching is also known to contribute to the development of critical thinking. All disciplines lay claim to critical thinking as a learning goal. So the question which comes to mind is what critical thinking actually is. We all think, but how is critical thinking different? According to the critical thinking society, most of our thinking is biased, distorted, uninformed, partial, and sometimes prejudiced. Critical thinking is a mode of thinking which includes analyzing, assessing, and problem solving. Critical thinking encourages us to overcome our native egocentrism and socio-centrism by encouraging open-mindedness, logic, fairness, and objectivity (The Critical Thinking Community, 2013). Since university education is expected to prepare students for real life and create critical thinkers who will be able to ask questions and find answers, interdisciplinary teaching is the best approach for the current generation of students. This study explores how interdisciplinary teaching can be successfully integrated in a literature classroom for students who are foreign language learners in the English department of SQU.

INTERDISCIPLINARY TEACHING AT SQU

The Department of English Language and Literature at SQU offers a number of core courses in British and American literature. Students who register for two survey courses in American literature are usually 3rd year students who have taken two prerequisites namely Introduction to Fiction and Introduction to Poetry and Drama. These two introductory courses focus primarily on the genre types and characteristics, structural elements, and literary devices. The focus in these introductory courses is not contextualizing works within their social, cultural, political, historical, economic, or global contexts but exposing students to as many different genres of poetry, prose, and drama in the Western literary tradition as possible. Hence, students come with minimal background information about the Western literary tradition with its diverse cultural values.

Research Problem

Educators have common goals across disciplines. Engaging students in the learning process, helping them to acquire knowledge, insights, and passion for learning are some of the many goals instructors set out to achieve every semester. Interdisciplinary teaching has become the new teaching trend which, as to the literature classrooms, can become the most fruitful teaching approach for foreign language learners if applied appropriately. In many educational institutions, however, interdisciplinary teaching across departments has not yet materialized despite the fact that cooperation is possible. Bureaucracies and administrative policies, on the one hand, frequently prevent such interdisciplinary cooperation from materializing. On the other, many teachers enjoy their in-class autonomy and would prefer not to have another faculty member co-teach the course. In addition, the tensions that exist between faculty members due to their differences in approaches, viewpoints, background, interests may also prevent collaborative team teaching from taking root.

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At SQU, only few departments in the sciences are known to apply interdisciplinarity due to the nature of the specialties. The College of Arts and Social Sciences with its progressive deanship has recently encouraged the application of interdisciplinary teaching as it believes that an integrative approach is only natural among the arts and social sciences. While there is plenty of literature on the pros and cons of interdisciplinary teaching in both schools and higher education institutions, there is little evidence of research on interdisciplinary approaches in the teaching the arts at SQU. The lack of attention paid to the application of this significant approach at the tertiary level in Oman certainly calls for the discussion of a more innovative approach to teaching Western literature in the English literature classroom than had been applied so far. Since a significant amount of research has discussed the advantages of interdisciplinary approaches in the international arena of education, it is important to take a closer look at the possibilities and the potential benefits of implementing such an approach in the literature classroom at SQU.

Research Questions

The guiding research questions for this study are:

1. To what extent is the application of an interdisciplinary approach feasible in the English literature classroom at SQU?
2. Does the interdisciplinary approach significantly benefit learners' understanding of selected literary texts?
3. Is there any difference in response among students to a text before and after being taught interdisciplinarily?

Objectives

The objectives of the study are:

1. To identify possible ways of teaching American literature at SQU from an interdisciplinary perspective.
2. To determine the resources required to achieve a successful interdisciplinary experience in the literature classroom.

Significance of the Study

Evidence of applying interdisciplinary teaching in the university classroom in the GCC and especially in Oman is sparse. Some research on interdisciplinary programs was done in the UAE (Gunn, 2012). No research on teaching literature interdisciplinarily at Omani universities was found. This study explores the possibility of applying an integrative approach in a literature classroom at a governmental university in Oman. More specifically, the study provides insights into the benefits of interdisciplinary teaching in an EFL literature classroom at SQU and shows how integrative teaching approaches can generate a fertile and dynamic learning environment. It investigates whether interdisciplinary teaching in the EFL Western literature classroom can contribute to achieving the learning outcomes for literature courses such as the development of cognitive thinking, critical reading, and the broadening of students' knowledge base.

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Methodology

Research Location and Research Participants

This study was done at SQU, the only governmental university in Oman, located in the capital Muscat. Out of 1052 students in the Department of English Language and Literature, 574 specialize in English language and literature; the rest are translation majors and education students. The sample consisted of 151 English language and literature majors registered in seven sections of Survey of American Literature (I) during fall and spring semesters of 2015/2016 and 2016/2017. The study uses a convenience sample, including the students who had registered for this course during the above mentioned semesters. The sample consisted of 12 males and 139 females. What needs to be noted here is that there is an uneven distribution of female and male students in English language and literature classes in the English department at SQU which is typical since the majority of the student body is female; male students are a minority. This should, however, not affect the results of the study since gender is not a significant variant. The researcher used different teaching methods with the study sample to expose the effect of the interdisciplinary method on students.

Materials and Procedures

Survey of American Literature I is a core course for all students majoring in English language and literature in the English department at SQU. This course introduces students to American literature starting with pre-Columbian Native American myths through mid-19th century Romanticism. The teaching strategy at the beginning of the course utilized textual analyses with some contextual information drawing mainly on the broad historical, religious, and cultural backgrounds of texts to facilitate the understanding of Indian creation myths and the colonial discourse of the early European explorers and conquistadores. The researcher chose one colonial American text by the infamous Cotton Mather who had fueled the ill-famed Salem witch trials. To experiment with the interdisciplinary method, the author decided on a more rigorous integration of multi-disciplinary material in the study of the above mentioned text. Students were provided with textual and non-textual information from different disciplines such as geography, history, bioarcheology, climatology, and psychology among others with the intention to aid them in the understanding of the assigned texts, to foster critical thinking and widen their perspectives on historical, social, and related global issues by introducing new perspectives to develop a better understanding of texts. To aid students in their acquisition of some specialized vocabulary from other disciplines, the researcher opted to give students extracurricular readings from various fields of knowledge whenever needed. It was hoped that the use of interdisciplinary information in the analysis of the selected text would tempt students to engage in vivid discussions of superstition, sorcery, and the socio-political, cultural and global factors behind these phenomena. Interdisciplinary data is useful in cases where issues or phenomena are to be understood beyond national borders and become of international concern. What follows is an example of an attempt to teach a well-known 17th century American literary text by integrating information from several different disciplines.

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Application

One interesting American colonial text for students to study is Cotton Mather's *The Wonders of the Invisible World* (1693) which is a book which defends Mather's role in the New England witchhunts. With this publication, Mather not only exposed witchcraft, but he also served the interest of some of his friends in the local government. Teaching this rather dark phase in American history, one is usually challenged with providing a logical explanation for what seems to a modern reader as bizarre madness. Having introduced students to the religious persecutions in Europe which encouraged many Puritans to escape England and other European countries in an attempt to seek a safe haven for themselves and their families where they could enjoy religious freedom, it seems abnormal to have Puritan communities sink into the same trap of intolerance which their ancestors had barely escaped. As survey courses like this one tend to draw on some historical information, it becomes only natural to teach the selected texts contextually. After selecting "The Trial of Martha Carrier" as a representative text from this part of Puritan history, the researcher decided to approach this particular text in a new way to see whether it would be possible to connect the text to the world and to cultivate students' critical abilities. An interdisciplinary teaching strategy was used which was hoped to allow learners to go beyond the text and encourage them to delve into the exploration of witchhunts from relevant socio-economic, historical, ecological, legal, and psychological perspectives. Mather's text lends itself to such an exploration.

After limiting the classroom discussion to a textual analysis of Cotton Mather's document during the first class session with no information on Martha Carrier and her family or the spread of diseases in the New World, the author decided to allow the exploration of the issue of witchhunts from within the context of 17th century New England settlements during the second class session, and from a more global perspective across time periods during the third class session. The instructor used an integrative teaching strategy in addition to an interdisciplinary one. As parts of these strategies, students were given additional readings such as book excerpts, newspaper clippings, filmography, scholarly research, and lists of bestselling fiction books in local bookstores. They were also asked to read about 1) what evidence would be permissible in a contemporary court in America and 2) trial by ordeal in medieval Europe and pre-modern and modern society. The instructor provided historical and cultural information using a Power Point presentation during the third classroom session. Students were finally given the opportunity to discuss the issue of witches and witchhunts in pre-Enlightenment Europe and America in groups and were asked to think about this phenomenon and Hollywood's continuous interest in recycling myths and stories of witches, vampires, and werewolves.

"The Trial of Martha Carrier" is a 17th century document describing the witch trial of Martha Ingalls Carrier who was a Puritan accused and convicted of witchcraft in Salem. Daughter to one of the original settlers of Andover, Martha was the eldest among her six siblings. After her marriage to Thomas Carrier, she and her husband relocated to live in a town in Massachusetts near her sister in the 1670s. After a decade, they returned to Andover and lived in poverty. Martha lost her father and two brothers to a smallpox epidemic in 1690, thereby becoming a landowner in her own right. The Carriers were accused of bringing the disease to the city and were barred from public appearance. In 1692, she was accused of and executed for witchcraft.

In Europe, America, and other parts of the world between the 13th and 18th centuries, hundreds of thousands of women and men were executed for crimes of witchcraft. Some even say that the number of people sacrificed during this period worldwide reached close to a million (Oster, 2004). Women have

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long been considered temptresses, distractors, and inferiors to their male counterparts. This misogyny was supported by social commentators, categorizing women at the lowest point in the household hierarchy (after the livestock) and by using the biblical text (Genesis) as proof of Eve being the main cause for the Adamic fall and their exile from the heavenly gardens of Eden. It was also believed that women could distract men from their primary responsibilities and loyalties especially those related to religion and the state. Women were also believed to be purely sexual beings; thus, the devil would use them to destroy mankind as he did in Paradise when he tempted Eve to eat the forbidden apple. Instead of celebrating women's intelligence and their capacity for endurance in the most difficult conditions, they were marginalized and ostracized.

The widespread witch phobia and moral panic which plagued both Europe and America for centuries were caused partially by extensive social, political, and economic changes. Communities saw an increase in the rate of poverty among the lower social classes as the old economic systems gradually crumbled and societies transitioned from the Middle Ages to the early modern age, from a predominantly agricultural economic system of interdependence to one of private ownership. In many communities, this transition led to crises especially for those members of society who owned no land. The documentary film by Chater (2010) about Pendle witches in Lancashire supports this claim. The poor, sick, deformed, old, blind, or lonely women who had no source of income became a social and economic burden as many depended on alms for their livelihoods. Their poverty set them at the margins of society where no one looked after them. Furthermore, the growing population led to increased competition for jobs. Poor laws were implemented but they were not able to eradicate poverty; they only heightened tensions and increased divisions between the affluent and the impoverished.

Not only were economies encountering structural changes, but they were also facing other challenges. The agricultural sector suffered stagnation due to unexpected and incomprehensible climatic changes. Toward the end of the Middle Ages, a period of cooling had started which would continue until mid-nineteenth century. This so called 'Little Ice Age' brought cooler winters to certain parts of Europe, America and other regions of the world. Canals and rivers were frequently frozen, crops failed more often, and some areas experienced severe droughts during summers (Cowie, 2007, p. 164). As the global temperature dropped, farming communities were badly affected. These bizarre changes in weather conditions led to uncertainty, feelings of guilt, frustration, and fear of possible divine punishment for unknown sins. Many thought that such changes were unnatural; therefore, they suspected evil forces at play and started searching for culprits. This led to an increased intolerance of strangers, newcomers, or non-conformists. Since Puritans believed they were born spiritually corrupt after the Adamic fall, they were convinced that Satan was an intimate threat to every Christian. Since the Devil's power of temptation could not always be warded off especially by those who were weak and easily tempted, women with no money, no connections, and no power were considered to be easy victims of Satan's power. These marginalized women became scapegoats for the collective frustration, anger, and aggression in their communities. Not only did communities commit atrocities against the sidelined and outsiders, but so did authorities and governments across Europe and America as they intensified the culture of fear by fueling witchhunts.

The elite social classes encouraged witch-hunts until they gradually reached an endemic scale. Publications like *Daemonologie* (1597) by King James VI of Scotland also later King James I of England asserted that witches were not just myths. The book not only explains how to identify witches—the slaves of the Devil—, but also endorses the practice of witch hunting and inflicting severe punishments on those who practice witchcraft. The publication by King James came at a time when he feared uprisings in his

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country and it served him well as the public imagination started to be haunted by witches and wizards. Consequently, wiccaphobia became a societal norm throughout much of early modern Christian Europe and America. Hence, the problem was more complex than one would assume at first glimpse. The witch-trials were not just a random phenomenon restricted to particular communities in crisis where people had just gone mad. This witch mania was a direct result of complex socio-economic factors that led to panic among the lower classes. This global anxiety was not relieved, as one would expect, by fighting ignorance and getting to the root cause of the evil, but was stimulated by spreading more fear.

Approaches to Teaching the Text

Historical

Students were introduced to the general historical theories about the possible origins and causes of witchhunts such as the illness and disease theories, disaster theory, and the religious rebellion theory. They were asked to consider the historical facts of the infamous Salem witch trials which started when a group of young girls claimed to be possessed by Satan and accused several local women of casting spells on them. Even though the hysteria abated soon after it started in Salem, it caused long lasting bitterness and social divide.

Socio-Economic

Students were asked to consider certain social ills which may have led to the witch mania. Among the theories discussed were the Greed Theory, the Social Control Theory, and the Misogyny Theory. Since economic systems were changing worldwide partially due to political or climatic factors, some witchhunts were initiated either to confiscate property or to remove a powerful and independent woman neighbor as was the case with Martha Carrier. Further, James I was one European authority who feared uprisings and conspiracies which may have cost him his divine throne; hence, he coordinated forces with the Church and used religion as a means for social control. The ensuing witchhunts not only spread fear and exercised suppression, but they also embodied social hostility and prejudice.

Cultural-Anthropological

Witchhunts can be studied for the sake of discovering the dynamics behind such social phenomenon. In persecutory movements, the non-conforming Other is usually targeted and punished. Even though anthropological studies of a social phenomenon in a particular geographical area are usually not generalizable, they nevertheless provide interesting insights into human behavioral patterns. These studies have shown that the belief in witchcraft is not confined to one continent, but is common across cultures and borders. This generality attracts analytical attention as a common and recurrent social phenomenon.

Climatic

In 1939, climatologist F. Matthes coined the term Little Ice Age which was then used to refer to the period of climatic deterioration starting with the 1400s and ending in the 1800s. During this period, the climate in Europe and North America was characterized by destructive thunderstorms, hails, winds,

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prolonged periods of frost or droughts. These weather phenomena were blamed on witches who were believed to be able to make weather. Demoralized peasants started questioning authorities' inaction and demanded that those involved in witchcraft be persecuted and prosecuted. Mid-19th century, the climate became warmer and witch executions stopped. Drawing students' attention to the climatic conditions in Modern Europe and America and their possible impact on various social phenomena encourages them to think more critically about contemporary issues related to global warming and its impact on societies.

Psychoanalytic

Allowing students to psychoanalyze a global phenomenon like the witchhunts not only provides them with the opportunity to read about Sigmund Freud's theories, but also helps them understand human nature and its rather mysterious subconscious. Psychoanalytic interpretation of the European witch-hunt started with the founder of psychoanalysis in 1897, when he corresponded with Dr. Wilhelm Fleiss about possessed women whom Freud never clearly distinguishes from witches. Freud speculated that witches had suffered from trauma in their childhood which caused neurotic disease in their adulthood. Apart from the neurosis of possessed women, Freud speaks about psychological defense mechanisms which human beings may use to ensure survival. Some of these are repression, denial, and projection. Discussing these will help students acquire new terminology in psychoanalysis and aid them in realizing the complex nature of the human brain which may, at times, lead to scapegoating as was the case during the witch mania.

Legal

The law in the American colonies was a mix of colonial statutes and biblical verses. Further, the accused did not have the right to receive a fair trial until proven guilty. Whoever went on trial was presumed guilty. In the case of witchcraft, courts relied on three kinds of evidence: 1) confession, 2) testimony of two eyewitnesses to acts of witchcraft, or 3) spectral evidence which was supported by Cotton Mather. Legal procedures involved corruption, abuse, rape, forced confessions, and false accusations. Only after a few centuries were legal systems reformed to protect the rights of the accused. Students are expected to get familiar with the basic human legal rights and the legal terminology needed to describe a simple court trial.

Discussion

For the first class session, students were asked to read Cotton Mather's document without additional reference material. They were given the opportunity to scrutinize a 17th century manuscript recording a court trial which used circumstantial and spectral evidence to indict a citizen whose arrival in the community chanced to be at a time of a smallpox outbreak and circumstances had forced her to play roles which were considered by her community not in line with the religious, social, cultural, or economic norms they were living by. Martha Carrier had come to be viewed as a threat to people's safety and tranquility. Persecuted for allegedly practicing witchcraft, she was eventually executed without receiving a fair trial (from a 21st century perspective). The manuscript which details the court trial of Martha Carrier contains testimonials that expose the reasons which made her an outcast among neighbors. Students were encouraged to read the text closely and make sense of the evidence provided by Mather.

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Analyzing Mather's document textually confined students to the examination of plot, structure, narrative technique, the appeals, vocabulary, rhetorical devices and figures of speech. Afterwards, students were asked to respond to a number of open-ended questions which aimed at exposing the extent of their textual comprehension. Students' responses clearly showed that their understanding of the text was limited to the information provided by the document since they completely lacked any information on the age, the Puritan's religious conservatism, and on societal norms in the Salem community at the time of the trials. Some students imposed meanings on the text in an attempt to make sense of their interpretations such as the belief that Martha Carrier possessed preternatural powers which she used whenever she needed to defend herself. Others doubted that this was possible since Carrier never tried to escape the trial or the judges. Still others read the text as an example of the age old battle between good and evil or linked it to the Adamic fall as she was punished for disobeying God by cooperating with the devil and using black magic to cause disease and frighten people. Students' answers clearly showed that the desired cognitive skills which students were expected to acquire were rather limited since they were not challenged enough by introducing new information and methods of interpretation that would further their critical abilities. However, the post-interdisciplinary teaching questions showed that students' understanding of the text, its context, and their view of witchcraft had been challenged considerably.

In subsequent class sessions students were introduced to secondary and tertiary source materials from a variety of disciplines in addition to non-textual sources. Students were given the opportunity to consider contextual information related to Mather's document and its age. As this information was discussed from interdisciplinary perspectives, it was noticed that students were initially amazed and stunned as they recognized the interconnectedness of religion, politics, history, environment, economy, human psychology and how these underpinned the interpretation of literary texts. After this exposure, students were more capable of comprehending the complexity of the phenomenon described by Cotton Mather which eventually turned out to be not only social in nature as they had initially assumed. Linking the text to its immediate context and to political, economic, and global phenomena helped them understand the 17th century world-view and the societal changes which were triggered by national, international, and global factors. Interestingly, they also linked the text to the present day and asked themselves why witches and witch hunters do still receive so much attention in both fiction and in the movie business. These queries which students started voicing showed that they were developing critical thinking abilities. This approach had encouraged them to become more inquisitive and eager to learn by bringing the text to the world and using knowledge from different disciplines to uncover the different layers of reality. Not only had they gained significant knowledge, but they were also starting to synthesize their newly acquired information to understand the extensiveness of the problem and its subsequent issues across history. At the least, it helped students understand that facts do not consist in vacuum and phenomena do not exist in isolation.

Prolonged discussions of related topics such as fertility rites, scapegoatism, demonization, and misogyny showed that after applying the interdisciplinary approach, students started thinking beyond the mere dictionary definitions of these concepts. Their more holistic comprehension of the medieval and early modern European and American witchhunts challenged them to go beyond their initial perceptions of this hysteria into a different level of reality. Students were encouraged to go beyond the mere textual analysis of the Mather's document and were allowed to comprehend the life-world within which the text is embedded. They were also stimulated to transcend Mather's immediate social and cultural climate which had shaped the text and its author's attitudes to cognize the contemporary international and/or global arenas for the witch hunt phenomena.

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After applying the interdisciplinary approach in the analysis of Mather's colonial Puritan text one can safely say that interdisciplinary teaching can play a pivotal role in improving Western literature learners' ability to understand selected texts from a more international or global perspective by incorporating readings from different disciplines. After one of my classes, one student approached me and said: "This was amazing. You have made literature real. I feel that I have been educated" Another said: "I really need to think about all this. This was a bit overwhelming ... all this information This will surely lead to hours of discussion with our colleagues after class." Many others stayed in the classroom chattering about some ideas which had been mentioned during class. Such expressions of enthusiasm by students make the whole process of interdisciplinary teaching worthwhile. University education aims at initiating the motivation to life-long learning and promoting critical thinking. The students' reactions are proof that interdisciplinary teaching can achieve these goals if applied successfully in the literature classroom.

To answer the research questions, the application of an interdisciplinary approach is definitely feasible in the American literature classroom at SQU and, hence, can be applied in other literature courses too. The application of such an approach has significantly benefitted learners of Western literature in their understanding of the selected text by Mather. Students' responses to the questions given to them before and after the application of an interdisciplinary approach have clearly shown that the majority of students perceive the text and the phenomenon differently after the text was discussed from a more interdisciplinary and global perspective. To achieve a successful interdisciplinary experience in the American literature classroom, no additional resources other than those already available in most classrooms at SQU are needed such as an LCD data-show projector and an internet connection.

CONCLUSION

While students are learning their basic requirements in core courses at universities, they are in most cases not instructed how to process what they have learned and how to apply their knowledge effectively to understand the world around them. Interdisciplinary teaching provides a meaningful way in which students can use knowledge learned in one discipline and apply it to another. It encourages them to make connections between different areas of learning and experience a deeper and more significant learning experience. So far, the application of an interdisciplinary teaching approach in the literature classroom at SQU is scarce. The application of such an approach is feasible, easily applicable, and does lead to significant learning by means of pushing students out of their comfort zones into different areas of learning they never experienced before. During the application of the interdisciplinary approach on the selected sample of students in this study, it was noticed that students responded more positively to the interdisciplinary approach than the traditional approach to teaching literature. Since SQU offers fully equipped classrooms, no additional resources and facilities are required other than the already installed equipment. The principle burden lies on the shoulders of the instructor who needs to decide on the most suitable approach to use for each text and what interdisciplinary knowledge to utilize to make the learning experience most successful.

Since the interdisciplinary approach requires the integration and synthesis of different perspectives rather than just a consideration of multiple viewpoints, it promotes critical thinking skills and a broader and multi-faceted understanding of issues and problems. Finding the right classroom strategy to engage students with such approach may not be easy, but it is certainly possible. First, the teacher needs to find the suitable level of complexity for each group of students since it is not advisable to push students be-

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yond their anxiety zone. Significant learning can only take place when students are not panicking and are not too uncomfortable when traversing different disciplines. In due course, students will learn how to synthesize different viewpoints from multiple disciplines by means of self-directed cognitive processes. Hence, creativity and independence are naturally encouraged by challenging students to become more inclusive thinkers. The foregoing discussion calls for a shift toward interdisciplinary teaching. The soundest course of action may be to enrich courses with interdisciplinary knowledge so as to widen students' perspectives and broaden their global knowledge.

At a global level, interdisciplinary teaching would mean enriching the disciplinary curriculum with multi-disciplinary information to foster global awareness among future generations and foster communication between different disciplines. It creates students who develop advanced cognitive abilities which they will use to understand world phenomena. Knowledge in the real world is applied integratively. The increasing competition in the global marketplace demands graduates who are able to work creatively and cross-disciplinarily by synthesizing knowledge to analyze problems and find solutions. The traditional approach to learning with fixed steps and pre-determined outcomes does no longer appeal to many students and teachers alike; therefore, integrative learning and interdisciplinary teaching should be considered as a serious option in undergraduate literature classes in Omani higher education institutions.

Interdisciplinary teaching strategies were showing positive impact on students' cognitive skills and interest levels. Several students informed the researcher that discussions continued outside the classroom with students from other sections. Such ignition of interest shows that students engaged in what is known as self-directed learning where they become more inquisitive about topics and more independent in expanding their processing of information.

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KEY TERMS AND DEFINITIONS

American Literature: Literary productions by European, African, and Asian immigrants who settled in post-Columbian America.

Cognitive Skills: Set of mental abilities or functions that learners use to carry out tasks.

Comfort Zone: A low-stress and low-anxiety state in which the learner is relaxed and is not challenged enough to achieve significant learning.

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Global Problems: Trans-national, long-lasting situations with far-reaching negative effects on a large number of people at a certain time in human history.

Integrated Teaching: A teaching methodology that incorporates a combination of skills, methods, and sources of information to help students engage in purposeful learning experiences that highlight connections between disciplines.

Self-Directed Learning: A strategy in which learners become independent active seekers of knowledge rather than staying passive receivers of information.

Significant Learning: The acquisition of knowledge and its application which cause some kind of lasting change in the learner.

Sultan Qaboos University: The only public higher education institution in the Sultanate of Oman founded in 1986. This co-educational university accepts exclusively the top students in the Sultanate. Admission is competitive based on students' performance in the general education exams.

Teaching Approaches: Essential part of a classroom pedagogy where the teacher decides on the best way of teaching.

The Trial of Martha Carrier: A 17th century report written by Cotton Mather on the court hearing of Martha Carrier who was accused and indicted of witchcraft in Salem, Massachusetts.

Chapter 8

Integrated Marketing Communications (IMC): The Interdisciplinary Concept

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ABSTRACT

Since introducing the concept integrated marketing communications (IMC) in the communication field, researchers and practitioners admitted to the interdisciplinary nature of the nascent concept. The current chapter tries to further explore the interdisciplinary concept of IMC, through subjecting IMC into in-depth analysis of its origin disciplines (Communication, Marketing and Branding). Furthermore, the paper resides to synthesize IMC empirical research in a meta-analytic framework to assert on the interdisciplinary field research trends emerging from utilizing the concept as a dependent or independent variable in different research disciplines. Finally, a case study tackling the status of Egyptian tourism after the recent political turmoil post the uprisings was assessed had the designated authorities turned to executing Integrated Marketing Communications instead of relying on temporary unfeasible solutions. A conceptual framework was proposed as a permanent solution of this matter. Employing a theoretical method and a Meta analytical method of 135 research papers, findings proved IMC to be an interdisciplinary concept. IMC research trends could be traced to three development phases with the third phase being crucially related to interdisciplinary frameworks. Thus, IMC is proved to be a viable framework to study topics related to branding, education, services and tourism.

INTRODUCTION

In an earlier point in time, Acheson (1993, p. 4) elaborated on the fact that Integrated Marketing Communications (IMC) “extends far beyond the merger of sub-disciplines into a single organization or the introduction of new jargon. In the path towards understanding how marketing and communications must come together in implementing IMC, it must be recognized that IMC is interdisciplinary”. The practice of IMC can be traced to the early 1980s when textbooks began to emphasize the concept of marketing

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communication (Edmiston-Strasser, 2007, p. 11), while the first “conceptual ideas” of the term were published in the book “Integrated Marketing Communications” in the last decade of the past century (Schultz, Tannenbaum, and Lauterborn, 1993).

One of the earliest definitions of Integrated Marketing Communications (IMC) was that of The American Association of Advertising Agencies that described IMC as: “A concept of marketing communication planning which recognizes the added value of a comprehensive plan which evaluates the strategic roles of a variety of communication disciplines (e.g., general advertising, direct response, sales promotion, and public relations), and combines these disciplines to provide clarity, consistency, and maximum communication impact” (Henderson, 1996, p. 10). The objective of all marketing communications efforts is to present a coordinated, cohesive and unified branded message to a specific target audience (Sayre, 2008, p. 243).

Several factors have aided the creation of this practical interdisciplinary concept. Marketing and communications are two distinct fields with parallel histories and considerable overlap. Advertising and other forms of communication disciplines have varying degrees of affinity with each of these two disciplines (i.e. Marketing and Communications). Inevitably, there is considerable synergy when the two disciplines work together (Acheson, 1993).

The current research paper tries to further explore the interdisciplinary concept of IMC, through subjecting IMC into in-depth analysis of its origin disciplines (Communication, Marketing and Branding). Furthermore, the paper resides to synthesize IMC empirical research in a meta-analytic framework to assert on the interdisciplinary field research trends emerging from utilizing the concept as a dependent or independent variable in different research disciplines. 135 empirical published papers and dissertations - selected based on their availability - from the year 1990 till 2017 were subjected to further scrutiny to uncover the truth behind the validity of the interdisciplinary concept and its status among researched topics worldwide. Finally, a case study tackling the status of Egyptian tourism after the recent political turmoil post the uprisings was assessed had the designated authorities turned to executing Integrated Marketing Communications instead of relying on temporary unfeasible solutions. A conceptual framework shall be presented hereafter.

METHODOLOGY

Research Problem

From an interdisciplinary perspective, this paper aims at fulfilling a tri-facet objective, primarily, exploring the disciplines comprising the concept Integrated marketing communications namely marketing, communications and branding via theoretical research. A meta-analysis of an available sample of empirical research will follow to prove the validity of the concept, which can be adapted to be utilized in multiple study disciplines. Finally, the paper sets out on the same track to present a conceptual model based on executing the full capabilities of IMC to rebrand Egyptian tourism following the turmoil caused by the instability that took place post the two uprisings that erupted in the country in the years 2011 and 2013 respectively.

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Research Objectives

The current research aims at achieving three major objectives:

1. Exploring the disciplines comprising the interdisciplinary concept Integrated Marketing Communications (IMC).
2. Specifying the empirical research originating from multiple disciplines and utilizing IMC as an easy adaptable concept.
3. Constructing a conceptual framework using the strategic integrated marketing communications approach and utilizing message synergy between the key marcom (marketing communications) as a comprehensive solution for Egyptian tourism crisis.

Research Questions

The current research is set to answer three main questions:

1. What are the disciplines comprising the interdisciplinary concept Integrated Marketing Communications (IMC)?
2. What are the research trends that empirically prove the viability of interdisciplinary IMC to be utilized in various research contexts?
3. How a conceptual framework is constructed using the strategic integrated marketing communications approach and utilizing message synergy between the key marcom (marketing communications) as a comprehensive solution for Egyptian tourism crisis?

Research Method

The current research resided to two research methods:

A theoretical method tries to explore the interdisciplinary concept of IMC, through subjecting IMC into in-depth analysis of its origin disciplines (Communication, Marketing and Branding) and finally constructs a conceptual framework based on IMC theory.

A meta-analytic is utilized framework to synthesize IMC empirical research. Meta-analysis in marketing research refers to “the analysis of a large collection of results from individual studies for the purpose of integrating the findings. Meta- analysis offers new opportunities for integrating and combining the contradictory outcomes of studies for analyzing variance in effect sizes across findings” (Laroche and Soulez, 2012, p. 79). Analyzing the sample in hand, the researcher attempted to synthesize the diverse findings of the various empirical research papers to prove the viability of IMC utilization in multiple research disciplines, thus elaborating on the interdisciplinary essence of the concept.

Sampling Procedures

The research utilized a purposive sample to implement the study because of the difficulty of assembling all the literature on IMC utilization through different disciplines and because the researcher posed a pre-condition in choosing the study sample residing on the availability of the term IMC and the other discipline in the headline of the research paper. The purposive sampling technique is simply defined

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as: “the deliberate choice of a participant due to the qualities the participant possesses” (Etikan et al., 2015, p. 2).

The researcher was able to track 135 empirical published papers and dissertations - selected based on their availability - from the year 1990 till 2017; and subjected them to further scrutiny to uncover the truth behind the validity of the interdisciplinary concept and its status among researched topics worldwide.

A conglomerate of research papers and dissertations in both Arabic and English were located through the following libraries and databases:

- Ebsco Academic Research.
- Egyptian Universities Library consortium available at: www.eulc.edu.eg
- Google scholar
- Pro-Quest.
- Sage Publications.
- Science Direct.
- Springer Link.
- SQU librarians available at: www.squ.edu.om/libraries
- Wiley Blackwell.

The following lines will depict on the origins of IMC as an interdisciplinary concept followed by the proof of IMC viability as a variable in other research disciplines and finally constructing a conceptual framework through utilizing the comprehensive capabilities of IMC as a feasible tourism solution.

INTEGRATED MARKETING COMMUNICATIONS AS AN INTERDISCIPLINARY CONCEPT

To discuss this aspect thoroughly, a review of the origin and components of the IMC concept will be presented hereafter:

Integrated Marketing Communications emerged as a promising field of study since the beginning of the nineties of the last century. The IMC concept draws its inspiration and has grown from the roots of the existing theories in the fields of Marketing and Mass Communication (McGrath, 2001).

The main foundation of the integrated marketing communication program is based primarily on the communication model which consists of the sender, message, medium, receiver, feedback and noise. The sender represents the company or organization trying to convey a message to the consumer, which is represented as the receiver. The message is sent through different types of media, which interpret that message to the consumer. A good marketing communication plan occurs when the consumer can correctly interpret the initial messages as it was meant to be sent. (Benkahla, 2006).

Marketing is designed to build brand and customer relationships that generate sales and profits. The American Marketing Association (AMA) updated its definition of Marketing in 2007 as “the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners, and society at large”. It is a function within an organization that focuses on managing customer relationships to benefit all of a brand’s stakeholders (Moriarty et al., 2012, p. 62-63).

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The four major components that make up marketing communications are as follows (Burnett, 2007, P. 207-208):

1. **Advertising:** any paid form of non-personal presentation of ideas, goods, or services by an identified sponsor. Most advertising messages are tailored to a group, and employ mass media such as radio, television, newspaper, and magazines.
2. **Personal Selling:** an oral presentation in a conversation with one or more prospective purchasers for the purpose of making sales.
3. **Public Relations:** a non-personal stimulation of demand for a product, service, or business unit by planting commercially significant news about it in a publish medium (i.e., publicity) or obtaining favorable presentation of it through vehicles not paid for by the sponsor. It is concerned with the intentional, often persuasive communication where communicators and stakeholders are relationally active in creating, amending and re-constructing meanings (Daymon and Holloway, 2011, p. 4).
4. **Sales Promotion:** those marketing activities that add to the basic value of the product for a limited time period and thus directly stimulate consumer purchase and dealer effectiveness.

Other researchers think that components of the IMC mix can include any of the following besides the four major components (Balakrishnan, 1997):

- **Direct Marketing and Telemarketing:** It is defined as a multichannel system of marketing that uses a variety of media to connect to sellers and customers who deal with each other directly rather through an intermediary. The most important function of direct marketing is that it opens up the door for interactivity, and it is known that the best practices of IMC engage stakeholders in meaningful and often interactive brand experiences. Interactivity – two way communication – is considered to be the heart of directing marketing ((Moriarty et al., 2012).
- **Sales Force and Distributor Communication:** They can be integrated with the relationship marketing program to ensure that the sales staff concentrate on building relationships rather than short term sales (Balakrishnan, 1997, p. 20).
- **Corporate Identity and Communications:** Corporate communication should be used to raise the awareness about the company and explain its activities. It refers to all that is not product-related communication (Balakrishnan, 1997, p. 19).
- **Relationship Marketing:** It is based on regular quality customer contact with information that reflects customer's needs (Balakrishnan, 1997, p. 20).
- **Presentations, Exhibitions and Events:** Like direct marketing and personal selling, exhibitions and presentations are considered to be a more personal and thus a "below the line" communication tool (DePelsmacker et al., 2010, p. 504). They are considered a part of a company's relationship marketing program with its customers and are also a PR tool to support the corporate image of the company and the quality and fame of its brands (DePelsmacker et al., 2010, p. 509).

Instead of a functional approach, IMC attempts to integrate these functions into a collective strategy. If conducted properly, IMC results in a more effective achievement of an organization's communication objectives (Burnett, 2007, p. 206).

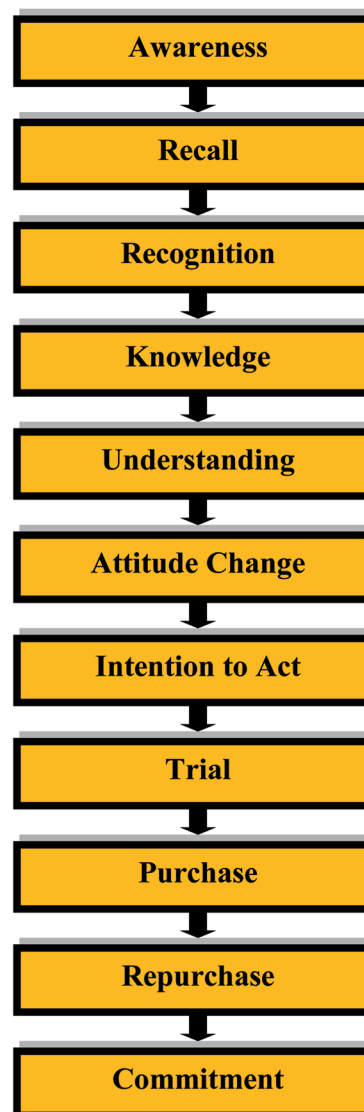
Goals of IMC are presented in the following diagram (Adapted from: Burnett, 2007, p. 215):

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IMC's objectives are not solely directed towards the achievement of sales growth or market share position, but maybe directed towards a number of different corporate, marketing or communication objectives or a mixture of all three (McCabe, 2009, p. 183).

The primary role of IMC is to systematically evaluate the communication needs and wants of the buyer and, based on that information, design a communication strategy that will: 1. Provide answer to primary questions of the target audience, 2. Facilitate the customer's ability to make correct decisions, and 3. Increase the probability that the choice they make most often will be the brand of the information provider (i.e., the sponsor or marketer). Marketers know that if they learn to fulfill this role, a lasting relationship with the customer can be established (Burnett, 2007, p. 205).

Figure 1. Goals of IMC (Adapted from: Burnett, 2007, p. 215)



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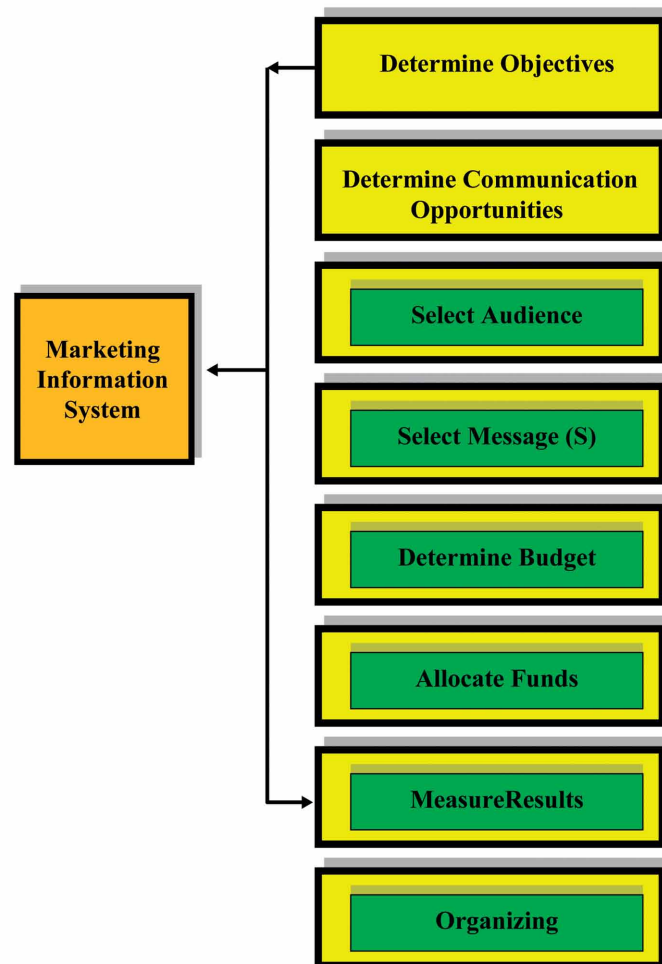
The basic objectives of marketing communications have been reduced to three more meaningful directives: 1. to communicate 2. to compete 3. to convince. The primary purpose of MC is to communicate ideas to target audiences. Principles of effective communication are intended to achieve this task. Clearly, most of marketing is communications and it is in this context that communication is included as a purpose of MC (Burnett, 2007, p. 208).

While all communication includes the same basic components marketing communication differs in two respects. First the intent of MC is to present a persuasive message, which reinforces the total offer made by the marketer. Second marketing communication can be divided into two flows: internal and external, which are directed at different target audiences (Burnett, 2007, p. 212).

To make a long story short IMC is an integration approach because if there is a marketing opportunity, there must also be a communication opportunity (Zahra, 2016).

The IMC strategy is presented hereafter: (Adapted from: Burnett, 2007, p. 214).

Figure 2. The IMC strategy (Adapted from: Burnett, 2007, p. 214)



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Originally IMC was about creating “one voice, one look” all across the messages in a campaign. In recent years it turned out that a more effective approach to IMC has moved from this narrow “execution” focus to a much broader focus on branding and customer brand perceptions. Companies now want to use everything that sends a message to create a coherent brand presence that leads to longer-term brand relationships (Moriarty et al., 2012).

Thus IMC shifted from being an interdisciplinary approach combining communication and marketing to being an interdisciplinary approach combining communication, marketing and branding. (Zahra, 2016). At the beginning of the 21st century demands of IMC strategists have shifted from the emphasis on communication to the emphasis on the brand, thus another recent term: Integrated Brand Promotion (IBP) evolved and was defined as: “using the various communication tools coordinated to build and maintain brand awareness, identity and preference”. Recent research and publications on IMC are now quickly recognizing the central role of the brand in communications (Semenik et. al., 2012).

IMC is a common sense ongoing process for managing brand perceptions and experiences as well as customer expectations about the brand (Moriarty et al., 2012: 485). It is the voice of a brand. In general the role of IMC is to inform, persuade and remind consumers of the brand essence, to engage them in a dialogue and to build relationships (DePelsmacker et al., 2010, p. 72). Therefore one of the newest research trends in IMC nowadays is the introduction of the concept: Customer-Integrated Marketing Communication or (CIMC); an approach where a customer in his or her individual ecosystem, based on integration of a set of messages from different sources, makes sense of the many branding messages he or she is exposed to (Finne and Grönroos, 2017).

Everything that sends a brand message is a point of concern for brand communication. To be effective, these messages need to complement one another and present the same basic brand strategy (Moriarty et al., 2012, p. 55). IMC can produce a stronger message consistency and help to build brand equity and create greater sales impact thus achieving clarity, consistency, and maximum impact through the seamless integration of discrete messages (Kotler et al., 2012, p. 482). The company wants to deliver a consistent and positive message with each contact. IMC leads to a total marketing communications strategy aimed at building strong customer relationships by showing how the brand can help customers solve their problems (Kotler et. al., 2012, p. 306).

Although almost everyone agrees that IMC is necessary for most brands’ success, implementing these practices can be difficult. Complexity in measuring results, lack of recall and resistance to change pose the major challenges (Thorson and Duffy, 2012). IMC doesn’t simply portray brands, it constitutes those brands in the sense that the meaning of the brand can’t be properly understood in separation from the consumer perceptions of its brand name, logo, advertising, media editorial, its portrayal in entertainment shows, peer comment and the communications associated with it (Hackley, 2010, p. 20)

UTILIZING IMC IN INTERDISCIPLINARY RESEARCH: THE THIRD PHASE OF IMC RESEARCH

The past argument proved what Acheson (1993) speculated before the turn of the century that IMC is interdisciplinary in itself. Researching IMC passed through multiple phases, though. Since IMC emergence as a formal field of study in the last decade of the past century; and as a nascent concept, the definition issues, perceptions, theoretical foundations, development and understanding of the IMC concept have been foremost among the concerns of scholars. Vast array of pioneer IMC researchers considered these

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topics their sacred mission (Schultz, 1992; Duncan and Everett, 1993; Nowak and Phelps, 1994; Grein and Gould, 1996; Phelps and Johnson, 1996; Brown, 1997; Schultz, 1997; Schultz and Kitchen, 1997; Schultz and Schultz, 1998; Hartley and Pickton; 1999, Abdullah and Zahra, 2011). In recent years IMC studies have developed even further and tackled several current topics such as: the relationship between public relations and IMC, the management of IMC process by corporations and advertising agencies and the measurement of IMC outcomes (Abdullah and Zahra, 2011; Zahra, 2016).

Further development is the focus of this paper and that is the third development phase of IMC research namely: executing IMC theory and principles to study topics from other disciplines. Although the three phases synchronized in time as will be discussed later, the third phase from the researcher's point of view is the most important phase; thanks to reflecting the real essence and multiple uses of the IMC concept.

In the next few lines the researcher will tackle phase one and two briefly, but will concentrate extensively on phase three.

Research Phase One: Preliminary Phase

As prior mentioned, this phase is considered the nascent phase. As a new concept introduced in the 80th and submitted to proper research in the 90th of the past century, most studies were much consumed with unveiling the concept. Defining the concept, theories underlying IMC, IMC research, internet utilization, concept acceptance by different corporations, co-ordination and integration concepts within IMC and interactivity and database usage were the main topics discussed here (Al Araby, 2000; Christensen et. al., 2005; Orr and Cano-Lopez, 2005; Benkahla, 2006; Peltier et. al., 2006; Eagle et al. 2007; Gurau, 2008; Khattab, 2008; Caemmerer, 2009; Schultz, 2009; Pjero et. al., 2010). What seems to be intriguing is that this phase includes some of the recent IMC studies as well proving the synchronized point of view (Garg, 2012; Murphy, 2012; Saber, 2012; Kerr and Patti, 2015; Kitchen, 2015; Muñoz-Leiva et al., 2015; Batra and Keller, 2016; Bruhn and Schnebelen, 2017; Ots and Nyilasy, 2017; Mortimer and Laurie, 2017).

Research Phase Two: In-Depth Phase

During this phase, IMC studies have developed further and tackled several current topics about the IMC concept. Some of the most prevelant topics herein were: the relationship between IMC and its major components as public relations and advertising (Carlson et. al., 1996; Diab, 2012; Abdel Azim, 2013; Turner, 2017), the management of IMC process by certain corporations and advertising agencies (Gabielli and Balboni, 2008; Khattab, 2008; Celebi, 2009; Saber, 2012; Tsikirayi et al., 2013; Lekhanya, 2015), managing IMC campaigns (Farid, 2000; MacArthur, 2014; Porcu et. al., 2017) and IMC outcomes (Ots and Nyilasy, 2015). Studies synchronized as well with the first and third phase.

Research Phase Three: Interdisciplinary Phase

From this study's viewpoint, this phase is considered the peak of IMC research when IMC started fulfilling its interdisciplinary duties and was subjected to empirical testing regarding its effects when utilized on a number of definite disciplines. Mostly being the independent variable, IMC proved its validity to be executed in almost every research discipline as a comprehensive communication solution instead of residing to its components. Research disciplines mostly studied revolved around branding (Mad-

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havaram et al, 2005; Ratnatunga and Ewing, 2005; Matarid, 2008; Zahra, 2009; Soliman, 2009; Erci, 2011; Luxton et al., 2014; Kuang-Jung et al., 2015; Luxton et al., 2017; Khizar et al, 2016; Seric et al, 2017). Education and education institutions were among the most studied disciplines (Kerr et al., 2004; Schultz et. al., 2007; Edmiston-Strasser, 2007; Horrign, 2007; Kerr et. al., 2008; Khiribi, 2011; King, 2013; Johnson, 2013; Kerr and Kelly, 2017). Telecommunications was tackled (Szanto and Harsanyi, 2007; Abdel Hameed, 2012) and services as restaurants and banks (Al Sayed, 2007; Nofal, 2013; Al Masry, 2013; Noby, 2014). Non-profits had a fair share of empirical research (Larson and Potter, 1995; Al Melhem, 2012) and most important were tourism and destination branding (Gerges, 2004; Salem, 2005; Dinnie et. al., 2010; Harb, 2013; Hanafi, 2014; Seric et al., 2015).

Judging by the vast array of research presented above, it seems convincing that IMC established itself not only as an interdisciplinary concept in its own, rather a term involved in studying various topics emerging from other disciplines, thus providing other disciplines with major opportunities of integration and convergence.

A CONCEPTUAL IMC FRAMEWORK TO REBRAND A DETERIORATING DESTINATION: THE CASE OF EGYPT

Overview

Egypt has always been a worldwide popular tourism destination. It is not only the incomparable, numerous archeological sites that make Egypt a major tourism destination, but also the Red Sea resorts, deserts, and the Nile; that is besides acceptable quality of tourism services and facilities. During the last four decades, tourism has become an indispensable source for the development of the Egyptian economy especially in terms of employment and securing foreign currency. For instance, in 2009 Egypt received about 12.5 million tourists, who spent approximately 10.7 billion dollars, representing about 11.3% of the Egyptian GDP, 39% of the Egyptian non-commodity exports and 19.5% of Egypt's foreign currency revenues (Egyptian Ministry of Tourism, website, 2010).

Unfortunately, Egypt's first uprising dated 25/1/2011 had a disastrous effect on Tourism. In an Egyptian report published by The Central Agency for Public Mobilization and Statistics (CAPMAS, May 26, 2011), the head of the Agency revealed a drastic setback of Tourism revenues by 60%, announcing that the tourism sector received the maximum blow due to the recent events (at the time). The government took quick measures in order to contain the deteriorating situation, through the Tourism committee that resumed meetings in March of the same year. Recommendations were adopting a short term plan to restore security in the area and a long term plan to preserve the environmental tourism, launching international campaigns and participating in international events to further promote the destination (Zahra, 2014).

In 2012, UNWTO figures showed international tourism generated \$10.1 billion. The good news was that, after a sluggish start, total numbers for 2012 picked up with a strong surge toward the end of the year. The first quarter of 2013 has continued the trend, with arrivals and hotel bookings showing a "healthy increase." Unfortunately for the second time Egyptian tourism has declined since the country's second uprising in 30/6/2013, with July and August tourist revenues \$600 million lower than in the same months of last year (Zahra,2014).

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Proposed Interventions

Since the presidential elections came to an end in 2014, Egyptian government represented by the ministry of tourism and the general authority for Tourism have been trying hard to re-attract tourists through various methods. One of the major methods was launching a series of special events in the hope of re-promoting Egypt. Planned events have been shown to alter tourists' perceived destination images and recent studies carried out in Egypt post the first uprising clarified that events can lead to sustainable tourist branding in the area (El Masry and Amara, 2012). This situation though, was more complicated than being solved by the series of events thrown by the authorities to attract tourists. Although tourist events are considered a strategic approach to combat prolonged negative image of a destination, in the Egypt's case, it was considered a cosmetic approach (Avraham and Ketter, 2012). Hundreds of events have been launched and promoted through official ministry websites ranging from cultural events to sports to even beauty pageants since the first uprising and the turnout was not as expected in tourism attraction or revenues (Zahra, 2014).

The comprehensive solution from the author's viewpoint would have been to integrate events under the PR umbrella in a strategic IMC approach of Rebranding the Tourist Destination (Egypt).

Rebranding Destinations via IMC

Egyptian tourism researchers took the initiative of tackling the post uprisings tourist crisis (Gaafar, 2013) and even some of them resided to study IMC in certain tourist organizations (Harb, 2013); nevertheless no one tackled the situation from a strategic rebranding point of view except lately (Amara, 2016) and even then IMC was not introduced.

A destination is a geographical space in which a cluster of tourism resources exist, rather than a political boundary (Pike, 2008: 24). There is a lack of published research relating to tourism destination branding. This is in spite of general agreement in academia and industry that the concept of branding can be applied to destinations. In fact the topic of destination branding did not appear in tourism literature until the late 1990s (Pike, 2008, p. 179).

IMC forms a key aspect of the delivery of Tourism and Hospitality services. This sector is heavily dependent on marketing because of the industries special characteristics. Although there has been a great deal of academic attention given to the various dimensions of marketing in tourism and hospitality services within the business and management literature, and within sociology on the semiotics of representations of tourist brochures; there has been remarkably little attention given to the broad dimensions of integrated marketing communications, the concepts, strategies, issues and challenges underpinning this important function in a dynamic service sector environment (McCabe, 2009, p. 2).

Rebranding is the least studied matter regarding destination brands. Even when tackled through empirical research, it is not through an IMC approach and most studies tackled rebranding in case of natural disaster not political turmoil such as the case in hand (Gotham, 2007). A rebranding and repositioning of strategic objectives will necessary entail a great deal of coordinated IMC activities providing information about the new brand logo, themes and values to the desired audience which is directed towards raising awareness and providing information (Fill, 2005, p. 183-184).

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WHY IS IMC A STRATEGIC CHOICE IN REBRANDING EGYPT AS A TOURIST DESTINATION?

IMC aims at harmonizing the messages across different types of communication tools. By adopting IMC as a strategic marketing approach, a consistency types of message, the words, images, brands and brand values, design and quality issues across all forms of promotion, selling and advertising channels, audiences would have a better understanding and recognition of the organization and its core messages and appeals. Having integrated communications across different channels is seen to help overcome these issues and reinforce the brand appeal within the minds of consumers (Fill, 2005, p. 134).

The researcher assumes that Egypt can be rebranded following a comprehensive approach tackling tri-fold major phases as shown in the next figure adapted from Sayre (2008) and McCabe (2009):

1. Egypt as a Destination (Brand Management and Marketing)
2. Reformulation of Brand Egypt (Different Positioning Approaches)
3. Egypt's new brand Equity (Customer Based Brand Equity + Financial Brand Equity).

Messages formulated in the previous tri-fold process must enjoy a tri-fold synergy as well:

1. Primary communication, which includes not only the architecture, urban design, infrastructure, museums and other real place offerings, but also the destination's behavior.
2. Secondary communication, which includes the formal and intended communication through all forms of advertising, public relations, graphic design, and the use of logos and slogans, which is similar to promotion in the traditional marketing mix.
3. Tertiary communication, which refers to word-of-mouth reinforced by the media as a form of communication largely beyond the control of place marketers.

The conceptual framework is presented hereafter:

ANSWERING RESEARCH QUESTIONS, DISCUSSION, AND RECOMMENDATIONS

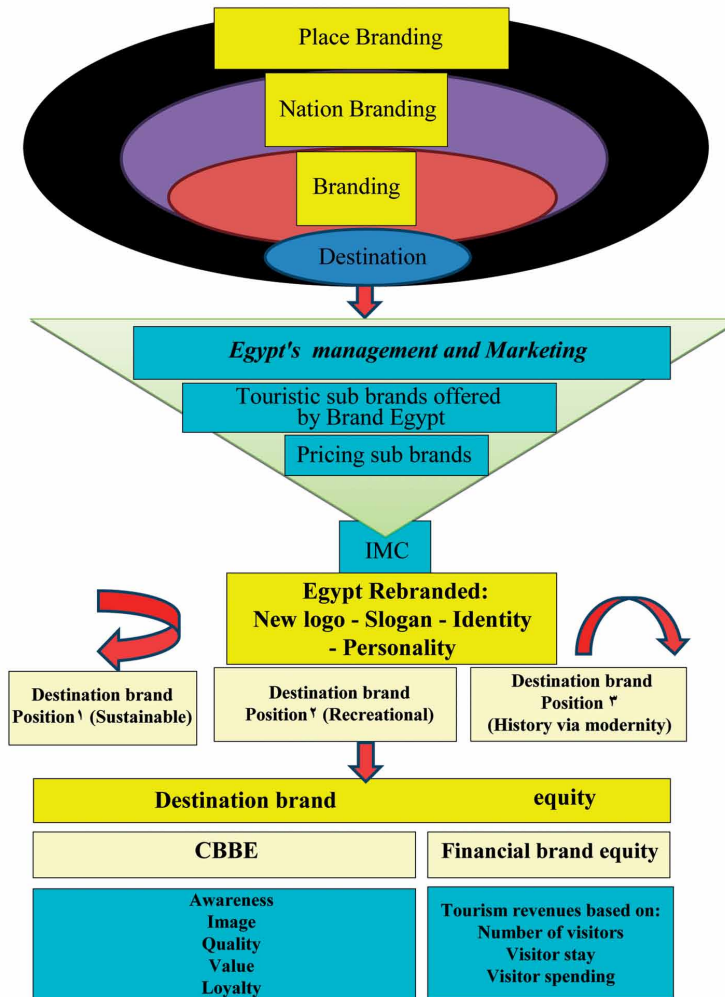
The current research is set to answer three main questions:

1. What are the disciplines comprising the interdisciplinary concept Integrated Marketing Communications (IMC)?

Literature suggests that IMC started out as being an interdisciplinary concept joining marketing and communications, then developed into being a more complicated interdisciplinary approach combining three disciplines, namely: communication, marketing and branding. Being an interdisciplinary concept in itself and being comprised out of multiple communication disciplines, IMC provides maximum opportunity for strategic solutions in the fields of both marketing and branding.

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Figure 3. The conceptual framework



2. What are the research trends that empirically prove the viability of interdisciplinary IMC to be utilized in various research contexts?

Researching IMC passed through multiple phases, though. Since IMC emergence as a formal field of study in the last decade of the past century; and as a nascent concept, the definition issues, perceptions, theoretical foundations, development and understanding of the IMC concept have been foremost among the concerns of scholars. Vast array of pioneer IMC researchers considered these topics their sacred mission. In recent years IMC studies have developed even further and tackled several current

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topics such as: the relationship between public relations and IMC, the management of IMC process by corporations and advertising agencies and the measurement of IMC outcomes. *Further development is the focus of this paper and that is the third development phase of IMC research* Although the three phases synchronized in time, the third phase prevails; thanks to reflecting the real essence and multiple uses of the IMC concept. Thus IMC is proved to be a viable framework to study topics related to branding, education, telecommunications, services and tourism.

3. How a conceptual framework is constructed using the strategic integrated marketing communications approach and utilizing message synergy between the key marcom (marketing communications) as a comprehensive solution for Egyptian tourism crisis?

Residing on the full capabilities of IMC and instead of relying on temporary solutions in crises and delicate situations, IMC can provide decision makers with comprehensive approaches and message synergy scenarios to perform a full crisis management contingency plan. Nations as commercial brands are not immune from events outside their control that may affect their brand equity.

An example of such a comprehensive approach can take into account marketing, positioning, equity and message synergies to developing marketing messages build on core destination values that include environment, innovation and quality. IMC can provide data, guidelines, resources to the private sector rather than by forcing a branding campaign with rules and regulations that can be perceived as restrictive; thus establishing brand name recognition, awareness and image development rather than making changes frequently.

Finally, this scientific discussion depicts on utilizing the massive opportunities provided by the interdisciplinary concept integrated marketing communications through establishing a strong theoretical base justifying the interdisciplinary origin of the term. Moreover, IMC proved itself to be a strong variable in interdisciplinary research. Being interdisciplinary in itself paves the way for practical executions of the concept in different research arenas. Destination branding in one area of study that IMC can be utilized to its full capacities. The emergent shift in thinking towards destinations as brands requires a management approach that focuses on developing relationships with customers rather than simply focusing on generating sales. One such approach is integrated marketing communication which has emerged relatively recently in the marketing literature specifically in the nineties. Dimensions of IMC that could be of great benefit to DMOs (Destination Marketing Organizations) might revolve around: profitable customer relationships, enhancing stakeholder relationships, stimulating purposeful dialogues with customers and message synergy.

Recommendations are based mainly on full exploitation of the resourcefulness of IMC. As a practical strategic framework and a flexible research variable, current organizations should depend on employing IMC to its full capacities, regardless of the problems of funding and eligible manpower. One possibility of achieving that end is including social media into the IMC framework. Social media succeeded in transforming branding into a two-way communication. Consumers not only share their experience on a brand but also create a brand by posting their own content. Social media has made it possible for marketer-generated content and consumer generated content to coexist, thus strengthening the IMC approach behind such brands.

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KEY TERMS AND DEFINITIONS

Destination Brand Identity: A four- stage phase namely: appointment of a brand champion, identification of a brand community, destination audit and production of a brand charter.

Destination Brand Image: Represents the actual impressions held in the market of a certain destination. Image objectives will usually involve creating a new image or reinforcing already established positive images.

Destination Brand Positioning: Establishing a distinctive rank of the destination in the mind of prospects (potential visitors).

Destination Marketing Organization (DMO): The organization responsible for marketing a known destination through articulate planning.

Integrated Marketing Communications (IMC)

Destination Vision: An abstract statement of an ideal future that the destination hopes to achieve; while a mission is what is really expected to be achieved and measured by this destination.

Integrated Marketing Communications: Strategically planned communication synergies seeking to integrate all forms of communications created by organizations to achieve coordinated transmission of brand values and orientation.

Product in Tourism: Consists of services, experiences and use of facilities, which are offered to a market for use to satisfy the needs of hospitality and travel.

Chapter 9

Interdisciplinary Relationships Between Medicine and Social Sciences

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ABSTRACT

The aim of medical science is treating and preventing diseases. The development of medical sciences has been influenced by developments taking place in other sciences including social sciences. Sciences including physical sciences, biological sciences or social sciences interact with each other. The interaction takes place between sciences in each category and between sciences from different categories. However, there are very few studies that deal specifically with the interaction of medicine with social sciences. As both have to work together because of the human complex nature as a result some authors considered medicine itself as a social science, thus creating an interdisciplinary environment that hosts both medicine and social sciences. This chapter reviews the complex interdisciplinarity between medicine and a number of social sciences, including anthropology, psychology, sociology, political sciences and economy.

INTRODUCTION

World Health Organization (WHO) defines health as “not only the absence of disease, but the complete state of physical, mental, and social well-being”(Koch-Weser, 2009). Health involves various aspects of human life, as it is not only concerned with being free of diseases. Mental and social stability are important components of health. That is why medicine should interact with other sciences including social sciences in order to reach the goal of World Health Organization.

Medicine is a science that aims to provide health, which is so complex and not easily achievable as defined by WHO. The complexity stems from the fact that health has to interact with other social sciences designed to describe and study the human’s behavior. Some researchers consider medicine itself as a social science. According to Kottle (2011, p. 930) medicine is considered as “a Social Science in Its Very

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Bone and Marrow”. The interaction between medicine and social sciences is complex because it interacts with a number of social sciences like Sociology, psychology, economics, political science, history and anthropology. These sciences interact with each other producing complex interdisciplinary relations.

This complex interaction produces new disciplines that include a combination of social sciences and medicine. For example, the interaction between psychology and medicine has led to a new discipline called clinical psychology. Similarly, there is an interaction between medicine and anthropology resulting in medical anthropology. It follows therefore that there is unlimited interaction between social sciences and medicine, bringing about interdisciplinary new specialized branches.

In this chapter, the interdisciplinary interaction between medicine and social sciences including anthropology, psychology, sociology, etc. is discussed and examples of the complex relations between medicine and social sciences are presented.

BACKGROUND

A productive community cannot be healthy unless health services are provided while sustainably developed. Since the development and progress of civilization is associated with the development of various sciences, complex relations as a result are bound to exist between them.

Although developments taking place between medicine and social sciences have greatly increased over the last century, there is still room for further development and enhancement to evolve, around a number of basic medical sciences like anatomy, physiology, biochemistry, pharmacology, embryology, etc. There is also a long waiting list for other clinical specialties to follow suit. This includes main specialties like medicine, surgery, orthopaedics, psychiatry, obstetrics, gynecology, neurology...etc. and other subspecialties.

It is generally agreed that progress in medical sciences is interrelated to developments in social sciences, because through social sciences, the needs of individual patients and community can only be identified (Kottle, 2011). In other words, inputs received from social sciences studies help in the development of medicine. Additionally, knowledge of epidemiology of diseases, genetic factors, and environmental factors is essential to understanding health problems in a community understanding the distribution and prevalence of diseases and for the services have to be delivered.

Providing a health service requires a knowledge of economy, epidemiology, politics and so on in order to optimize the use of resources which are not always abundantly available. Therefore, the interaction between medicine and social sciences is two faces for the same coin. Medicine, on the one hand, has its effects on social conditions that the social sciences are concerned of. Social conditions also have their effects on medicine on the other hand.

THE ROLE OF SOCIAL SCIENCES IN THE DEVELOPMENT OF HEALTH SECTOR

Health services require the information provided by various social sciences disciplines to give the best and appropriate care to the society. Prevalence and distribution of diseases in a specific community differ from other communities. Social sciences help in identifying the diseases that are prevalent in that particular community. More resources will be given to treat these diseases.

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Without knowing childhood disease, immunization programs would not have developed or even started. This also applies to infectious diseases and cancer. Social sciences provide the knowledge needed to guide the development of medical sciences and health services. Also, it boosts the research culture in the medical field.

MEDICINE AND ANTHROPOLOGY

Anthropology is the science which studies various aspects of humans and their interaction with society. That is why there is a great interaction between medicine and anthropology. Epidemiology and distribution of disease, availability of resources, development of the country or society, war and peace all are factors that affect human health and medical services in any community. Nonetheless, the interaction between anthropology and medicine is very complex. As a result, a specialized new branch of anthropology, medical anthropology, has emerged and is concerned with the study of health and how it is affected by various factors that exist within the society.

Medical Anthropology studies the interaction of individuals with their social and material environment at present. It also studies the interaction of humans with environment at the past (Archeology). Because of the medical anthropology, it is known now that cancer has existed since the beginning of human race. In addition, anthropology has introduced a holistic approach which means that any society healthcare system cannot be studied in isolation. To understand the requirements of a particular health care system and to optimize that system, social, religious, political and economic organization have to be taken into account. Relativism is another concept of anthropology and means that each culture has its own distinctive features, understanding, ideas and roles. As there are differences between different cultures, researchers should be able to understand sickness from the point of view of the culture that he is studying but not from his own point of view of the culture. A third idea that was introduced by anthropology is that beliefs may not reflect actions. What is important is what the people do about their diseases not what they say about their diseases (Dein, 2006).

An example of this complex interaction between the medical field and anthropology is the case of certain congenital anomalies. As congenital anomalies require treatment, knowing their cause is also of great importance. Anthropology and epidemiology are the sciences that consider the causes on a wider scale. Some congenital anomalies are more prevalent in certain communities or certain countries. An example is cleft lip and palate which have the incidence of 1:500 in Oman compared to 1:1000 in some western countries because consanguinity is relatively common in Oman (Rajab & Thomas, 2001).

Apart from genetic factors, various other reasons may play a role in the occurrence and distribution of certain medical conditions, including environment and economy. Access to health services, which vary according to the country, community, peace and war, is important to have the optimum management of medical condition, because studying these factors require medical anthropology.

In medical anthropology, communities are usually studied in depth. It shows how the present conditions of a community are reflected in its health. An example is the effect of economy on the health of a community. Poor countries will not be able to provide good health care to their patients, nor will poor parents be able to afford treatment for their children.

The role of anthropology in identifying certain medical conditions and the social and economic contributing factors can be seen again in the cases of cleft lip and palate in poor countries. Children with cleft lip and palate cannot speak properly, cannot eat properly and have ugly facial deformity. The

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management of such cases is complex and it requires the involvement of multiple medical disciplines. Poor countries cannot afford to treat all these patients. As a result certain international organizations such as smile train, were established to try to help these patients. These organizations are doing charity work in some poor countries, but this will help solve a small part of the problem as only the surgical treatment will be provided. Speech therapy, dental work, ear problems etc. usually cannot be addressed completely by an interim short charity work. If not for the anthropology and its role in studying the various aspect of communities, these type of cases would not have been identified.

Medicine is affected by the community, its wealth, development and stability. Medical conditions congenital or traumatic affect the patients and the patient family emotionally and psychologically. From the above examples, it is succinct that anthropology and medicine are interdisciplinarily linked to each other because of the constant interaction between both of them. The outcome of this interaction has recently led to the emergence of medical anthropology.

MEDICINE AND PSYCHOLOGY

There is a vast and multiple relationships between medicine and psychology. As a result, a branch called clinical psychology has developed. Also, a clinical part of medicine has emerged and that is called psychiatry, emphasizing the interdisciplinarity that medicine has with other social sciences.

Clinical psychology started at the end of nineteenth century. Lightner Witmer, a psychologist at the University of Pennsylvania, was the founder of clinical psychology and the founder of the first psychological clinic. Further development of clinical psychology took place during World War II, when soldiers suffered from posttraumatic stress disorder upon their return from war. This was not a physical condition to be treated, instead it was a condition that required psychological intervention. Subsequently, clinical psychology kept progressing and evolving. As a result, the interdisciplinarity between medicine and psychology kept growing.

At present, clinical psychology deals with many clinical disorders that behavioral and social changes play a part in their management. This includes endocrine disorders like diabetes mellitus and obesity, gastrointestinal disorders like irritable bowel syndrome and inflammatory bowel diseases, cardiovascular diseases, pulmonary diseases like asthma, chronic obstructive airway diseases and cystic fibrosis, chronic pain, cancer patients, neurology, dentistry and preoperative support of patient who will undergo surgery (Vander & Suls, 2014).

Clinical psychology also plays a role in many other medical and surgical specialties. An example is the interaction between psychology with plastic surgery. Psychology plays a crucial role in the management of certain patients who are present to plastic surgery. Victims of burns require psychological support as there are physical and psychological trauma, disability, deformity and lifelong aesthetic consequences. If the burn victim is a child, parents may feel guilty and will need support themselves. Burns may also produce lifelong deformities that the patient and the family have to cope with. The patient may have difficulty in interacting with the society especially if burns are affecting a visible part of the body like the face. Patients with congenital anomalies may suffer from their anomalies as the surgical correction may be partial.

The parents of child with congenital anomaly like cleft lip and palate will need lots of psychological support. These children will have anomalies that affect the appearance of the face and the speech function. Surgical correction is done in stages, but there will be scars and the deformity may not be corrected

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completely. These patients will need intense speech therapy, yet the speech may not become normal. Caring of such a child is a challenge as the treatment takes many years. In developed countries, there are support groups that patients can join and interact with other patients and share their experiences. But this does not exist in developing countries. Further interaction between psychology and medicine is seen in patients seeking cosmetic surgery. The problem is mostly psychological, because they are not happy with their appearance and they want improvement. Another person with similar appearance may see this as normal and he will not think it is an abnormality. These are just examples of the connection between the psychology and medicine, but the interaction is wider and deeper.

MEDICINE AND SOCIOLOGY

The American heritage dictionary defines sociology as the study of human social behavior especially its origins, organization, institutions and development of human society. It is a social science that uses various methods of empirical investigation and critical analysis to develop a body of knowledge about social order, disorder, and change.

There is a fundamental theory in sociology proposed by Parson (2007). This theory describes four basic functions that any social system or society should perform in order to survive.

The four functions as proposed by Parson (2007, p. 355) are:

- **The Function of Pattern Maintenance:** The function of pattern-maintenance refers to the imperative of maintaining the stability of the patterns of institutionalized culture defining the structure of the system.
- **The Function of Goal Attainment:** The function of goal attainment describes the problem of settling and implementing goals. Basically this is the focus of political organization of the society.
- **The Function of Adaptation:** The function of adaptation describes the problem of acquiring sufficient resources. This is the focus of economic organization of the society as the resources are always limited.
- **The Function of Integration:** The function of integration describes the problem of maintaining solidarity or coordinating between the subunits of the system. If these units do not have coordination, the social system will not work.

Through this theory, it is clear that illness affects the function of the society and the social system. It affects its productivity and progress and can cause collapse of a community. A well-known example of that from the history is the plague which was responsible for the collapse of an empire. The functionalist theory of Parson (2007) emphasizes that good health and good effective medical care are essential to the society's ability to function and progress. Illness impairs the ability of individuals to perform their duties and commitments towards their society and subsequently impairs the society's function as a whole. It is very vital that a society be healthy. Sick people should be treated for the survival and maintenance of any community.

As illness can be treated, preventive measures are also vitally important because if there are too many people who are unhealthy, the function and stability of the society is disturbed (Barkan, v.1.0). As a result, nowadays there are prevention programs that prevent certain diseases, such as immunization for

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children that has prevented so many children diseases. Flu vaccine is another preventive measure that reduces flu in the community, resulting in less sick leaves while increasing the society's productivity.

It is clear from the above that like many social sciences, sociology is closely interacting with medical sciences and with other social sciences. As with most of social sciences, a new branch of sociology, medical sociology, has emerged. Medical sociology studies the relationships that exist between medicine and sociology. Areas that medical Sociology is involved in include research, burden of chronic illness on society and how the people adapt to their chronic illness, policies and future planning.

Medicalization is a term that was introduced to sociology literature in the 1970s after the works of Irving Zola who proposed the medicalization theory in 1972. Medicalization can be defined as the management of a social condition as a medical condition. In this case, the particular social condition is considered a pathological condition that requires certain form of medical intervention (Riska, 2003).

There are several examples of such conditions: alcohol abuse, obesity, and childhood attention deficit hyperactivity disorders, which are all considered medical problems. All these conditions are referred to a specialized physician. Childhood attention deficit hyperactivity disorders and substance abuse are all treated by psychiatrists.

Similarly, obesity is a complex problem that requires input from general surgeons, plastic surgeons and internal medicine specialists. Obesity will be taken as an example to prove that it is a social and medical problem at the same time. According to World Health Organization, obesity has reached epidemic proportions globally. There are more than 1 billion adults overweight. 300 millions of them are clinically obese and obesity rate has risen three-fold or more since 1980 in some areas of North America, the United Kingdom, Eastern Europe, the Middle East, the Pacific Islands, Australasia and China (World Health Organization, 2003).

While Obesity is a complex condition, with serious social, medical and psychological consequences, it is a major contributor to the global burden of chronic disease and disability. Medically, obesity and overweight are major risk factors for a number of chronic diseases, including type 2 diabetes mellitus, cardiovascular disease, hypertension, stroke, and certain forms of cancer. Diabetes, hypertension and cardiovascular diseases are associated with morbidities, and other medical problems that result from them. Socially, obesity is not restricted to adults only, childhood obesity is also increasing. The factors that contributed to increasing obesity include: Increased consumption of more energy-dense, nutrient poor foods with high levels of sugar and saturated fats (Junk foods), and reduced physical activity (sedentary jobs). The obesity epidemic is not restricted to developed and rich societies, it is also increasing developing countries at the same rate or even faster (World Health Organization, 2003).

Obesity, a simple social condition, has become a burden on the society. It is draining the resources of the community for its medical management and the management of its medical consequences.

Alcoholism is another social condition that has medical consequences and requires intensive medical and sometimes lifelong treatment. Alcohol affects the mental health. It can cause liver damage, it may affect the pancreas, and it may affect the stomach and so on. Alcohol according to World Health Organization is the third cause of ill health and premature death. The highest consumption of alcohol is recorded in the European Union. This means that it is a major problem in that part of the world even though European countries are developed and wealthy. Alcohol consumption is common with certain people in the society. Alcohol consumption increases among the poor and the unemployed. Alcohol dependence is also a social problem with major consequences on the life of the person, his family and his community. Alcohol dependence may lead to reduced productivity and absence from the work. It may lead to family problems and problems at work place (Moller & Galea, 2012).

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MEDICINE AND POLITICAL SCIENCES

Politics and political status of a country have a profound effect on medical care. A peaceful stable country will have a diversity of resources directed towards the development of medical services. In areas of conflicts, less resources are provided for health services. As a result, essential programs like an immunization program may stop. Trauma cases will be in large volumes and that will affect the care of other conditions. Certain infectious diseases may become endemic like cholera for example. Medicines availability may not be that good. In general, wars, conflicts and political instabilities result in deterioration of medical services, health and life expectancy of the individuals of the involved community.

Wars, even though they had a negative effect on medical care, they were responsible for the development and progress of medicine. The best example is World War I and World War II, as many medical developments happened during World War I and World War II. The development that took place at that time is the cause of the present status of medical practice. The medical field kept developing in a fast rhythm. Examples of the development during both wars and in between is the invention of Thomas splint, emergency laparotomy for abdominal gunshot injuries, introduction of tetanus toxoid and the management of open fractures (Ellis, 2015; McDonald, 2016).

Political conditions play a role in the development of medical fields, but also in certain situations it has a role in the deterioration of medical services and child mortality. An example of the negative effects of politics on health is the Iraqi war and sanctions imposed on Iraq after 1991. Prior to 1990, Iraq had one of the highest per capita food availabilities in the region. Due to the good income from the oil, Iraq was importing large quantities of food, up to two-thirds of the Iraqi population's food requirements. The medical services were very good and infants and children were getting very good care. The infant mortality rate had dropped to 40 per thousand by late 1980s. Following the Gulf War in 1991 and the imposition of sanctions, food imports declined tremendously. Iraq on its own was not able to produce enough amount of food. Between 1991 and 1998, nutritional status declined and Iraq's infant mortality rate increased to above 100 per thousand. Apart from the infants, 37% of school children aged 12-15 years in a poor area of Baghdad were also malnourished. War had disrupting effects on food availability, quality of water and sanitation. It caused widespread malnutrition, spread of diseases and increased mortality. The effect of war is not only on food resources, but on many aspects of medical fields. The sanctions caused the vaccination program to regress. As a result, the preventable childhood diseases increased. As antibiotics were not that much available, respiratory tract infections were common in children and were responsible for many deaths among children (Center for Economic and Social Rights, United States of America, 2003).

Iraq was a stable, wealthy and progressing country prior to the Gulf War and the war with Iran. Health conditions in Iraq were as good as other countries with good income. The health system was considered one of the best in the Middle East region. There was an extensive network of well-equipped and well-staffed health care facilities all over the country. Communications between different facilities was extremely good as there was a good and efficient communication network. As with any developed health system, there were also specialized units where the patients who needed specialized care were taken and treated. People access to the health care was extremely good. It was estimated that 97% of urban and 79% of rural populations had access to the health care. The health system also included public health programs for malaria and tuberculosis control, and an expanded program of immunization. Unfortunately, this development in health sector could not be sustained as Iraq got involved in number of conflicts.

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MEDICINE AND ECONOMY

Economy has a direct effect on the health services and development of medical sciences. Countries with good economy and industrial countries invest on the development of drugs, equipment and instruments which can be used by doctors and health care providers. A good economy is also associated with better health services like the case in oil producing Arab Gulf where health services are provided for free and at a high standard. In poor countries, the government health services may not be that good. Private services may be very good, but many people cannot afford the expenses for treatment in these private institutions due to lack of money.

Good economy leads to development of health services and development of health programs like immunization programs, control of infectious diseases programs and early detection of cancer programs. In areas where health system is not provided for free, people can still get good medical services, provided that they can afford the related expenses.

An example of the effect of improved economy on health is the Sultanate of Oman over the last 40 years or so as a result of oil discovery and exploration of new oilfields. As a result, there has been a progressive improvement in medical services as reflected on the health of the people showing progressive improvements annually. In 1990, life expectancy at birth was 69 and this rose to 74.3 in 2005 and 76.2 in 2012. Infant mortality rate was 29 per 1000 live births in 1990 and it has dropped to 10.3 per 1000 live birth in 2005 and 9.5 in 2012 (Ministry of Health, Oman, 2013; Hill, Muyeed, & Al-Lawati, 2000).

In Oman, the health sector has developed rapidly and a reasonable amount of the government expenditure was allocated to the development of medical sector. Many experts were recruited and many programs started. Many new hospitals and health centers were built. By the end of 2012, there were 65 hospitals compared to only 2 hospitals in 1970. In 2012, there were 242 health centers compared to 22 in 1970. The Ministry of Health (MoH) initiated major programs. One of these is the expanded program of immunization initiated in 1981. Nowadays, immunization covers almost 100% of the children in Oman. Diseases like poliomyelitis and Diphtheria are not found any more in Oman. Another major program was the establishment of the disease surveillance and control system in 1987. World Health Organization ranked Oman first among 191 WHO members for its overall performance on the level of health in its comparative analysis of health systems in 2000.

Work has also been done to control other communicable diseases such as respiratory infections, diarrheal diseases, tuberculosis and leprosy with great success. One of the successful programs was malaria control program. Malaria was previously a deadly disease. Registered malaria cases were 16,348 in 1985 and 32,720 in 1990. The number dropped tremendously to only 1451 in 2013. Most of the cases which were reported in the last few years were in non-Omani people (Ministry of Health, Oman, 2013; World Health Organization).

HEALTH ECONOMICS

In economy, a new branch, health economics, has been developed and is concerned with issues related to resources, efficiency and effectiveness, productivity of health care system and consumption of health-care. Health economists study the function of healthcare systems in the presence of limited resources

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(Wiseman, 2011). As resources may not always be available, this restricts the amount of health services that can be given to a particular community.

Kenneth Arrow published a paper titled “Uncertainty and the welfare economics of medical care” in *The American Economic Review* in 1963 (Arrow, 1963). This paper marked the beginning of health economics (Savedoff, 2004) as a specialized branch that concentrates on the interdisciplinary relationship between economy and health.

There are number of health care systems in different parts of the world. Each system has its advantages and disadvantages. There are government based systems and insurance based systems. A health system consists of all organizations, people and actions whose primary intent is to promote, restore or maintain health (World Health Organization).

According to the WHO (2016), there are six building blocks for a good health system:

- Good health services are those which deliver effective, safe, quality personal and non-personal health interventions to those who need them, when and where needed, with minimum waste of resources.
- A well-performing health workforce is one which works in ways that are responsive, fair and efficient to achieve the best health outcomes possible, given available resources and circumstances. There are sufficient numbers and mix of staff, fairly distributed; they are competent, responsive and productive.
- A well-functioning health information system is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health systems performance and health status.
- A well-functioning health system ensures equitable access to essential medical products, vaccines and technologies of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use.
- A good health financing system raises adequate funds for health, in ways that ensure people can use needed services, and are protected from financial catastrophes or impoverishment associated with having to pay for them.
- Leadership and governance involve ensuring strategic policy frameworks exist and are combined with effective oversight, coalition building, the provision of appropriate regulations and incentives, attention to system-design, and accountability.

At the present time, there is no health care system that is better than others. Each has its advantages and disadvantages. There have been changes in the health systems since Arrow published his paper. Many health systems now provide highly specialized and costly services and these systems are funded by complex financial and insurance mechanisms (Savedoff, 2004). Many other systems are government based systems like in the UK and most of the Arab Gulf countries. The insurance based system is meant for profit in some countries like US, but in some European countries it is a non-profit system. The government based systems are controlled by the government. In these systems, the quality and the spread of the service depends on the amount that government can spend on the health sector.

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SOCIAL MEDICINE

Social medicine studies the impacts of economic conditions and social condition on the health. Basically, it studies the effects of social sciences on medicine. In a particular society, health problems have always been affected by political, economic and social conditions present in that society. Many medical conditions are found during a particular event. For example, during wars, certain infections like cholera may appear and spread rapidly as a result of the poor conditions, unavailability of clean water, unavailability of medical care or unavailability of medicines. Also, poor societies are affected by certain diseases. Social medicine also studies the working condition of workers and its effect on their health like exposure to toxic substances, availability of injury protection measures and so on. (Porter, 2006). Social medicine and epidemiology are closely related.

EPIDEMIOLOGY

WHO defines epidemiology as “the study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems”. Epidemiology is a powerful tool for medical investigation of the social conditions, economy and other factors that play a role in spreading diseases. Epidemiology also measures the disease outcome. It can find out the outcome of a particular treatment and its effectiveness.

Epidemiology provides information about global population or certain population health issues. Such information help planners and policy makers decide on the priorities and the targets of health services. It helps in planning the distribution of services, identifying the main medical issues and prevention programs. Epidemiology also studies the effectiveness of a health system and the effectiveness of treatment or particular health related changes in a community. Epidemiology use several tools like disease rate, cross sectional studies, screening, case control studies and meta-analysis to reach to a conclusion.

An example of the effectiveness of epidemiology and its role in health improvement is the study of fluoride role in dental caries. The result of that study led to the addition of fluoride to drinking water. The study was based on the observations that the incidence of dental caries differs from one area and community to another. Also, it was noticed that there was a difference in the concentration of fluoride in drinking water. Areas that had low fluoride concentration in drinking water had higher incidences of tooth caries. On the other hand, communities and areas with high fluoride concentration in drinking water had less incidences of tooth cares. Fluoride has a role in preventing tooth caries. The study was carried out in the United States of America where two similar communities in New York, Kingston and Newburgh, were chosen. Initially both communities were assessed for dental caries. The water in Newburgh was then fluoridated, but the water in Kingston was kept as it is. 10 years later, both communities were evaluated again and it was found that dental caries in Newburgh had dropped significantly, whereas in Kingston, there was no change (Gordon, 2014).

This is one example of the impact of epidemiology on the improvement of health and medicine. Epidemiology links medicine to social sciences. It shows mathematically the effects of social, genetic, environmental factors on the occurrences and distributions of diseases and health problems. It also shows statistically the effectiveness of certain treatments of a particular disease. It further shows statistically the

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effectiveness of a prevention program in a short term or a long term basis. Epidemiology is a powerful tool for medicine.

HEALTH LITERACY AND ITS EFFECTS ON PATIENTS' DEMANDS

Health literacy is considered an imperative aspect of society. Health literacy gets better with better-quality education, improved economy and income. Increasing health literacy means increasing awareness of chronic diseases like diabetes and hypertension, increasing awareness of certain diseases that have negative impacts on person's life if detected late like cancer. The awareness of the community of these diseases and their risk will make people seek medical help early, resulting in early treatment, better control and prolonged life. Communities with low health literacy may seek traditional treatments that are not scientifically based bases resulting in a shorter life span or lifelong disabilities.

Health literacy is a direct outcome of education, development of society, and civilization. Nowadays, with the presence of all types of media and availability of knowledge online through the internet, people are much more aware of diseases and illnesses. Patients sometime may visit their doctor carrying with them a printout from the internet about the diseases they are suffering from.

Health literacy have different definitions or meanings. One of the ways of defining health literacy is what is mentioned above. Other ways of defining health literacy is the ability to understand and act on physician's instructions (Shaw, Huebner, Armin, Orzech & Vivian, 2009). There are many factors that may contribute to the patients' understanding of what their doctors tell them. These factors include cultural differences between the doctor and the patient. The patient may be an immigrant from another country. The doctor may also be a foreigner to the country that he or she is working in and may not be able to speak the local language of the citizens. In this case, he will be dependent on others to translate to him. This will create a gap between the doctor and the patient, resulting in communicative misunderstanding of the patient's conditions.

Cultural beliefs also play a major role in health literacy. Some less educated communities have certain beliefs that may not go in line with medicine. These people may not believe their doctor and they go for a local healer who may cause more damage and may worsen the patient condition.

In modern medicine, successful treatment depends on both the doctors and patients. Failure of the patient to follow the instructions or to take his medications may lead to worsening of the patient's conditions. Chronic illnesses like diabetes and hypertension can be controlled by following strict instructions for example taking appropriate dose of medication in the right time and dietary control, while certain conditions require regular follow up. Patients have to be ready to visit their doctor according to the given appointments. The awareness of the patients and their knowledge are important in current advanced medical care era. Strictly following doctor instructions is very important to have a good outcome. Clear understanding of the patient of his condition, treatment plans, drugs that he is taking and their side effect and the expected outcome of the treatment are very important. The best outcome of any treatment requires cooperation of the patient and his doctor.

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CONCLUSION

There are broad, multifaceted and interdisciplinary relations that exist between medicine and social sciences. Some authors considered medicine itself as a social science. This interaction is the result of human nature where the physical component cannot be separated from the social and psychological conditions. Medicine interacts with almost every social science: anthropology, sociology, economy, political sciences and so on. Social sciences promote, direct, and control the progress of medicine in order for the people to have a better live.

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KEY TERMS AND DEFINITIONS

Anthropology: The science that look into the mankind relation to his community, his culture, his believes and his development.

Epidemiology: The science that study the incidence and distribution of all the health issues in the community.

Health Economics: The Study the healthcare system for the purpose of optimizing the effectiveness of that particular system by using the minimal resources to achieve the goals.

Health Literacy: Basically how much a person knows about common medical conditions and how that knowledge can make him understand the instruction of his doctor.

Psychology: The science that study the various behavior and mental conditions of human.

Sociology: The study of social behavior of human, how it started, how it developed and how it become organized. It study the basic roles of a community and how it function.

Section 3

The Role of Interdisciplinary Education

Chapter 10

Is Interdisciplinary Collaboration in Academia an Elusive Dream?

Can the Institutional Barriers Be Broken Down? A Review of the Literature and the Case of Library Science

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ABSTRACT

A description of how interdisciplinary collaboration can take place is presented to frame this chapter on the risks and barriers to interdisciplinary collaboration. Beginning with a working definition of interdisciplinary collaboration, defined as jointly co-authoring a paper, academic project, or grant with somebody from another discipline or jointly creating a program that contains courses from the joint collaborators' disciplines, this chapter reviews recommendations for creating and supporting successful interdisciplinary collaborations. Included are ten simple rules for successful cross-disciplinary collaborations put together by a group of researchers in the sciences, who more often participate in interdisciplinary collaborations than do their counterparts in the humanities and social sciences. The chapter closes with the case of issues with interdisciplinary collaboration in library and information science, an area that is truly interdisciplinary, yet often becomes the object of turf battles with other academic areas. This case provides a true-life look at just how attempts at interdisciplinary collaboration that should work, can easily backfire.

UNDERSTANDING COLLABORATION

Collaboration is defined as “working jointly with others or together especially in an intellectual endeavor” (Merriam-Webster, 2017), thus interdisciplinary collaboration could be defined as working jointly with other disciplines in an intellectual endeavor. Because Fullan (1993) made the statement that “Collaboration is one of the most misunderstood concepts in the educational change business”, Wasonga, Rari, and Wanzare (2012) conducted a review of the literature that revealed quite a variety of definitions of collaboration such as

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(a) A relationship involving equal partners working on ongoing basis to achieve mutually beneficial goals (Russell and Flynn, 1992); (b) sharing resources to reach a common goal (Welch, 1998); (c) the ability to work cooperatively together on a task over time to mutually agreed-upon goals (Lafler and McFadhen, 2001); and (d) a partnership characterized by mutual or reciprocal benefit (Ponticell, 1990) (p. 252).

Disciplines form borders that are made up of their assumptions, theories, tools, techniques, and the methods used to organize their academic work are embedded in the degree offerings of that discipline. These borders serve to differentiate the work of one discipline from another. When these boundaries are crossed, academics are working in an interdisciplinary fashion (Pirrie, et al., 1998, as cited in Townsend, T, Pisapia, J., & Razzaq, J., 2015, p. 660). The National Academy for Sciences (2004) defines interdisciplinarity in this way:

Interdisciplinary research (IDR) is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice (Townsend, et al., 2015, p. 660).

To take this one step further, the United States Department of Health and Human Services (HHS) Office of Research Integrity suggests that the nature of collaboration is evolving to include not just departments, disciplines, and institutions but also academic, government, and private industry that encourages “the development of innovative and groundbreaking strategies in investigating increasingly novel, complex and convoluted areas.” So, we don’t just have interdisciplinarity collaboration involved in research but also inter-institutional or inter-organizational collaboration.

For the purposes of this chapter, interdisciplinary collaboration will be defined as jointly co-authoring a paper, academic project, or grant with somebody from another discipline or jointly creating a program that contains courses from the joint collaborators’ disciplines. However, all of the definitions discovered by Wasonga, et al. (2012) could and should be characteristics of a successful interdisciplinary academic collaboration. Furthermore, in interdisciplinary research and collaboration there is assumption of an interdependence and sharing because the theories, perspectives, tools, and findings of one discipline cannot solve or illuminate the problem it is trying to solve so there is a sharing of purpose and methods, and development of understanding of the core principles of the contributing disciplines (Townsend, et al., 2015, p. 660).

BENEFITS TO INTERDISCIPLINARY COLLABORATION

The HHS website provides information to justify collaboration and highlights the number of factors that are driving the push toward increased collaboration which are:

- Preferences by funding sources
- Demand for expanded capacity
- Division of labor
- Ability to share resources

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- Opportunity to learn from other disciplines
- Risk management
- Opportunity to engage in collegiality
- Opportunity to lend credibility and validity to project
- Technological advances facilitating communication
- Impact on RCR

Many United States federal government agencies such as the National Institute of Health (NIH) and the National Science Foundation (NSF) highly support projects that specifically ask for interdisciplinary research. So, as is detailed on this U.S. Department of Health website, there are many benefits to increased collaboration, but there has to be a willingness on the part of the researchers and varying types of support from their parent institution or organization must be available. The types of support that are essential for successful collaboration are top-level administrative support, realistic expectations, sufficient financial resources and rewards, professional respect, and support in breaking down institutional barriers such as conflicting goals, different language, interest, cultures, types of expertise, and organizational conditions (Wasonga, et al., 2012). And most of all, successful collaboration needs communication: “through effective communication, the agendas can be generated, understood and clarified, especially at the beginning of a collaborative process”, (Wasonga, et al., p. 257).

According to Sa (2008) even though interdisciplinarity is a commendable goal for academia, “creating adequate environments for the practice of interdisciplinary research is often viewed as a managerial problem that requires academic leadership (p. 538). Sa (2008) investigated strategies, including new university policies, practices, and structures that have been adopted to encourage collaborative research across disciplinary boundaries. In many cases, however, the policies, practices, and structures that are in place are not easily changed and actually become the barriers to interdisciplinary collaboration.

STRATEGIES THAN CAN PROMOTE INTERDISCIPLINARY COLLABORATION

Funding in the form of incentive grants is one way that organizations can support interdisciplinary collaboration. This can lead to the formation of structures that can apply for federal grants with large interdisciplinary awards which is yet another incentive for this type of research. Faculty recruitment and evaluation can be geared toward interdisciplinary interests, a strategy that can push the changing of institutional norms, which is a difficult task. Financial incentives can go a long way toward offsetting the costs of faculty time, research and administrative support, and materials and equipment (Sa, 2008, p. 547). Monetary incentives can provide a reason for faculty to get out of their own comfort zone and physical area and engage with their colleagues across the university. Because research is costly, it may truly motivate faculty to pursue new and exciting ideas.

In 2004, the National Academy of Sciences conducted a survey that pinpointed three ways to promote interdisciplinary collaboration: providing seed money for the interdisciplinary research projects, creating a collaborative environment, and creating incentives through tenure and hiring policies that reward interdisciplinary research involvement (Townsend, et al., 2015, p. 661).

According to De Bevoise (1986) the following are the fundamental principles that guide effective collaboration:

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- Top-level administrative support and cooperation
- Focus on persistent and important institution-based programs
- Realistic expectations
- Duties and responsibilities should be assigned based on the knowledge and skills of the participants
- Each partner should be satisfied and the team should appreciate the rewards for all
- Each partner must remain objective and non-committal and not get involved in the politics of the other side
- Exhibit professional respect
- Traditional obstacles of institutional barriers such as conflicting goals, different language, interest, cultures and types of expertise and organizational conditions must be broken down (pp. 10-12).

Vincens and Bourne (2007) discuss the fact that scientific research has always been collaborative, which is crucial, and recommend “ten simple rules for a successful collaboration” (p. 335).

Rule 1: Do not be lured into just any collaboration

Rule 2: Decide at the beginning who will work on what tasks

Rule 3: Stick to your tasks

Rule 4: Be open and honest

Rule 5: Feel respect, get respect

Rule 6: Communicate, communicate, and communicate

Rule 7: Protect yourself from a collaboration that turns sour

Rule 8: Always acknowledge and cite your collaborators

Rule 9: Seek advice from experienced scientists

Rule 10: If your collaboration satisfies you, keep it going. (pp. 335-336)

To expand on these rules, these authors make some recommendations. It is important not to get into something you cannot handle, and make sure you have the expertise and the time. Careful planning and delegation of tasks, timelines, and so on is a must. A memorandum of understanding (MOU) is probably a good idea. New things may be uncovered as you progress in the research but do not digress from your appointed tasks unless you discuss it with the collaborators. Trust is of paramount importance so be open and honest, share data and materials, and most of all, be available. Don't enter into a collaborative project unless you respect the collaborative partners. Since trust is so important, communication moves to the forefront. Face-to-face communication is preferable or synchronous digital communication because email can be misunderstood. Have a plan for dealing with the situation if things go bad. For example, try the three strikes and you are out rule. Be sure to give credit to the proper people and be clear about who did what in the collaboration. When problems arise, seek out advice from experienced colleagues who are not involved in the project as their insights and experience can be invaluable to getting back on track. And finally, if the collaboration is working, and you've obviously invested time in getting to know how to work with this group, capitalize on that and keep the collaboration going (Vicens & Bourne, 2007, pp. 335-336).

In a subsequent publication in this series on collaboration, a group of researchers from the sciences authored an editorial on the ten simple rules for a successful cross-disciplinary collaboration. They mention that these collaborations are becoming an “increasingly important part of science” that are “seen as

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key if we are to find solutions to pressing, global-scale societal challenges...” (Knapp, B., Bardenet, R., Bernabeu, M.O., Brodas, R., Bruna, M., Calderhead, B., Cooper, J., Fletcher, A.G., Groen, D., Kuijper, B., Lewis, J., McInerny, G., Minssen, T., Osborne, J., Paulitschke, V., Pitt-Francis, J., Todoric, J., Yates, C.A., Gavaghan, D., & Deane, C.M., 2015, p. 1).

Rule 1: Enjoy entering a completely new field of research

Rule 2: Go to the wet lab

Rule 3: Different fields have different terminologies: learn the language

Rule 4: Different fields move at different speeds: do not become impatient

Rule 5: Different fields have different reward models: know what you can expect

Rule 6: What different fields mean by data

Rule 7: Assess the advantages and disadvantages of service work

Rule 8: Create and manage structural bonds

Rule 9: Recognize when things are not working well

Rule 10: Be synergistic. (Knapp, et al., 2015, pp. 2-7)

The ability to improve efficiency and eliminate duplication, monetary savings, maximization of limited resources, access to specialized knowledge or skills, access to specialized equipment or software, enhanced curricula and program quality, increased potential for outside grants, increased opportunity for faculty development are important.

Risks and Barriers to Effective Interdisciplinary Collaboration

Collaboration is more common in the biological and physical sciences while in many disciplines in the social sciences, it is more common for people to conduct solo research and produce articles with single authorships. This is what produces policy issues. Furthermore, “profound differences exist in collaborative practices, evolving from the socialisation of academics into disciplinary cultures, and from the national research systems and the individual universities that they are located in” (Lewis, J.M., Ross, S., & Holden, T., 2012, p. 694). It should be noted that “scientific research productivity has been closely linked to high levels of collaboration” (p.294). There is a great deal of research on the patterns of collaboration that work in the biological and physical sciences, but research on collaboration in the humanities and social sciences is scarce. “...there is almost no comparative research on disciplinary differences” (p. 694). A three university study was conducted using structured interviews with 274 academics in the humanities, sciences, and social sciences in which 66% of the humanities respondents, 30% of the social science respondents and only 7% of the science respondents stated that they do research mainly alone. In the area of publications, 53% of the humanities respondents, 33% of the social science respondents, and only 2% of the science respondents said that they publish mainly alone. When asked why they publish alone the humanities respondents stated that it was easier (40%), it was a tradition of the discipline (70%), it depends on the project (32%) and the nature of the research (26%). The social science respondents responded: easier (40%), a tradition of the discipline (9%), depends on the project (49%), and nature of the research (32%). With a striking difference, the science respondents answers were: easier (20%), a tradition of the discipline (21%), it depends on the project (19%) and nature of the research (42%) (Lewis, et al, 2012).

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Interdisciplinary supporters “have historically argued that the disciplinary mode of research production leads to an excessive fragmentation of knowledge” (Sa, 2008, p. 540) and that “the continuing specialization of fields is reflected on the organizational structure of universities” (Sa, 2008, p. 540). This approach seems to create specialties and sub-specialties, which leads to the formation of departmental silos that have no communication across disciplines or organizations. This nexus between disciplines “produces several disincentives for interdisciplinary research (Sa, 2008, p. 540). The academic reward structure and the early training and socialization in doctoral programs, which is conducive to disciplinary specialization, generate transaction costs for university faculty to conduct interdisciplinary research, especially in collaboration with colleagues from different academic units (Sa, 2008, p. 541). Some of these transaction costs are to be expected in a collaborative situation such as communication, management of research teams and the necessity of becoming familiar with knowledge and methods used in other fields (Sa, 2008, p. 541). Resource allocation, credit systems that do not reward or fund individuals for collaborating, promotion, tenure, and evaluation processes that do not value collaborative and interdisciplinary work, and departmental and campus cultures that are hostile to interdisciplinary activities are additional transaction costs. The creation of interdisciplinary research centers and institutes can help to circumvent these kinds of problems.

According to Elizabeth Wilder, Strategic Coordination Director of the National Institutes of Health (NIH) (2013), “while not new, cross-disciplinary collaborations—wherein scientists from different disciplines work together on a common problem—are increasing in frequency” (Willyard, 2013.). Even though these collaborations can result in rewarding opportunities and access to non-traditional funding streams, there are risks to the participants, especially in academia (Willyard, 2013). First of all, it is a complex process to bring members of different departments or disciplines together and it is especially complex when the collaboration involves different organizations such as universities and schools (Wasonga, et al., 2012) or universities and business. This complex process involves “establishing shared goals and values; methods for implementing project goals; establishing roles and responsibilities and meeting expectations of the workers from varied work cultures (Wasonga, et al., 2012, p. 251).

It is easier and safer for new faculty researchers to firmly plant themselves in one discipline because spanning several different disciplines can leave one academically homeless, so to speak, because each field has its own “culture and conventions” making it difficult to be fully integrated in any one discipline. Furthermore, as an academic, “learning a new discipline and its jargon takes extra time and effort—which many departments may wish young scientists devoted to their own field” (Willyard, 2013). Finding the right research journal also becomes difficult because most journals narrowly focus within a specific field rather than being interdisciplinary. Publishing customs relating to authorship listing varies from discipline to discipline which means that attribution of credit can become a nightmare for authors of interdisciplinary works (Willyard, 2013).

At the institutional level, Institutional or disciplinary differences in mission, vision, and values; differences in governance, systems, and culture; structural differences in promotion and tenure, teaching loads, compensation; logistics: travel, space and time can be problematic. “The amount of time needed for collaboration is grossly underestimated and time is usually a scare resource for educators...” (Wasonga, et al., p. 255).

Research suggests “although emerging communication technologies have radically transformed the style and scope of collaboration around the world, physical proximity continues to play a critical role in predicting the impact of scientific research. (Lee, Brownstein, Mills, & Kohane, 2010). Though studies have found that international collaborations produce articles with greater citation impact, Lee, et al.,

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(2010) found that impact increases with proximity and that creating an institution-wide policy to do more international collaboration might be replaced with creating space that enhances direct interaction with students and postdocs.

THE CASE OF LIBRARY AND INFORMATION SCIENCE

Programs that are extremely interdisciplinary, such as library and information science, can have a difficult time expanding and growing without being perceived as threatening. Turf battles have resulted when library school curricula appears to encroach on the “teaching territory of other schools and departments” (Paris, 1990). Schools of business, departments of computer science and management information systems will most certainly become defensive when library school curricula threatens to expand into their own closely guarded cadre of course offerings (Paris, 1990, pp. 98-99). The protection of turf is probably one of the major barriers to interdisciplinary collaboration.

In her doctoral dissertation work, Paris (1986) examined four cases of library school closings and found that each of these schools had failed to connect with other disciplines on campus mainly because they would not or could not “explain library and information science to outsiders (Paris, 1990, p. 100).” This does seem to be an issue; however, because other disciplines do not seem to understand what library and information science does. But what happens when library and information science educators try to explain, but the others will not listen?

Because schools or colleges of library and information science are usually small, there has been a trend in universities to combine these schools with other academic disciplines. Different configurations are present in the field today: education, communication, business, and what is interesting is that “almost any academic unit could be appropriately and fruitfully combined with library and information science” but the “viability of a particular combination depends not so much on what academic units are involved but on how they are brought together (Katzer, 1990, p. 86).” The success of any of these combinations depends on the actors and their motivation for the combination, whether there is a shared vision, and the compatibility of the norms, expectations, rituals, and values of each unit. (Katzer, 1990, p. 87).

THE CASE OF CLARION UNIVERSITY: ANOTHER TURF BATTLE

In the case of Clarion University, Library Science was once the College of Library Science with one single department: the Department of Library Science. For years it was under the leadership of Elizabeth Rupert, who, among other things, engineered the first successful application for accreditation by the American Library Association. Rupert stepped down as dean in the early/mid 1980's and was replaced with an administrator who was just “passing through” and after several years at the helm, departed Clarion for a provost position at another university. Following her departure, university administration decided to dissolve the College of Library Science and append its one department, Library Science, to the College of Communication and Computer Information Science to form the College of Communication, Computer Information Science and Library Science. A new dean from the discipline of Communication was hired and turned out to be another just “passing through” administrator who left for a university provost position after a few years. Upon this dean's departure, the university again decided to dissolve and append and did away with the College of Communication, Computer Information Science and Library Science,

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with the first two departments going to the College of Arts and Sciences and Library Science going to The College Education and Human Services. The provost at that time was up front about the cost savings involved in dissolving the college and eliminating the cost of the dean's salary and benefits package (W. Buchanan, personal communication, January 2017.) . In 2014, under the leadership of another provost, who has since departed for a presidency at another university, the College of Education and Human Services was dissolved. Education became a School in the College of Arts, Education and Sciences, while other departments went to various places. Library Science was allowed to make a choice and decided on the College of Business Administration. The Department of Computer Information Science, formerly in the College of Arts and Sciences was combined with Library Science into the School of Information Sciences in the College of Business Administration and Information Sciences. Administration expected great things from the two Departments being combined into the School of Information Sciences, but the Departments were not informed what those "great things" were to be.

Because it was combined in the School of Information Sciences, the Department of Library Science decided it was time to change its name to broaden the appeal of the degree and to show it was not just about libraries but all types of information. So, the Department of Library Science wrote a proposal to change its name to Department of Library and Information Science. This met with objections from our brand new partner in the School of Information Sciences. It seemed that Computer Information Science though they owned the word "information." The turf battle began. In the end, the chair of the Department of Computer Information Science told the Faculty Senate that if they approved our name change, that they would be opening up all of their own department turf to be "stolen" by other disciplines. This resulted in a negative vote by the Faculty Senate. Disappointed and dejected, the Department of Library Science worked to find a change acceptable to Computer Information Systems, who finally begrudgingly agreed to Department of Information and Library Science. The Chair of CIS seemed to think that if Library Science had the words "Information Science" together, that students would be confused and would end up in the Library Science program and not the Computer Information Science program. Of course, he didn't seem to worry that Library Science students could end up in Computer Information Systems.

So, with this type of mindset, is the interdisciplinary collaboration and the "great things" the university administration envisioned, ever going to take place here? Likely it will not, and if it does, it will be a constant battle and struggle. So, a great interdisciplinary collaboration in academia might just be an elusive dream. There are too many strikes against it and not enough rewards.

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KEY TERMS AND DEFINITIONS

Collaboration: Working together with others in some sort of endeavor.

Interdisciplinarity: Two or more academic areas crossing boundaries to work together on a project or to create something new.

Memorandum of Understanding: A non-binding agreement between two parties or organizations that spells out the details and terms of that agreement in a serious fashion.

Synergistic: Two or more parties or organizations interacting to create a result that is more than what they could accomplish separately.

Chapter 11

Cultural and Communication Barriers to Interdisciplinary Research: Implication for Global Health Information Programs – Philosophical, Disciplinary Epistemological, and Methodological Discourses

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ABSTRACT

This chapter examines the cultural and communicative challenges of interdisciplinary research. The author argues that to understand the nature and scope of cultural and communicative barriers to interdisciplinary research, we must focus on the link between the philosophy of science and research philosophy which shape how scholars frame empirical inquiries, determine interesting research questions, and define the choice of research methodologies and methods. The chapter examined the cultural and communicative challenges of interdisciplinary research through the philosophical perspectives of philosophy of science and research philosophy. It distinguished between main research choices: deductive and inductive and their relevance to the cultural and communicative challenges of interdisciplinary research. It also explains the epistemological, ontological and axiological positions of research and its role in understanding the cultural and communicative challenges of interdisciplinary research. It discusses how scholars are socialized into a scholarly tradition, and how scholarly tradition is perpetuated. It outlined the assumptions of contending scientific methods and how they hinder interdisciplinary research with implications for global health information and communication programs. The chapter demonstrates why it is important for global health information and communication scholars to examine and contrast the opposing scientific research paradigms with associated competing knowledge claims since each offered a different way of understanding how research should be done.

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Cultural and Communication Barriers to Interdisciplinary Research

INTRODUCTION

Over the last decades, scholars and educational leaders have advocated for an interdisciplinary approach to research (Nissani, 1997; Borrego & Newswander, 2010, Boyer Commission). The call for interdisciplinary research is rooted in the premise that 21st century technological and socio-technological challenges require interdisciplinary approaches to tackle. In essence, 21st century is characterized by complex challenges, that demand integration of theories, models, and research methodologies from diverse disciplines (Pellmar and Eisenberg 2000; National Institutes of Health, 2006; National Science Foundation, 2006). In many universities, academic institutions, research centers, and funding agencies, interdisciplinary research is gaining acceptance. It is becoming increasingly popular and is emerging as the scholarly norm of the 21st century. Unfortunately, in spite of the increasing interest in interdisciplinary research (Kessel, Rosenfield, & Anderson, 2008), scholars face challenges in conducting interdisciplinary exploration.

The objective of this chapter is to identify, discuss, and analyze the cultural and communicative challenges of interdisciplinary research with implication for global health information and communication programs. By cultural challenges to interdisciplinary research, I refer to how the differing but conflicting standards of research philosophies, methodologies, and methods shapes empirical inquiries. In particular, I argued that the cultural and communicative challenges of interdisciplinary research are deeply entangled and shaped by the trajectories of scholarly traditions deeply-rooted in the philosophy of science, research philosophies, and to the long standing question of what is evidence and what count as valid knowledge.

The chapter is divided into four sections: Section 1 provides conceptual distinctions and clarity about interdisciplinary, multidisciplinary, cross-disciplinary, and transdisciplinary research. Section two, identified and discussed the epistemological perspectives that guide investigation. Beginning with a discourse on science, the norm of science, and philosophy of science the author analyses research philosophy classifications and debates by describing contending processes of reasoning (abduction, induction, and deduction), which support different research designs. It also discussed a range of philosophical issues that are central to scientific culture: empiricism, rationalism, hypothetic-deductive, likelihood, parsimony/Occam's razor, demarcation, verification principle, theory, falsification. In section three, the author describe the notion of paradigm and research paradigms. In particular, through a comparison/contrast format, the section examined the particularities of modernist, and postmodernist to research practices. The section also describes philosophical assumptions of modernist and postmodernist philosophies in regard to perceptions of reality, and what counts as truth and value systems in each of the philosophical movements, and demonstrate the contrast between quantitative and qualitative research methodology and methods. In section four, I demonstrated that cultural and communicative challenges that hinder interdisciplinary research are tightly connected to contending philosophical, epistemological, and methodological scholarly traditions.

This chapter concludes by conceptualizing disciplines as cultural groups and argued that for cultural and communicative barriers to interdisciplinary research to be reduced below a minimum, there must be an understanding of scholarly culture among interdisciplinary teams. Specifically, each member of an interdisciplinary team must understand own scholarly traditions and the scholarly traditions of each of the team members. In this way, interdisciplinary team members are in a vantage position to be sensitive to the dynamics of research traditions. The author discussed the implications of cultural and communicative barriers to global health information and communication programs in a multi-cultural context of Africa; and highlighted the need for studies to clarify and motivate scholars to think critically about

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the assumptions and beliefs that underlay particular research paradigm and scholarly traditions which pose as barriers to interdisciplinary research. This chapter is significant because it identified various cultural determinants impeding interdisciplinary research suggesting that cultural dynamics should be considered as ubiquitous.

CONCEPTUAL CLARITY

Discipline, Interdisciplinary, Multidisciplinary, Transdisciplinary, and Cross Disciplinary Research

Several concepts, terminologies, and languages appears in interdisciplinary discourse. Disciplinary, interdisciplinary, multidisciplinary, cross disciplinary, and transdisciplinary are pervasive in literature. This section looked at the befuddling concepts as used by scholars, and which are often applied interchangeably.

- **Discipline:** Discipline is defined as the study of any comparatively self-contained isolated domain of human experience, which possesses its own community of experts (Nissani, 1997). It is also defined as an established area of inquiry, a branch of knowledge, instruction, or learning (Choi & Pak, 2007). There are varied disciplines (Moran, 2010). Each disciplinary has its own epistemology consisting of scholars who share common understandings, language, tools, epistemological commitments, and ways of apprehending the world (Buker, 2003; Petts et al. 2008, Reich & Reich 2006). In this sense, disciplinary epistemology is related to how research is conceived, designed, and implemented. Consequently, disciplines have questions, methodological approaches, and methods (Kuhn 1962; Price 1965; Chubin, 1983). Disciplines have contrasting substance and syntax i.e. ways of organizing themselves and of defining rules for making arguments and claims that others will accept as valid. They have different ways of talking about themselves and about the problems, topics, and issues that constitute their subject matters. (Schulman, 2002).

Krishnan (2009) observed that disciplines have five common characteristics which include: Every discipline have a particular area of research, though the area may overlap with other disciplines. Disciplines have a body of accumulated specialist knowledge that is popularize and passed to members of the discipline. The accumulated body of knowledge in discipline is organized into theories, principles, concepts, models, and frameworks. Additionally, disciplines have and/or use specific terminologies or a specific technical language, and have developed specific research methods according to their specific research requirements. Finally, disciplines have institutional manifestation in the form of subjects taught at universities or colleges.

Universities and colleges are organized according to disciplinary epistemologies, mainly along departments, schools, colleges, and/or faculties. In this sense, scholars are trained and mentored according to disciplinary categories and are conferred disciplinary identity sharing scholarly culture and scholarly interest. In this sense, each discipline has established scholarly procedures, norms, value systems, and practices that determine which kinds of statements are accepted as true or false within the scholarly

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discourse community of practice. Many scholars believed that advancements in science occur within disciplinary boundary or boundaries.

Scholarly discipline is related to how research is conceived, designed, and how analysis of a result is done. Consequently, every discipline at any particular point or paradigm (Kuhn, 1962) consists of community of scholars who are working on a specific set of research questions, using identical methods and methodological approach. The concept of disciplinary epistemology is related to the typologies of disciplines or what Gibbons (1994) considered as Mode 1 and Mode 2 knowledge. Mode 1 knowledge—is a system of organizing knowledge in universities along disciplinary lines as in faculties, colleges, schools, and departments. Accordingly, Mode 1 knowledge is homogeneous in terms of epistemic stance. The quality control mechanism is through a peer review process. At any given period Mode 1 knowledge community is characterized by choice of problems that are considered worthy of investigation.

Mode 2 knowledge emphasizes a strong tendency towards interdisciplinary. Mode 2 knowledge is generated within the context of an application of knowledge it is characterized by framing problems in the context of the environment in which the problems arise. It is characterized by identifications of diverse theoretical perspectives and methodologies to problem-solving. In essence, mode 2 knowledge is referred to as having epistemological pluralism which is rooted in the dictum that the complexity of the natural world eludes complete representation by a single epistemological, theoretical, or investigative approach (Longino 2002). Under Mode 2 knowledge research scholars are organized on a temporal or ad-hoc basis, whereas the formation of research scholars changes or dissolves when research is completed.

Interdisciplinary Research

Interdisciplinary research is a “a mode of research by teams or individuals who integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a singular discipline or area of research practice”(NRC, 2005; National Academy of Sciences Committee on Interdisciplinary Research, 2004). Hall, Bainbridge, Buchan, Cribb, Drummond, Gyles, Hicks, McWilliam, Paterson, Ratner, Skarakis-Doyle, and Solomon (2006) defined interdisciplinary research as involving “a team of researchers, solidly grounded in their respective disciplines, that come together around an important and challenging health issue, the research question for which is determined by a shared understanding in an interactive and iterative process” (p.764). Similarly, Peller (2000) defined interdisciplinary research as “a cooperative effort by a team of investigators, each expert in the use of different methods and concepts, who have joined in an organized program to attack a challenging problem” (p.502).

Inter-disciplinary research examines an issue, problem, or a phenomenon from more than one perspective. It integrate the perspectives into a unified or coherent framework of analysis (Allen and Kitch 1998). Interdisciplinary research draws on disciplinary perspectives and integrates their insights through the construction of a more comprehensive perspective on an issue or problem (Klein & Newell, 1996). Interdisciplinary research is related to Mode 2 knowledge comprising of heterogeneous scholars, operating in specific contexts on a specific problem. (Krishnan, 2009).

Interdisciplinary research is adopted when scholars fathom that mono-disciplinary approach to problem-solving is insufficient to explain a problem. There is a growing understandings among scholars that 21st-century societal problems are too intricate to be understood and solved with mono-disciplinary approaches. Therefore, interdisciplinary research is done to address an issue that is too broad or complex

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to be dealt with adequately by a single discipline or profession. It involves thinking, understanding, and framing issues from the epistemological perspectives of differing academic disciplines. For example, many important advances of modern society have come from an interdisciplinary approach (Pellmar & Eisenberg, 2000).

Multidisciplinary Research

Multidisciplinary research comprises of a team of scholars who are working on the a problem but applying differing epistemological and methodological approaches, techniques and tools of empirical inquiries. In multidisciplinary research, a problem is examined from multiple perspectives, without making any conscious effort to systemically integrate the diverse disciplinary perspectives. Multidisciplinary scholars investigate a single problem, but do so as if each were working within their specific disciplinary setting or epistemological silos. By epistemological silos, scholars work from their own epistemological perspective and seek to acquire and validate knowledge within that epistemology (Miller, Baird, Littlefield, Kofinas, Chapin, & Redman, 2008). Scholars in a multi-disciplinary inquiry draw on knowledge from different disciplines but stay within their disciplinary boundaries without attempting at an integration of findings (Stokol, 2005; Choi & Pak, 2007; Paul & Peterson, 2001). Multidisciplinary empirical inquiries are less concern with integrated systems. Integration may occur by meta-analysis of research evidence from desperate scholars to the subject of interest.

Transdisciplinary Research

Transdisciplinary research involves shared concepts, as well as integration and extension of discipline-specific theories to address common research issues (Stokol, 2005; Rosenfield, 1992). Transdisciplinary research requires more extensive connections among researchers and attempts to integrate differing disciplinary perspectives by transcending the specific disciplinary boundaries to frame problems in new ways (Choi & Pak, 2007). Transdisciplinary research is usually a collaborative effort and scholars usually agree to frame a problem from a unique epistemological perspective by redrawing boundaries between disciplinary knowledge (Roux, 2006; Eigenbrode et al., 2007). Scholars in transdisciplinary research cross disciplinary boundaries and expanding the diversity and the variability of investigation that can be done.

Cross-Disciplinary Research

Cross-disciplinary research examines a problem or an issue typically connected to one discipline through the lens of another discipline. For instance, a Physics scholar may explore a problem in music. However, some scholars view cross-disciplinarity as a general designation for the three terms of multidisciplinary, interdisciplinarity, and transdisciplinarity (Rosenfield, 1992). Other scholars consider cross-disciplinarity as “a gradual process in which the research group little by little moves in the direction of integration—from multi- to transdisciplinarity and which is taking place at different paces” (Aagaard-Hansen & Ouma, 2002).

The distinction between the concepts of multidisciplinary, interdisciplinarity, and transdisciplinarity can be summarized thus: While multidisciplinary researchers work in parallel or sequentially from disciplinary specific base to address a common problem; interdisciplinary researchers work jointly but

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still from disciplinary-specific basis to address a common problem (Rosenfield, 1992). In contrast, transdisciplinary researchers work jointly using shared conceptual framework drawing together disciplinary-specific theories, concepts, and approaches to address a common problem (Rosenfield, 1992). However, it should be observed that interdisciplinarity entails more integration than multidisciplinary. It involves the formulation of a uniform, discipline-transcending terminology or common methodology and cooperation within a common framework shared by the disciplines involved (McNeill 1999), while trans-disciplinary research is based on a common theoretical understanding and accompanied by a mutual interpenetration of disciplinary epistemologies (McNeill, 1999). Multi-disciplinary on the other hand involve autonomy of the different disciplines and does not lead to changes in the existing disciplinary and theoretical structures (Rosenfield, 1992; Thompson, 1990). The basic variance between these definitions is the degree of integration of the disciplinary perspectives and the integration of empirical findings. In multidisciplinary research, for instance, collaborative empirical inquiry does not emphasize on integrating the differing epistemological perspectives and the findings from inquiries. In multidisciplinary research scholars from differing disciplinary culture are focused on a problem, with each discipline having unique questions, methodology and methods of investigating the problem which generates discrete inferences, and conclusion (Miller, Baird, Littlefield, Kofinas, Chapin, & Redman, 2008).

RESEARCH: PHILOSOPHICAL AND EPISTEMOLOGICAL PERSPECTIVES– SCIENCE, PHILOSOPHY OF SCIENCE, AND RESEARCH PHILOSOPHY

Science

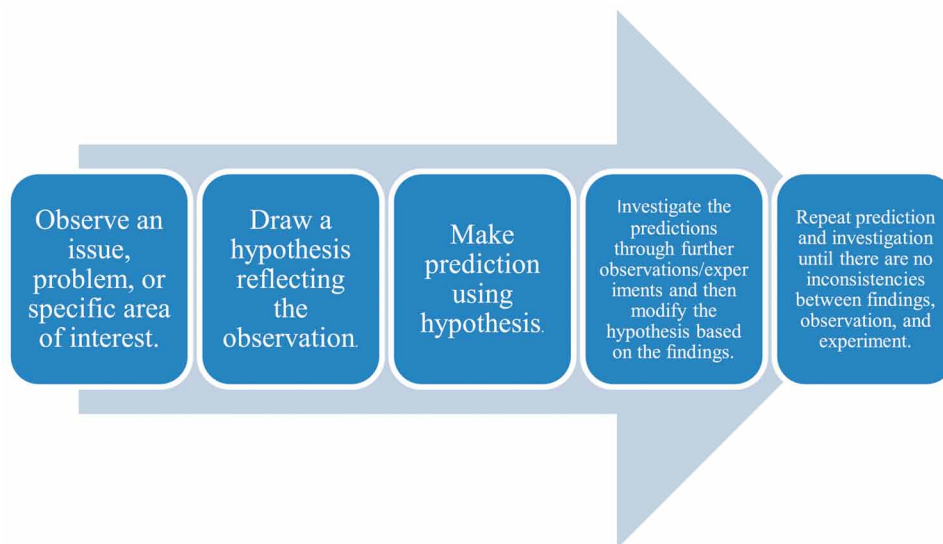
Science is defined as a system of accumulating knowledge that uses observation and experimentation to describe natural phenomena. It is “an objective, logical, and systematic method of analysis of phenomena devised to permit the accumulation of reliable knowledge” (Lastrucci, 1963). Science is also described as any system of knowledge that is concerned with the physical world and its phenomena and entails unbiased observations and/or systematic experimentation (Godfrey-Smith, 2003). In general, science involves the search for truth and knowledge. The central principle of science is problem-solving with the objective of understanding issues, phenomena, or solving a problem. There are many concepts that are associated with the notion of science which serves as scholarly culture. These concepts are explained:

- **Scientific Realism and Instrumentalism:** Scientific realism is defined in terms of objectivity of science that is aimed at truth. It considered scientific theories as factual, correct, or likely to be accurate. It is concerned about the actual epistemic status of theories, particularly in terms of the truth or approximate truth of scientific theories or certain aspects of theories (Chakravartty, 2016). Some scholars considered scientific realism in terms of epistemic aims of scientific inquiry (van Fraassen, 1980). Particularly, in respect to the aims of science noting that the objective of science is to produce true descriptions of things about the world. In contrast to scientific realism is the scientific anti-realist or instrumentalist. This argues that theories are tools or rules for calculating numbers of observable quantities. And that theoretical statements are not either true or false and hence not genuine statements at all. They argued that scientific theories aim at being instrumentally useful and should only be regarded as useful, but not a true descriptions about the world (Loyola University New Orleans, n.d.).

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- **The Norm of Science:** Refers to the belief that science is “an objective, logical, and systematic method of analysis of phenomena devised to permit the accumulation of reliable knowledge” (Lastrucci 1963). In this sense, scientists are always determined to achieve objectivity. Being objective refers to the process of scientist to be explicit about measurements and submitting findings to peer review. It also means following a well-defined method for collecting and treatment of data. The norm of science also include the idea that there is, in general, a single scientific method, and that the scientific method is based upon three assumptions: (1) that reality is out there to be discovered; (2) that direct observation is the way to discover it; and (3) that material explanations for observable phenomena are always sufficient and metaphysical explanations are never needed (Bernard, 2006; Oetzel, Pant, & Rao, 2016). The norm of science also include the idea that the purpose of science meant at developing general laws that explain how the world around us works, to explain why things happen the way they do, and to trace a consistent structure with order and meaning.
- **Scientific Method:** Fundamental to the norm of science is scientific method. Scientists adopt scientific methods to draw inferences. Scientific method follows a rigorous standard of procedures and discussions that apply reasons against beliefs that are unreasoned, illogical, and contradictory. Through scientific procedures, scientists hypothesize a precise image of the world. The adoption and application of scientific methods is aimed at reducing the influence of personal and cultural beliefs on perceptions and interpretations of natural phenomena. In particular, scientists apply scientific procedures to minimize the influences of subjectivity in theory development. By far, the scientific procedure has been considered as the best process for examining truth from deceptions and misbelief. Scientific procedure follow the steps depicted in Figure 1.

Figure 1. Process of Scientific Method



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- **Theory Building:** Central to scientific method is theory formulation. Scientific method is aimed at explaining the world through theory building. Scientific theories refer to descriptions of reality, but do not constitute a reality (Godfrey-Smith, 2003). Theory refers to generalizations and principles that are developed based on observation and experimentations. It is also defined as a system of assumptions, accepted principles, and rules of procedure devised to analyze, predict, or otherwise explain the nature or behavior of a specified set of phenomena (American Heritage Dictionary, 1969). A theory is a system of assumptions, principles, and relationships posited to explain a specified set of phenomena. In putting forward a theory scientist apply rigorous process of scientific process.

Bates (2005) has discerned two types of theory formulation: nomothetic and idiographic. Nomothetic is concerned with establishing general laws about a phenomena. The aim is to provide explanation by putting forward general principles based on observing large number of sample to contribute to the formulation of generalization. Some scholars are considered as nomothetic scholars because of their desire to provide generalization from specific event. Idiographic on the other hand is concerned with explaining individual unique cases of the universe by a thorough detailed description and in-depth analysis of specific case that is not aimed at generalizations. Qualitative ethnographic study for instance, is an example of idiographic approach to theory formulation. Prominence is attached to complete understanding of problems or issues from individual cases and not from huge sample size. The idiographic approach collect and assemble in-depth data about specific cases. The result is a nuanced description and assessment of the unique facts of a situation or historical event, in which themes are discovered, but rarely any general laws. This approach is the one that is fundamental to the study of human behaviors and also the humanities (Sandstrom & Sandstrom, 1995).

- **Propositions/Theoretical Constructs:** Fundamental to theory is proposition and/or theoretical constructs. Propositions are the statements scholars use to explain phenomena in a theory – placing them in interrelationships. Propositions and constructs refine and extend our understanding of phenomena (Tennis, 2008).
- **Observations, Measurements, Peer Review Process, and Public Scrutiny:** Closely related to the scientific theory formulation are observations, measurements, peer review process, and public scrutiny. Observations is critical to science, scientists observe and take accurate measurements with the aim of providing solid evidence for explaining the world. Explanations that cannot be based on empirical evidence and measurements are not a part of science. Closely related to observation and measurement is the notion of objectivity. Scientists are particular about objective measurement to ensure accuracy. It is important for science that the information about the surrounding world and the objects of study be as accurate and as reliable as possible (Pellmar & Eisenberg, 2000). In explaining the universe scientist apply peer review process and public scrutiny. A scientist makes available scientific findings for review by peers. Scholars submit empirical pieces of evidence for scrutiny. If accepted the pieces of evidence are published in a scholarly journal. The peer review process help against subjectivity, and confirming proposed evidence through further observations or experimentations.

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Philosophy of Science

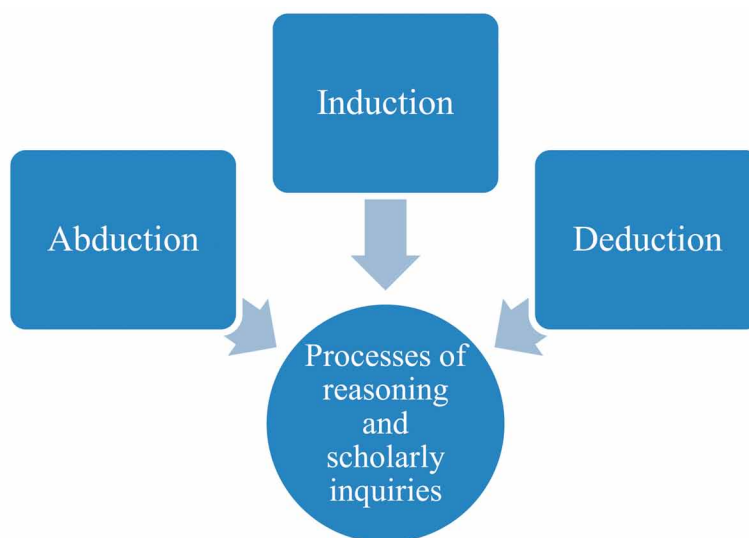
Philosophy of science seeks to describe and understand how science works within a wide range of sciences. Philosophy of science is concerned with the assumptions, foundations, methods, implications of science, and with the use and merit of science. It include discourse about ontology, and epistemology particularly the notion of reality and truth. Philosophy of science also is interested in disciplinary philosophies (Forster, 2004). There are many concepts and terminologies that are associated with the philosophy of science, an explication of the concepts is critical to understandings the cultural and communicative challenges of interdisciplinary research. Some of the concepts are related to the processes of reasoning that have implication for scholarly inquiries.

- **Process of Reasoning:** The process of reasoning is central to philosophy of science. Three process of reasoning are discerned: abduction, deduction, and induction (see Figure 2) (Aliseda, 2005).

Abduction is the process of generating hypotheses from a body of data. Abduction identifies constructs from narratives aimed at explaining phenomena or building hypothesis (Inoue, 2004; Burk, 1964). Zakaria (1994) identified three stage processes in an abduction that are aimed at developing a hypothesis: Abstraction, retroduction, and heuristic. In abstraction scientist gather relevant information about a problem or an issue, the apply retroduction principles and then investigate to confirm or falsify the hypothesis.

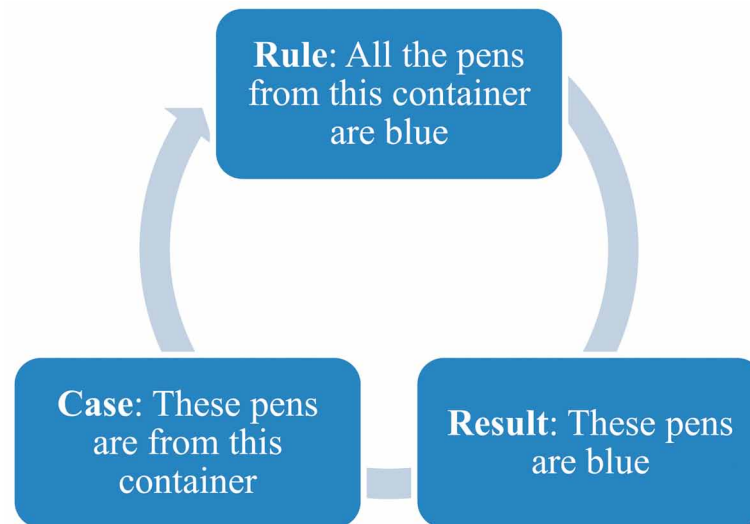
Abduction is about inferring a *case* from a *rule* and a *result* (see Figure 3). Like induction this inference is also more or less probable, and not sure. The beans could in fact have come from the bag of mixed beans or from a bag that is no longer there. Abduction is a process of gaining new knowledge. The basic elements of this process are outlined:

Figure 2. Processes of reasoning that has implication for scholarly inquiries



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Figure 3. Process of Abduction



In general, abduction begins a known truths from specific evidence and/or observations. From the observations of events scholars propound a proposition or hypothesis. The scholar then link the facts to provide a more general description to a wider context (Svennevig, n.d.); Givón, 1989). The process of abduction is described as follows:

Induction reasoning maintains that if a situation holds in all observed cases, then the situation holds in all cases. Thus induction is a procedure theory building and deduction is the systematic process for applying and validating theories. Induction is a process of logic and/or reasoning in which scientists make generalization based on specific instances that seem to fit with that generalization. Induction makes it possible for scientists to put forward general truth from multiples of specific and or particular observations.

Induction essentially is the process of making inference or *rule*, given a specific *case* (a requirement) and a *result* (from observation). This inference involves oversimplification, sweeping statement, generalization from particular instances to a general pattern (see Figure 4).

A deduction is a method of reasoning in which a conclusion is logically reached from premises. Deduction makes it possible for scientists to articulate a set of premises, and principles from a general truth. Deduction method of reasoning is a process in which a conclusion is logically reached from premises. Deductive reasoning is essentially concern about the rationality and legitimacy of arguments. An argument is valid when its conclusion follows deductively from its premises (Forster, 2004). Deduction and probability theory have been the main technical tools in a philosophy of science. Deduction provides generalization, starting with a theory and using it to explain particular observations. Deduction propose a claim from specific case and applies the general theory in order to deduce an explanation for the data.

Deduction infer from a general *rule* and a given *case* to inferences or *result* (see Figure 5). For example:

- **Empiricism:** The term ‘empiricism’ denotes a general approach to the study of reality that suggests that only knowledge gained through experience, and the senses are acceptable. In other words, this position means that ideas must be subjected to the rigors of testing before they can be considered knowledge (Bryman, 2013). Empiricism is a set of philosophical approaches to build-

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ing knowledge that stresses the significance of observable proof from the natural world. The basic tenet of empiricism is that experience is the only source of knowledge and verifications is simply a consequence of this tenet. Empiricists hold that individuals in communal setting acquire beliefs, norms, and standards of behaviors and that this differs from one society to another. In this sense, empiricist, stress that people are born tabula rasa—empty. What people know and understand is through socialization, histories, and experiences. Empiricism challenged the view of rationalism. Empiricists argued that all that can be known results only from human sensory experience. Empiricist proposes the “inductive method” through which one can arrive at universal claims about the world

Figure 4. Induction Process

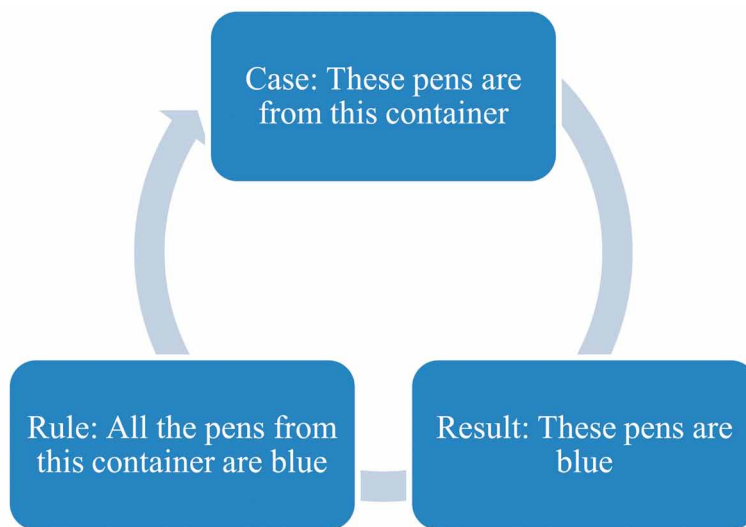
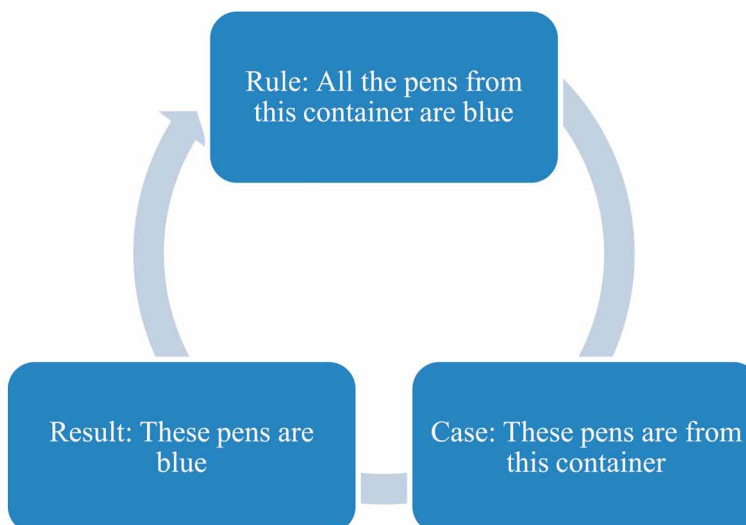


Figure 5. Deduction Process



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by drawing on multiple observations and experiments and thus discovering “event regularities” or “constant conjunctions of events.” A contending argument against empiricism is rationalism and is discussed.

- **Rationalism:** Is the belief, that reason rather than experience is the primary source of knowledge. Rationalist maintained that our knowledge includes a component that is not derived from observation (Mastin, 2008). That human beings achieve knowledge because of their capacity to reason. Rationalist contends that there are universal truths about right and wrong. Rationalism makes clear differences between two types of knowledge: Empirical knowledge (which is knowledge gained through experience), and a priori knowledge (which is the knowledge gained prior to experience and reason). Empirical knowledge is about the things, entities, individuals, and phenomena about the universe. In contrast to empirical knowledge is *a priori* knowledge that arises through reason. This knowledge depends upon no experience, this is abstract knowledge and not about phenomena in the universe. Rationalist believed that there are apriori truths, which, if we just prepare our minds adequately, will become evident to us (Bernard, 2006; Ayer, 1955).
- **Parsimony/Occam’s Razor:** Is the idea of preferring a simpler description above a complex one. Reductionism has its roots from, Occam’s Razor, which states that between competing ideas, the simplest theory that fits the facts about a problem is the one that should be selected (Godfrey-Smith, 2003). Reductionism is contrasted with the notion of holism, which claims that complex systems are inherently irreducible and more than the sum of their parts and that a holistic approach is needed to understand them (Mastin, 2008).
- **Demarcation:** Demarcation problem is central to the philosophy of science. It refers to the distinction between science, non-science, and pseudoscience. Unfortunately, there are no standard benchmarks for differentiating science from pseudoscience and non-science. However, observation and debunking scientific claims (falsification) are central to science. In the philosophy of science debunking of scientific claims is related to the notion of hypothetic-deductive and falsification principles, which are explained:
- **Hypothetico-Deductive:** Is a philosophical idea that refers to the process of developing a scientific theory from the data obtained through observations and experiments. Scientists collect data, subject the data for analysis, and arrive at inferences with the aim of either confirming or invalidating existing evidence from earlier experimentations. The process of hypothetic-deductive involves scientists putting forward hypotheses with the intent of testing the acceptability or falsity of the premise through observations. Hypothetic-deductive is simply about confirmation or rejection of hypotheses (Encyclopædia Britannica, 2017; Merriam-Webster, Incorporated, n.d.; Forster, 2004). This is related to the notion of likelihoodists principle that replaces deduction with a probabilistic relation. That is the probability that the evidence is real given that the hypothesis is veritable; as against Bayesianism principle, which focuses on the probability that the hypothesis is true given the evidence. It is also related to falsification principle (Thornton, 2017) and is explain.
- **Falsification:** Falsification is the idea that scientific claim is considered true as long as it is not proven to be wrong. This principle is related to hypothetic-deductive. Philosophers of science stressed that no amount of evidence can prove that any scientific hypothesis is true. This is because there are always untested predictions (Forster, 2004). Scientific ideas are proven through a falsification principle (O’Hear, 1980). Any scientific claim must be capable of being proven false for it to be valid. Popper argued that evidence can only be used to rule out ideas, not to support them. Scientific ideas are tested through falsification, and not through a search for supporting evi-

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dence. Falsifiability is the hallmark of scientific theories and methods. The prime role of scientists is to falsify scientific claims. Science is distinguished from pseudoscience through the principle of falsifiability. If scientific claims are falsifiable such claims can be applied in an empirical scientific inquiry. In essence, Popper observed that science is more concerned with falsification of hypothesis than with the verification. According to this principle, any scientific claim that cannot be falsified is not science but a pseudo-science and therefore, cannot be valid for scientific investigation. For instance, a claim that cannot be observed or measured is considered as pseudo-science because it is difficult to verify the claim and as a result, not falsifiable. Closely related to the principle of falsification is the verification principle and is discussed.

- **Verification Principle:** Is the idea that proposition is meaningful if it is true or false. That is if it is verifiable or falsifiable. Karl Popper recognized that a theory can be meaningful without being scientific. Science is aim at falsifying theoretical claims. Verification principle hold that a statement is meaningful if it is empirically verifiable or that its truth arises from the meanings of its terms. It hold that the ultimate basis of knowledge lies on verification or confirmation of theory.

PARADIGM AND RESEARCH PARADIGM

The aim of this section is to describe the notion of paradigm and research paradigms. In particular, the section discusses positivism/post-positivism, constructivism/interpretivist. The section also describes philosophical assumptions of modernist and postmodernist philosophies in regard to perceptions of reality, and what counts as truth and value systems in each of the philosophical movements, and demonstrate the contrast between quantitative and qualitative research methodology and methods. This is critical for understandings of cultural and communicative barriers to interdisciplinary research. It is critical for two reasons: first, scholars frame inquiries based on upon their scholarly traditions and culture; and second, scholarly culture influences how research problems are framed and studied so that the findings are credible to disciplinary communities. Inquiries are framed through the lens of scholarly paradigm.

- **Paradigm:** Kuhn (1960) coined the term ‘paradigm’ to express the idea that disciplines are organized around certain ways of thinking or larger theoretical frameworks, which can best explain empirical phenomena in that discipline or field. Results that do not fit into the prevailing paradigm are somehow excluded, for example by limiting the domains of theories, or treated as anomalies the ongoing attempted resolution of which shape its development. Thus paradigms shape the questions scientists ask and also the possible answers they can get through their research. Once the problems with the paradigm become obvious as too many exceptions remain unexplained, a new paradigm that is able to explain more phenomena and/or that is in some sense more efficient might replace the previous one. Paradigm shifts and scientific revolutions is a view of science, associated with philosopher Thomas Kuhn, which suggests that the history of science can be divided up into times of normal science (when scientists add to, elaborate on, and work with a central, accepted scientific theory) and briefer periods of revolutionary science. Kuhn (1960) asserted that during times of revolutionary science, anomalies refuting the accepted theory have built up to such a point that the old theory is broken down and a new one is built to take its place in a so-called paradigm shift. The notion of paradigm shift has brought the distinction between normal science and revolutionary science. Kuhn (1960) distinguished between normal science, where scientists

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solve puzzles within a particular framework or paradigm, and revolutionary science, when the paradigm gets overturned.

- **Research Philosophy:** A research philosophy is a belief about the way in which data about a phenomenon should be gathered, analyzed, and used. Two major research philosophies have been identified in the Western tradition of science, namely positivism (sometimes called scientific) and interpretive (also known as anti-positivist) (Galliers, 1991).
- **Positivism:** Is the view that the only authentic knowledge is scientific knowledge, and that such knowledge can only come from positive affirmation of theories through strict scientific method. The term “positive” indicates an objective approach to the study of humanity that shares much in common with methods employed in the natural sciences, as contrasted with “normative”, which is indicative of how things should or ought to be. Positivists believe that the logic of inquiry is the same across all sciences (both social and natural). The goal of inquiry is to explain and predict, and thereby to discover necessary and sufficient conditions for any phenomenon. Research should be empirically observable with human senses and should use inductive logic to develop statements that can be tested. Science is not the same as common sense, and researchers must be careful not to let common sense bias their research. Science should be judged by logic and should be as value-free as possible. The ultimate goal of science is to produce knowledge, regardless of politics, morals, values, etc.
- **Logical Positivism:** Also called logical empiricism, is a philosophical movement that arose in Vienna in the 1920s and was characterized by the view that scientific knowledge is the only kind of factual knowledge and that all traditional metaphysical doctrines are to be rejected as meaningless. Logical positivism is a school of philosophy that developed out of positivism and attempted to combine empiricism with a version of rationalism (Mastin, 2008). Logical positivism maintained that the basic task of philosophy is to clarify the meanings of basic scientific concepts and assertions—and not to attempt to answer unanswerable questions such as those regarding the nature of ultimate reality or of the absolute. Logical positivists also stressed the idea of the unity of science which states that propositions in science should describe objectively existing, directly observable states of affairs or events and that there should be a unitary set of physical premises from which the regularities of all of the reality could be derived. Logical positivists believe in the doctrine that all sciences should share the same language, laws, and method or at least one or two of these features. For example, the unity of method means that the procedures for testing and supporting statements in the various sciences are basically identical. The Logical Positivists stressed the idea of the possibility of producing a single theory that will encompass the domains of all the sciences (Unified Science).

The logical positivist is reductionist. The notion of reductionism is rooted in the accepted conception of scientific theories, which suggest that:

One theory is reduced to another when the axioms of the reduced theory can be derived from the axioms of the reducing theory, supplemented with principles ('bridge principles') that connect the language of the reduced theory with that of the reducing theory. So, for example, to reduce genetics to biochemistry, one would show how the principles of genetics follow from premises that include the principles of biochemistry together with specifications in biochemical language of the distinctive vocabulary of genetics (terms such as gene, allele, and so forth). (Kitcher, 2017)

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Logical positivism differs from earlier forms of empiricism and positivism in holding that the ultimate basis of knowledge rests upon public experimental verification or confirmation rather than upon personal experience. It argued that metaphysical doctrines are not false but meaningless—that the “great unanswerable questions” about substance, causality, freedom, and God are unanswerable just because they are not genuine questions at all. This last is a thesis about language, not about nature, and is based upon a general account of meaning and of meaninglessness. All genuine philosophy (according to the group that came to be called the Vienna Circle) is a critique of language, and (according to some of its leading members) its result is to show the unity of science—that all genuine knowledge about nature can be expressed in a single language common to all the sciences (Quinton, Quinton, & Fumerton, 2016).

In essence, Logical Positivism grounded science in observation, and campaigned for a systematic reduction of all human knowledge to logical and scientific foundations. Positivism is opposed to the Constructivist belief that scientific knowledge is constructed by scientists, and therefore, not discovered from the world through strict scientific method (Mastin, 2008).

- **Interpretivism:** Is a term given to a contrasting epistemology to positivism. Interpretivists are critical of the application of the scientific model to the study of the social world. Interpretive scholars share a view that the subject matter of the social sciences —people and their institutions—is fundamentally different from that of the natural sciences. The study of the social world, therefore, requires a distinctive logic of research procedure, one that reflects the distinctiveness of humans as against the natural order (Cresswell, 2013). Interpretive scholars contend that only through the subjective interpretation of reality can that reality be fully understood. The study of phenomena in their natural environment is the key to the interpretivist philosophy, together with the acknowledgment that scientists cannot avoid affecting those phenomena they study. They admit that there may be many interpretations of reality, but maintain that these interpretations are in themselves a part of the scientific knowledge they are pursuing.

So, in methodological terms, interpretive scholars argue that we cannot understand why people do what they do, or why particular institutions exist and operate in characteristic ways, without grasping how those involved interpret and make sense of their world: in other words, without understanding the distinctive nature of their perceptions, beliefs, attitudes, and so on. Furthermore, this requires an openness on the part of the researcher in which prior cultural assumptions and attitudes are suspended, and there is a willingness to learn the culture of the people being studied. As a result of this, normally, interpretivists adopt or recommend qualitative methods, such as ethnography, in-depth or unstructured interviewing, or analysis of documents in the manner of the historian or the literary critic.

Modernist and Postmodernist Philosophy and Their Perspectives on Reality and Truth

Scholars are trained and mentored on philosophical traditions. There are two dominant schools of philosophical thought that guides scholars in framing empirical inquiries: modernist and postmodernist. Closely related to the notion of modernist and postmodern philosophical thoughts are the notions of reality and truth, evidence, and how evidence is evaluated. Both the concepts of modernist, postmodern, reality and truth and the question of what is evidence in science have a bearing on scholarly culture and tradition vis-a-vis interdisciplinary research. This section discusses the modernist and postmodernist philosophy

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and their perspectives on reality and truth. It also explicated the concept of evidence by using the lens of quantitative and qualitative methodologies.

Modernism and postmodernism are periods and philosophical approaches to looking for an understanding the world (Hoffman, 2008). The modernist period is traced to the Enlightenment era and is characterized by the development of sciences and technological innovations (Gergen, 1991). The modernist period valued individuality, authority, sense of authenticity, and truth. The modernist view on society was rooted in structural functionalism theory of Luhmann and Parson aimed at attaining equilibrium, order, and tension reduction in society (Milovanovic, 1995). In contrast, the post-modernist period represents a way of thinking about the nature of social sciences and their claim to knowledge. Postmodernists are opposed to the modernist thought and were inspired by insights from Weber, Freud, and Durkheim. postmodernist view on society is that of diversity and change through structural dislocations. The postmodernist tradition is characterized by social saturation of technology and has doubts the capacity of language as a communication media. The postmodern period saw the demise of personal definition, reason, authority, commitment, trust, and sense of authenticity (Gergen, 1991).

Closely related to the modernist and postmodernist philosophical thought is the concept of reality and truth. The concept of reality has been discussed extensively by scholars like Gergen (1991); Berger & Luckmann (1966); and Thomas Kuhn (1962). The concept of reality is rooted on ontology and epistemology. Ontology refers to the nature of reality, the existence of reality, and whether reality is independent of our knowledge of it (Marsh, 2002). The modernist believed that reality is objective, and can be studied objectively independent of the value of the researcher. An underlying question in the modernists' era pertains to epistemology, i.e. the nature of truth and how we know what we know. The modernist tradition has rejected the pre-modern doctrine of romantic notions of love, and passion; and have instead subscribed to the epistemological doctrine that is based on reasons, observations, and reliable prediction through science (Gergen, 1991). In contrast to the modernist notion of reality, the postmodernists have assumed that nobody's version of reality can claim to be more objective; because reality is human creations with several versions (Bryman, 2008). Postmodernists have viewed reality as that which cannot be known, nor be described objectively.

On the concept of truth, the modernist view on truth is based upon the notion that a researcher is value-free who adopt deductive forms of logic for predicting, explaining and understanding the truth (Gergen, 1999). The modernists have viewed scientific knowledge as truth that is superior to narrative knowledge (Hayles, 1990). The modernist believed in absolute truth and has opined that something is true in so much as it corresponds with objective reality found within the world (Gergen, 1991; Witcombe, 1995).

The postmodernists' notion of truth has contrasted to the modernist view. They have rejected the idea that truth can be obtained through the application of reason (Witcombe, 1995). They affirmed that there is no absolute truth, and that truth is relative to each community. They maintained that truth is socially constructed, and individuals are blinded by their perspectives. According to the postmodernists, a truth is partial and contested (Martin & Sugarman, 1999; Denzing & Giardina, 2008; Milovanovic, 1995). The postmodern view of truth is related to Kuhn's (1970) idea of a paradigm where each disciplinary scholarly culture develops social truths as the basis of its experiences and value systems (Hoffman, et al., n.d.). Postmodernist has replaced the word "truth" with words like multiple perspectives or points of view. Postmodernist tradition believes in reflexivity, which denotes a sense of self-reflection or self-awareness, and a feeling that what is right depends on the situation (Gergen, 1991; Perry & Smart, 1997). The postmodernist traditions have deconstructed the notion of truth, and have noted that truth is

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disguised with ambiguity and uncertainty. Deconstruction is a philosophical movement that questions traditional assumptions about certainty, identity, and truth.

Postmodernists claimed that all knowledge would be just a social construction and would be necessarily tainted by societal power arrangements, which they serve. The whole concept of scientific truth would be, therefore, historically contingent and the product of discourses and of prevailing rationalities. Some philosophers of science like Paul Feyerabend (1924-1994) who is considered a rebel within the philosophy of science have argued that there is no scientific method or, in his words, "anything goes." Without regard to rational guidelines, scientists do whatever they need to in order to come up with new ideas and persuade others to accept them. Also, he argued against the idea of a 'scientific method' that could reliably produce truth of the world. Instead, he proposed an anarchical science based on the motto of 'anything goes' in terms of method. Scientists should proceed as they see fit without the need of any overarching framework for what may or may not count as science proper.

Quantitative and Qualitative Research Concepts and Methods

The modernist philosophical tradition is equated with quantitative research methodology and methods, while the postmodernist philosophical approach aligns with qualitative scholarly culture.

- **Quantitative Research:** Is an inquiry into a problem through testing a hypothesis, and the use of measurements and statistical techniques to reach inferences. The goal of quantitative methods is to determine whether the predictive generalizations of a theory hold true (Bryman, 2008, p. 24; EPA, 2007). Quantitative research has an objective conception of social reality. Experimental research is an example of quantitative research. The main steps in quantitative research are: develop a hypothesis, formulate a research design, devise a measure of concepts, hand picked research site, select research respondents, administer research instruments/collect data, process data, analyze data, and present findings/conclusion (Bryman, 2008, p. 141). Quantitative research makes use of tools such as questionnaires, surveys, and other instruments to collect numerical data (Experiment-Resources, 2009).

Reliability and validity are important concepts in quantitative research. Reliability is concerned about the issue of consistency in measurement of variables. There are three forms of reliability in quantitative research: Stability, internal reliability, and inter-observer consistency. Validity refers to the issue of whether a measure of concepts really does measure that concept. There are four types of validity in quantitative research: face validity, concurrent validity, internal validity, and ecological validity.

In quantitative research, knowledge claim can be evaluated using the following: measurement, causality, generalization, and replication. Measurement allows researchers to establish a correlation between the variables they are studying. Causality enables researchers to provide an explanation as to the cause and effect relationship (Bryman, 2008). Generalization is aimed at applying the findings of research in other settings. Replication of study is aimed at establishing the validity of findings, and to avoid bias in the conduct of research.

Data analysis in quantitative research involves the application of univariate, bivariate, multivariate, and statistical significance. Univariate analysis is concerned about the use of frequency distribution and measure of central tendency and measure of dispersion. Bivariate analysis entails analyzing data to establish a relationship through the use of contingency tables, Pearson's correlation, and Spearman's

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correlation etc. Multivariate analysis is concerned with establishing whether intervening variables exist or the existence of a third variable that moderates the relationship between variables. The statistical analysis attempts to establish correlation and statistical significance between variables by using the following: Analysis of Variance (ANOVA), and Chi-Square test. It can also be applied to compare “mean” of a Population and statistical significance.

Qualitative Research Methods

Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. Qualitative method is useful in seeking to present the world as individual perceive it (Krathwol, 2004). Qualitative research gives emphasis to meaning. Kaplan, and Maxwell (1994) have argued that the goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data are quantified. The qualitative research adopts an inductive view of the relationship between theory and research. The epistemological position of qualitative research is interpretive aimed at examining the communal world through the world of participants (Bryman, 2008, p. 367). The ontological position of qualitative research is constructionist, which denotes that social properties are outcomes from the interaction between individuals, rather than phenomena out there (Bryman, 2008).

The main steps in qualitative research are: identify general research questions, selection of material sites and subject, a collection of pertinent data, interpretation of data (collection of further data), conceptual and theoretical work, writing findings/conclusion (Bryman, 2008, p. 371). Qualitative research uses observation, interviewing, and document review, narratives, content or documentary analysis, participant observation and focus group to collect data. (EPA, 2007). For instance, focus group is a group of people convened for obtaining perceptions or opinions, suggesting ideas, or recommending actions. A focus group is a method of collecting information for the evaluation process (EPA, 2007).

Other forms of qualitative research are qualitative content analysis, action research, case study, ethnography, grounded theory and phenomenological studies. For instance, phenomenological study is concerned with discovering how individuals construct meaning. Its attempts to pay attention to the uniqueness of the individual and the uniqueness of individual world view. The goal of phenomenology is to describe how people understand their lived experience (Fry, Carl, Friedman, & Kreps, 1991; Krathwol, 2004, p. 233; Creswell, 1998). Ethnography approach is a situation in which the researcher immersed himself/herself in a group for an extended period of time, observing behavior, listening to what it is said in conversation both between others and with the field worker and asking questions (Bryman, 2008).

Grounded Theory is a methodology designed to develop a theory primarily through interviews and systematic procedures for data gathering and analysis that minimize the influence of preconceived hypotheses (Creswell, 1998). Ground theory methodology adopts in-depth interviews in which the researcher orally solicits responses (EPA, 2007).

Qualitative researchers have adopted criteria for establishing and assessing the quality of research: Trustworthiness, credibility, transferability, dependability, confirmability, authenticity (Bryman, 2008, p. 379). Lincoln & Guba (1985) have identified four criteria used to assess the degree to which a qualitative study will have “truth value.” These are credibility, transferability, dependability, and confirmability (Guba & Lincoln, 1981, p. 246). Credibility is equated with internal validity, and it denotes identifying factors in the research question and accurately and completely describing the ways in which these factors are reflected in the data gathered. Transferability is equated with external validity, and it means a

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judgment about the applicability of findings from one context to another (White, & Marsh, 2006). To ensure transferability, credibility, and confirmability of evidence qualitative researchers usually collect data on a single variable from multiple sources (triangulation). Dependability is similar to replicability, and it encourages researchers to provide an audit trail (the documentation of data, methods, and decisions about the research) which can be laid open to external scrutiny. Confirmability relates to objectivity in qualitative research findings are confirmed by looking at the data, not the researcher(s), to determine if the data support the conclusions (Guba & Lincoln, 1981, p. 246; White, & Marsh, 2006). Figure three outlined the differences between quantitative and qualitative research.

CULTURAL AND COMMUNICATIVE CHALLENGES TO INTERDISCIPLINARY RESEARCH: PHILOSOPHICAL, DISCIPLINARY EPISTEMOLOGICAL, AND METHODOLOGICAL DISCOURSES

This section draws on the notion of the philosophy of science, disciplinary epistemologies, and methodological classifications to make clear the cultural and communicative challenges to interdisciplinary research. But first a brief clarification on the concept of culture and scholarly culture.

Culture refers to the concerted activities of a group based on shared ideas and understanding (Becker, 1986). Value systems and norms are part of culture and they refer to standard of judgment by which people set what is of important to them as a group; as well as set the standard of behaviors in a social setting. In this sense, scholarly culture refer to group of scholars with common scholarly philosophies, scholarly paradigms, and research methodologies and methods. Scholarly culture provides a way of conceptualizing, and implementing research that is peculiar to scholarly entity. Each scholarly culture share common philosophical, paradigmatic, and methodological principles, procedures, and ways of thinking, including worldviews, and standards of research. Members of scholarly culture are socialized into disciplinary entity through years of intensive training, mentorship, and belonging to professional associations. Each scholarly culture have a shared beliefs about what constitute knowledge, truth, reality, and what is regarded as valid evidence.

Table 1. Differences between quantitative and qualitative research

Quantitative Research	Qualitative Research
• Inductive	• Deductive
• Emphasis on numbers	• Emphasis on words
• Positivist epistemology	• Interpretivist epistemology
• Generalization	• Contextual understanding
• Researcher distance self from study participants.	• Researcher is immersed in the study.
• Artificial setting	• Natural setting
• View reality as objective	• View reality as an interpretation of how individual perceive their world.
• External validity	• Transferability
• Hard data	• Rich deep data

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Scholarly culture determine interactions and mode of behaviors for members of disciplinary group. It provide directions on how scholars will frame empirical inquiries indicating what is acceptable research culture and what is not. Scholarly culture dictate how research should be done, including the “correct” philosophical principles to apply, theories to use, methodology to adopt, and how data should be analyzed and interpreted. Research done using different scientific culture by scholars outside a disciplinary paradigm is therefore likely to be “ignored” or “dismissed” if it is perceived to be at odds with the scholarly norms and values of specific group. Scholarly norms subconsciously guide and dictate the acceptable behaviors of scholars, including their attitudes toward collaboration in interdisciplinary research endeavors.

Cultural Barrier to Interdisciplinary Research: Philosophical Discourses

- **Process of Reasoning:** A key barrier to interdisciplinary research is rooted in the process philosophical reasoning. In particular, the process of reasoning: Abductive, deductive and inductive are scholarly norms that guide empirical inquiries which have potentialities of limiting interdisciplinary research. This is essentially because of their conflicting views and influences on research design. For instance, a scholar whose belief is rooted in deductive reasoning will invariably frame inquiries using positivists’ tradition by inferring from general rule to a specific conclusion. In contrast, however, interpretive scholars whose belief systems are rooted in inductive reasoning will favor framing inquiries by starting from a specific observation (not set of observations) towards general conclusion. In contrast to both inductive and deductive reasoning, some scholars may want to frame inquiries using abductive reasoning. Under this scenario, scholars begin research by deciding the most likely inference from a set of observations (as against observation in inductive reasoning).

The three contending standards of reasoning with implications for research design provide varieties for scholars to choose from. However, it is also a fertile ground for tension when an interdisciplinary research team is composed of scholars with differing but conflicting perspective in regard to beliefs about reasoning and knowledge production. For instance, in an interdisciplinary research tension may occur when scholars from contending philosophical perspectives disagree on whether the research should be framed deductively, inductively, or abductively. Inductive and abductive scholars are likely to challenge deductive beliefs for its lack of reasoning in regard to how a theory is selected for testing. Similarly, deductive and abductive scholars may challenge inductive beliefs by arguing that no quantity of observed data will necessarily enable theory-building—by noting the incompleteness of observations.

More so, scholars whose belief systems are rooted in a deductive approach to research will be aiming at testing a theory. In contrast, a scholar whose belief systems are rooted in an inductive approach to an empirical inquiry will be more concerned in the generation of fresh theory. Conflict is imminent in interdisciplinary research if a deductive scholar has a deep-rooted belief of framing empirical inquiry deductively from a top-down approach. In other words, from broad, universal, or general to the particular or specific. Under deductive approach scholars will be more interested in framing inquiries by identifying theoretical expositions about an issue, problem, or phenomena. The scholar will then formulate proposition or hypothesis for investigation for the purpose of either accepting or rejecting the hypothesis. The overall aim, however, is either to ratify or reject the theory. Conversely, scholars who have a deep-rooted belief in inductive reasoning will frame inquiry using the bottom-upward approach. This entails framing empirical research starting getting narratives about a phenomenon of interest from

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observation moving to generalizations and subsequently developing a conceptual model ending with a theory. Inductive scholars are after making observations, and then condensing the observed phenomena into a pattern(s), that is regularities (or irregularities), and then formulate a conceptual framework, and finally ending with developing a theory. Therefore, the basis of interdisciplinary conflict is essentially rooted in scholarly culture-- while inductive scholars frame empirical inquiry using an open-ended and exploratory approach; deductive scholars are more comfortable in framing inquiries by identifying extant theories, generating a hypothesis, and afterward test the hypothesis.

- **Philosophy of Science as Scholarly Codes:** Another source of cultural barrier to interdisciplinary research is rooted in philosophy of science. Philosophy of science is a scholarly culture as it provides standards and directions of scholarly inquiry through its analysis and perspectives of what is science and what is not science, what constitute the boundary of science, and its explanation of the norms of science. In any empirical inquiry, the choice of research design resonates with scholars' understandings of the philosophy of science. In particular, philosophy of science shapes the world view of scholars. It provides direction for scholarly conducts, including how problems are a frame, and how scientists arrived at acceptable evidence and conclusion. In explaining what is science and the norms of science, philosophers, and scholars of science have come up with the notions of relativism, falsification, demarcation problem, unity of science, verification principle, the concept of realism and antirealism, among others. While each of these perspectives influences how research is framed, it also presents a source of tension and barriers to scholars in the conduct of interdisciplinary research. For instance, realism, antirealism, and idealism are contending philosophical debate, which also invariably serves as a potential source of tension and barriers to interdisciplinary research. This is because of their contending notions in regard to truth and reality. Scholars with a deep-rooted belief in realism are of the view that scientific theories are fundamentally true. What we observe by our senses as reality is the truth, and that objects have an existence independent of the human mind. In other words, reality is quite independent of the mind. In this sense, realism is opposed to idealism, the philosophy that only the mind and its contents exist. This view is contrasted with anti-realists with their notion of falsifiability. Falsifiability is the belief that a theory should never be regarded as true. Anti-realist scholars argued that science is all about falsifying a theory, noting that for any theory to have credence, it must essentially be disprovable before it can be accepted.

Another source of tension and barrier to interdisciplinary research is the notion of relativism with its associated philosophical perspectives of absolutism, objectivity, and monism. Relativism contrasts with realism, which is the idea that reality and what is true exists independently of the mind, and that knowledge is essentially connected to beliefs, values, and societal norms and that no perspective of reality is superior to the other. In interdisciplinary research relativism presents a potential source of tension and barrier to interdisciplinary research because it is opposed to philosophical perspectives of absolutism, objectivity, and monism. For instance, relativist scholars have challenged the notion of absolutism, and objectivity. In regard to the former, the relativists noted that no opinion, perspective, viewpoint, or stance is dominant or privileged over other; while in the, later the relativists deny that there is no one all-inclusive truth arising from a disconnected, independent, and impartial attitude associated with scientific investigations. They argued that truth cannot be all-embracing because it is a function of one's experiences and cognition. In the same vein, the relativists have challenged the notion of monism,

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a philosophical world view which argued that reality can be abridged to one entity. In other words, it is possible to make objective judgement about entities and that identifying one, explanation should be the main task of science. The relativist argued that there is no one correct explanation that is applicable to every issue or reality. In this sense, the relativist had sided with the dualist who allowed for a plurality of equally valid values or even truths (Jonathan, 2016).

- **Research Philosophy as Scholarly Standards:** Research philosophy provides a framework and standards for scholarly inquiries. It is concerned with scholar's perspectives about knowledge, reality, and existence. It is also the assumptions' scholars make about their views of the world. Scholar's assumptions regarding the world underpin the choice of research strategy, including research methodology and methods. Research philosophy has three critical elements depicting ways of thinking of scholars about the world: positivism, interpretative, and critical. The three contending standards of research approaches provide variety for scholars to choose from. But it is also a fertile ground for tension, particularly when the interdisciplinary research team is composed of scholars with differing but conflicting research perspective in regard to how interdisciplinary research will be frame, implemented, and evaluated. For instance, positivism inquiry is framed using quantitative data collection techniques and research approaches involving measurements, experimentation, and quantification. It also involves the formulation of hypothesis and/or identification of variables that are organized into dependent and independent. On the other hand, interpretive scholars' frame inquiries with the intention of understanding phenomena by uncovering meaning attached to object, and the thinking, action, and thought of individuals and groups in a communal setting through the use of focus group discussions, individual in-depth interviews, and participant observation. Critical scholars, on the other hand, frame empirical inquiries with the intent of explaining issues, and phenomena rooted in social context and situations (Fine, Weis, Wesson, & Wong, 2003; Lather, 2004).
- **Ontology, Epistemology, and Methodology as Scholarly Beliefs:** Three important beliefs with potentials as cultural barriers to interdisciplinary research are best discussed as questions: what is ontology? What is epistemology? And what methodology and methods should be applied in empirical inquiries? Ontological, epistemological, and methodological assumptions are considered as research values. These scholarly values influence research design. For instance, ontological questions help scholars to answer the question about what is real; and there are diverse but conflicting answers to the question of reality with each perspective having implication for scholarly inquiry. In contrast, positivist's scholars have an underlying belief that there are a single objective reality and an absolute truth that is universal which can be discovered through a scientific process. In opposition to the positivist concept of reality, interpretivism scholars do not believe that a single reality exists. Instead, they believe that reality is discrete and subjective depending on the individual in relation to social, cultural context and situations.

Unlike ontology that is concerned with reality, epistemology is about knowledge and what is considered as acceptable knowledge in a specific field of inquiry. Epistemology is essentially concern about three scholarly belief systems: what is knowledge, the process of gaining knowledge, and whether the knowledge obtained is valid. Essentially, there are two major epistemological typologies: positivist's epistemology, and interpretative epistemology. The differing epistemologies are opposed to each other which may inhibit interdisciplinary research. For instance, in regard to how knowledge is obtained, the

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positivist's epistemologists have stressed that scientists should be impersonal, unbiased, objective, and should not interrelate with the subject of the research. And that the process of knowledge production should be via observation, experimentations, measurements, formulation of hypothesis and quantifying observations. In contrast, however, interpretive scholars noted that procedure of obtaining knowledge involve continuous interaction with subjects of the study with the sole aim of uncovering and understandings opinions, thought, feelings, and actions of individuals and groups in social and cultural contexts. It also involves scholars to obtain thick descriptions of situations and issues from the subjective understandings of people in specific social and cultural context.

Another barrier to interdisciplinary research is in regard to the question of what is knowledge. Again, the positivists and the interpretative epistemologists differ. While the positivist's epistemologist has considered knowledge as universal and objective; the interpretative epistemology believes that knowledge is subjective rooted in social and cultural contexts. In each of these contending perspectives, conflict is bound to occur between members of the interdisciplinary research team.

Cultural Barrier to Interdisciplinary Research: Disciplinary Paradigmatic Discourses

- **Disciplinary Paradigm as Scholarly Norms:** Scholarly norms are the acceptable scholarly behaviors of members of a disciplinary community. It provides guidelines for the conduct of empirical inquiries specifying the appropriate procedures for research and knowledge production within a disciplinary community. Scholarly norms subconsciously guide and dictate the acceptable behaviors of scholars including the choice of research design. The concept of scholarly norms is adopted in explaining the cultural and communicative challenges to interdisciplinary research. Scholarly norms, therefore, dictate the behaviors of scholars, including what problem to study and how the problem should be studied. Knowledge produced that do not conform to the specific disciplinary norms may either not be considered as valid knowledge, or it will out rightly not be recognized as valid evidence by the scholarly community.

Three broad typologies of disciplines are discerned) with the implication of cultural and communicative challenges to interdisciplinary research: Social sciences, humanities, and natural and applied sciences. Therefore, cultural and communicative challenges to interdisciplinary research are rooted in the three major disciplinary categorizations with their differing but conflicting disciplinary epistemologies. For instance, within social sciences scholars are mentored to answer and explain human behaviors aiming at prediction by applying disparate scientific procedures, methodologies, and methods. In contrast, scholars in the humanities have a culture of evaluating, analyzing, and interpreting past experiences with the aim of understanding behaviors through documentary evidence, cultural objects, and societal relics; while the main preoccupation of scholars in the natural science is aimed at providing clarity about the world and to explain phenomena, issues, and complexity of the ecosystems.

Unlike the natural sciences, and the social sciences, the philosophical assumption of hermeneutics scholars is very distinct from either that of the natural sciences or of the scientifically influenced social sciences. The main preoccupation of a hermeneutics' scholar is not with providing an explanation but with understanding. For example, while the natural scientist is interested in explaining a sequence of events, the hermeneutics scholar will want to understand the moral, aesthetic, spiritual and historical significance of an event, issue, or phenomena. Additionally, the natural sciences often deal with issues of

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causality and attempt to subsume particular incidents under general laws. In contrast, the hermeneutics scholar is interested in understanding meaning.

The contrasting natures of heterogeneous disciplinary fields with differing methodologies and methods is influencing empirical practices of scholars. Each disciplinary clusters has distinctive research paradigms, ways of inquiry, ways of thinking, and how problems are approached. For decades Kuhn (1970) has described academic disciplines as social entities representing different scholarly cultures.

Cultural Barriers to Interdisciplinary Research: Methodological Discourses

- **Research Methodology as Scholarly Ethos:** Methodology refers to how scholars actually conduct research about reality. It is the strategies and instruments scholars apply in identifying the population of study, determining of sample size, the type and nature of data to collect, how data is collected, techniques for data analysis, reporting of findings, discussions, and reporting research inferences. There are three main typologies of research methodologies: quantitative, qualitative, and mixed method or pragmatic. These dimensions of research methodologies provided scholars with options of designing empirical inquiries, but it also presents a challenge for interdisciplinary research.

Methodological conflicts that have potentials of limiting interdisciplinary research include whether to adopt quantitative or qualitative research methodology. In particular, conflict may arise in deciding whether to frame methodology for an interdisciplinary inquiry from positivism, post-positivism, social constructionism, or critical meta-theoretical perspectives. Another source of conflict that may limit interdisciplinary research include the choice of appropriate research methodology, and the type of data to collect, the instruments for collecting data, and selection of sample and sample size.

For instance, quantitative methodology is interested in identifying causal relations. Scientist adopting quantitative methodology propose dependent and independent variables, with strong importance attached to generalization of findings using statistical methods of analysis. Conversely, qualitative methodology does not emphasize on causal relationships. Under this scenario, methodological quagmire is imminent. Mainly arising when qualitative scholars with their constructionist's orientation reject quantitative methodology doctrine of objective, verifiable knowledge about the world.

Communication Barriers to Interdisciplinary Research

- **Scholarly Terminologies as Barriers to Interdisciplinary Research:** Scholars speak the language of their disciplines. In particular, academic disciplines have terminologies and concepts that are unique to the academic field. While terminologies and concepts assist scholars in a discipline to converse with each, it is a source of tension and barriers to scholars in the conduct of interdisciplinary research. Interdisciplinary team members that are from a diverse discipline may face challenges in understanding each other due to problems with concepts and terminologies. For instance, it is unlikely for a scholar in anthropology to be conversant with the scholarly jargons, terminologies, and rhetoric of another scholarly field as in medicine, law, or information systems. Therefore, interdisciplinary research faces obstacles when scholars working as members of the interdisciplinary research team have conflicting understandings about terminologies and concepts. There are instances of interdisciplinary team members getting confused or not getting along as

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a result of lack of coherence in terminologies. For instance, Morse, Nielsen-Pincus, Force, & Wulfhorst (2007) reported confusion among scholars during interdisciplinary research as a result of scholars using words that appears to have no meaning to other team members. Also researcher in interdisciplinary research team use the same words that has completely different definitions from the perspective of other team members.

Cultural Barriers to Interdisciplinary Research: Implication for Global Health Information and Communication Programs in Africa

In this section, the author highlighted the importance of undertaking interdisciplinary empirical inquiries for advancing the cause of global health information and communication programs for Africa. An interdisciplinary approach to global health information and communication in Africa is critical because disease, illnesses, health, and wellbeing are socially constructed—a function of context, situations, communal experiences, histories, and cultures. Africa is a multi-cultural society. For instance, Nigeria is one of the most populous country in Africa having about 250 distinct cultural and sub-cultural groups. Cultural entities are flashpoints for global health information and communication program—polio immunization information resistance in northern Nigeria is a case that was well reported and documented (Obregón, Chitnis, Morry, Feek, Bates, Galway, & Ogden, 2009; Musa, 2015; World Health Organization, 2015).

Therefore, to ensure effective and efficient global health information and communication programs in multi-cultural African settings, there is the need for global health information and communication programs to be context specific. Achieving a context specific global health information program requires thinking outside the box by focusing and integrating skills, tools, perspectives, knowledge, concepts, and/or theories from two or more disciplines for the purpose of designing context specific global health information programs.

Accordingly, it is strongly suggested that an interdisciplinary and transdisciplinary center for global health information and communication programs be established in Africa. The center will coordinate global health information and communication research by applying diverse and discrete disciplinary scholarly content areas. The center will bring together scholars from discrete disciplines—similar to the metaphor of the elephant and the blind guys—with each team member bringing a unique expertise, and working from a holistic approach.

The proposed African center for interdisciplinary and transdisciplinary research for global health information and communication when operational will unquestionably complement the activities of governments, transnational health organizations, funding agencies, and third sector organizations in achieving the lofty aims of global health communication. In particular, the center will be responsible for providing insight into the imperviousness nature of mono-discipline empirical inquiries on complex issues related to global health information and communication.

More so, the research center will be concerned with synthesizing theories, methodologies, and methods from diverse disciplines to frame global health information and communication programs using novel and unusual perspectives. For example, communication science can be combined with religious studies scholarly content area that may lead to the design of new information and communication techniques that are context specific to a sub-culture in Africa. When ideas from diverse unrelated fields are brought together there is the possibility of giving birth to a new global health information and communication scholarly field. In the same way, mathematical physics came into limelight by transferring mathematics to physics.

Cultural and Communication Barriers to Interdisciplinary Research

Cultural Barriers to Interdisciplinary Research: Implication for Research

The cultural barriers to interdisciplinary research have implication for research. There is the need for a study that will examine cultural barriers to interdisciplinary research from the theoretical perspectives of stereotyping, specifically, academic and disciplinary stereotyping. Academic stereotyping refers to misleading, misrepresentation, or incorrect generalizations about an academic field of inquiry by scholars from another academic entity. Such inappropriate generalization strongly shapes scholar's discernment of the type-casted academic unit, believing the stereotypic characteristics when they are not extant. For example, scholars from academic disciplinary unit "A" may stereotyped academic disciplinary unit "B" by associating a certain characteristic with the stereotyped academic discipline. Academic stereotyping inhibit interdisciplinary research collaboration. Academic stereotyping may be responsible for some academics and scholars not wanting to collaborate with scholars from certain disciplines. In addition, there is the need for a study that will uncover the prevalence of academic stereotyping, and whether the misrepresentation is warranted or not.

CONCLUSION

In sum, the greatest challenge to interdisciplinary research can be summed up from what I considered to be scholarly or disciplinary ethnocentrism. Disciplinary ethnocentrism is cultural and it denotes a situation whereby scholars find it difficult to appreciate the dichotomy, contrast, and differences between methodologies and methods across disciplines and instead insist on applying the scholarly values and ideas from their subjective academic experiences. Scholarly ethnocentrism is developed inertly during disciplinary socialization of scholars in colleges and universities. During doctoral training, for instance, students are introduced to the scholarly culture of their academic unit comprising of the disciplinary epistemology, philosophical worldviews, and perspectives as to what constitutes reality, knowledge, and what counts as evidence. Principally, scholars become engrossed in the content of their disciplines.

Closely related to cultural challenges of interdisciplinary research is the communicative challenges arising from the artificial academic boundaries created in universities and colleges. Academic boundaries as operated in universities imposes barriers to communication among scholars which inhibit interdisciplinary research. For instance, each discipline has a unique language, terminologies, and language making communication difficult between scholars of differing disciplines. Consequently, interdisciplinary research is constrained when collaborative team members experience difficulty in understanding each other due to differences in the use of concepts, terminologies, and disciplinary jargons.

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KEY TERMS AND DEFINITIONS

Communication Barriers: Factors that hinders individuals or group in communal setting from identifying, accessing, understanding, and using information.

Cultural Barriers: Refers to the standard of behaviors, norms, and value systems in a social settings that prevents people from participating in activities or events.

Global Health Communication: The study and practice of communicating information about diseases and illnesses that is of public health concern at global level. It involve the use of mass media, information and communication technologies, dialogue, discourses, and interpersonal communication to influence distinct and communal conducts that affect health and wellbeing.

Interdisciplinary Research: Refers to a synchronized team of specialists from a number of scholarly content areas who agree to collaborate on a research work with the objective of addressing an issue or problem. In so doing interdisciplinary team cooperate by integrating philosophical, theoretical, conceptual, and methodological expertise. This collaborative efforts is throughout the phases of the research process.

Multidisciplinary Research: Involve scholars from differing scholarly content areas conducting empirical inquiry from their individual disciplinary perspectives. In multidisciplinary research, scholars working on a problem have dissimilar questions, methodological approaches, and conclusions. Findings and recommendation is disseminated in different professional journals.

Research: The orderly examination and study of issues, problems, and phenomena with the sole intent of having a better understandings of the issue to establish evidences and arrive at valid conclusions

Transdisciplinary Research: Refers to research practices comprising of scholars from diverse scholarly academic background. Scholars work as a team by transcending their disciplinary identify, adjusting discipline-specific research design, mixing approaches from diverse disciplines in designing empirical studies.

Chapter 12

Issues and Challenges in Interdisciplinary: Methodological Barriers

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ABSTRACT

The need for interdisciplinary studies to address the complex issues, too broad to deal adequately by a single discipline, is widely acknowledged in literature. Many issues in modern days such as climate change, food security and energy crisis, are interdisciplinary in nature. The success of interdisciplinary studies depends on ‘collaboration’ and ‘synthesizing mind’ among researchers in different disciplines. Research studies have identified disciplinary focus, assumptions, theories and practices, research design, and methodological pluralism as the major sources of conflict in an interdisciplinary context. In particular, the chapter discusses the various methodological barriers such as differing methodological approach, conflicting research findings, methodological pluralism, terminological problems, time barriers, and diverse motivations in interdisciplinary studies. Based on analysis, the chapter provides few recommendations to address methodological barriers and to promote collaboration and integration among members from various disciplines involved in interdisciplinary studies.

INTRODUCTION

Interdisciplinary research is defined as a mode of research by teams or individuals that integrates perspectives/concepts/theories and/or tools techniques and/or information/data from two or more bodies of knowledge or research practice (Porter & Rafols, 2009). The role of interdisciplinary research, by integrating insights and learning’s from different disciplines working in collaboration with each other to address a complex research problem like sustainable development, alternate sources of energy, food security (Morse et al., 2007; Bililign, 2013); climate change and curing cancer (Olsen et al., 2013); sus-

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tainable energy struggle (Riper et al., 2012); food, water and energy security (Ignaciuk, et al., 2012) is well acclaimed in academic literature. Also, the awareness that many of the scientific problems ‘cannot be compartmentalized into arbitrary disciplinary structures’ contributed to the growth of interdisciplinary research. Acutt et al. (2000) cited examples of interdisciplinary studies involving social and natural sciences in order to solve environmental problems. Fleischmann et al. (2013) tried to bring two groups together: social scientists (who study social phenomena broadly or deeply) and computer scientists (who have computational approaches) in order to balance the trade-off between depth and breadth in an interdisciplinary study. Similarly Ignaciuk et al. (2012) mentioned that the non-linearity and complexity of natural and social processes are recognized and policy makers pose questions for which solutions require collaboration between various fields. An example is a research focused on problems of food, water and energy security. These research studies need to be tackled in more holistic ways, allowing for a variety of different systemic feedback and inclusion of the expertise of many different disciplines. Brister (2016) observed that the complex environmental problems require well-researched policies that integrate knowledge from both the natural and social sciences. Thus, the progress gained from viewing a research problem in its entirety stimulated many researchers into interdisciplinary research. Funding agencies and institutions are creating initiatives to encourage interdisciplinary research (Gill et al., 2015).

Klein and Newell (1997) explained interdisciplinary research as a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline. It draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective. Chettiparamb (2007) commented that the arguments for interdisciplinarity generally stems from debates surrounding disciplinarity. Two main threads are found in these debates. The first arguments consider interdisciplinarity normatively, positioning it in terms of filling the gaps that disciplinarity leaves vacant or in terms of transcendence surpassing disciplinarity can ever hope to achieve. The second thread posited that interdisciplinarity already exists within disciplines. The argument further explains that the space for interdisciplinary studies is not just out there – interdisciplinary activities may be in the heart of disciplinary practice (Klein, 2000).

Effective collaboration between people from different disciplines is necessary to maximize the potential benefits of interdisciplinarity for future research activity (Bridle et al., 2013). Interdisciplinary studies are the only way to dismantle the inherent power structures created by disciplinary boundaries (Lattuca, 2001). In this way, it is closely associated with postmodernist paradigm, but unlike postmodernists does not reject all advancements created by the disciplinary focus. The focus of interdisciplinary research is on those research problems whose solutions cannot be identified within a single discipline (Visholm et al., 2012) and the research questions are determined by shared understanding in an interactive and iterative process (Canadian Academy of Health Sciences, 2005).

The benefits of interdisciplinary research over undisciplinary research are many, though several barriers and challenges prevail. Development of new collaborations and building research ideas (Taylor, 2004) and transfer of benefits and outcomes to a broader audience (Kelley & Randolph, 1994) are key advantages. Interdisciplinary research in natural and social sciences, of course, has to overcome many issues and challenges resulting from different reasons, ex; the differing expectations of research team (Campbell, 2005), methodological barriers (Lach, 2014; Szostak, 2007; Gooch, 2005; Lele & Norgaard, 2005; Gilbert, 1998), communication barriers (O’Rourke et al., 2014; Lah et al., 2013; Aboelela et al., 2008; Bracken & Oughton, 2006; Miller, 2011), and philosophical obstacles (Niglas, 2009; Morse, 2005; Onwuegbuzie & Johnson, 2006).

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In general, three major barriers affect collaborative work; organizational structuralism, power imbalances and role socialization (Orchard et al., 2005). Ignaciuk, et al. (2012) mentioned that the key challenge in designing a new integrative research structure is to give it enough flexibility, at the same time to provide a stable institutional home where they would find support for their scientific activities.

In many ways, disciplines are socially constructed conventions that have their own institutional and ideological structures (Bruun et al., 2005). Moreover, 'disciplinary focus' limits the researchers to study isolated variables rather than the systems of interrelationships between the clusters of variables. 'Bundling' different disciplinary approaches in interdisciplinary studies risks the study at times, leading to incommensurable assumptions (Shenkar & Reuer, 2006). Knowledge in a particular discipline makes an expert in academic sense; yet an open mind to accept challenges and work collaboratively makes a great researcher.

Many issues in modern days are interdisciplinary in nature. Interconnected research activities are essential in such cases to examine the research problem in its totality and to gain valid insights on it. Combining different disciplines into a common platform certainly leads to some barriers and challenges. The notion that "Everything put together. Sooner or later falls apart" (Simon, 1971) indeed defines the barriers in interdisciplinary studies. The major barriers in interdisciplinary studies include conceptual and methodological barriers (Shenkar & Reuer, 2006), intellectual issues such as attitude and communication to organizational issues such as academic structure, funding mechanisms (Pellmer & Eisenberg, 2000), difficulties of organizing meetings, developing a common language and knowledge, understanding the task at hand (Domino et al., 2007), intellectual and institutional constraints (Eve, 2010), individual personalities, disciplinary disciplines, and programmatic design (Morse et al, 2007).

Researchers in interdisciplinary research should be experts with strong backgrounds in their disciplines; they also require a 'synthesizing mind' (Gardner, 2006). To be effective in interdisciplinary research, Romito (1997) suggested that stepping outside of one's own discipline is necessary in order to reconstruct what is being researched and thereby enhance data analysis. If one stays within the bounds of one's own speciality, however, there is the risk that the object of research will be poorly and only partially reconstructed. In addition, if interdisciplinary conflict persists, there is a chance to ignore the issues that results in conflict, leaving the study incomplete. Parkhe (1993) examined the issue and concluded that when conflicts arise in interdisciplinary studies, "The response has been one of ignoring away the messy concepts and soft issues, of studying outcomes, but not the processes" (p.246).

There are arguments against interdisciplinary studies in literature, for example, like Salter and Hearn (1996) highlighting the disruptive nature of interdisciplinary.

METHODOLOGICAL BARRIERS IN INTERDISCIPLINARY STUDIES

The key element of interdisciplinarity is that it reflects a belief that enhanced understanding of particular problems, issues, and themes is possible by integrating insights from different perspectives (Szostak, 2007). Interdisciplinary perspective is the intellectual capacity to view a complex problem in its entirety, from multiple perspectives, including disciplinary ones in order to develop a more comprehensive understanding of it. Complexity in interdisciplinary studies is not a coincidence. Success in interdisciplin-

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ary studies requires temporarily setting aside own beliefs, opinions and attitudes (Repko et al., 2014). Interdisciplinarity presupposes disciplinarity (Scott, 1979).

To understand the methodological barriers, it is necessary to highlight two major perspectives in interdisciplinarity. The generalist perspective views interdisciplinarity as; any form of interaction between two or more disciplines (Moran, 2002); stresses more importance to the questions asked rather than on the integration (Lattuca, 2001); reject any definition that emphasize on the element of synthesis i.e., integration (Richards, 1996). Thus, the generalist perspective provides more emphasis on the interaction between different disciplines and discards the integration element in interdisciplinarity. The second perspective, i.e., integration perspective is inextricably linked to integration and stresses the priority of integration in creating a distinctive interdisciplinary research process and describes how it operates (Newell, 2007). As pointed out by Kockelmans (1979) 'The search for a common ground is the fundamental element of all (interdisciplinary) investigation' (p.141). But the reality is that, as pointed out by Fuchsman (2009) 'Disciplines can be wildly flourishing jungles fragmented by insular sub-fields and competing research programs' (p.70). Further, as Dogan and Pahre (1990) stated 'each discipline is fragmented; the fragments, too, are fragmented' (p. 5). Most of the challenges in interdisciplinary emerge when it is viewed from the 'integration perspective' because synthesis is difficult to achieve when disciplines follow diverse theory, assumptions, concepts and practices.

By methodological barriers, the authors include all the conflicts in methodologies by different disciplines in an interdisciplinary study. The authors consider methodology from a broader perspective, not just the methods used or the underlying assumptions in a research. Viewing methodological barriers in a broader perspective, the authors inferred that methodological barriers arise at all stages in research, from defining the research problem, aims and objectives, setting hypothesis, research design, sample design, data analysis and findings. The breadth and depth dilemma is often challenging and as pointed out by Golde and Gallagher (1999) interdisciplinary studies scarify the breadth for depth. In a similar study, Evans and Randalls (2008) observed that reaching at the cutting edge of each area is a challenge and one's knowledge of literature becomes broad and shallow rather than narrow and deep.

Methodological barriers discussed in this chapter includes; different methodological approach among members in the team, conflicting research findings, methodological pluralism, terminology problems, time barriers and diverse motivations.

DIFFERING METHODOLOGICAL APPROACH

There is no 'one size fits all' concept in interdisciplinary studies. Interdisciplinary studies do not follow a homogeneous methodological approach and a common research design. Different disciplines may put forward different research approaches when dealing with a complex issue. Though a common methodological approach is impractical in majority of these studies due to the disciplinary differences, these methodologies should not contradict each other, rather support each other to develop a common research platform. In a study by Lach (2014), it is mentioned that the differences in interdisciplinary studies is the determination of the methodological approach; appropriate methods for collecting data; what actually constitutes data; applicable analytic tools; what evidence looks like. In interdisciplinary research, researchers should reduce bias including operationalization of questions, sampling strategies, research design, control groups, and robust statistical techniques, each with their own requirements of data collection. Similarly Lélé and Norgaard (2005) observed that when studying the same phenomenon,

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researchers from different disciplines may differ in their theories or explanatory methods. Adherence to research practices in a particular discipline also makes it difficult to highlight significance of a particular approach to another. Sometimes researchers are not willing to abandon their distinctive disciplinary perspective developed over years of experience. Gooch (2005) and Knight and Pettigrew (2007) addressed this issue and mentioned that the differences in the process of agreeing on the choice of methodology, authorship, patenting or data ownership issues can lead to tensions and mistrust among the team members, thereby hindering collaborative research.

The major reason for differing methodological approach among researchers in interdisciplinary research is the inherent culture to identify everything primarily in terms of the discipline. Individual members bring to the groups their own prior views and biases and it influences their interaction in the group, the way they perceive knowledge, theories and methods of group members involved. As rightly pointed out by Szostak (2007), "Most centrally, faculty members within interdisciplinary programs generally identify themselves primarily in terms of a particular interdisciplinary theme or question, rather than with interdisciplinary itself". According to Lele and Norgaard (2005) this problem is observed among natural and social scientists. They are reluctant to acknowledge the presence of value judgments in their work. This causes the problem of values being embedded in all types of inquiry and at all stages such as in the choice of questions, theoretical positions, variables, and style of research. Addressing this issue, Lattura (2002) posited that those who wish to participate in interdisciplinary research must not only change the culture of the discipline but also change the system in their efforts to conduct interdisciplinary research. They have to step outside of the boundaries of their original discipline into the "no man's land" of the new discipline, acquiring appropriate methodological tools along the way. It is also important to create a culture which promotes looking for commonalities in the team building process and as pointed out by Lele and Norgaard (2005), negotiation is required particularly in the areas; subject focus, assumptions about factors under study, larger world-view assumptions, models used, methods used and the intended audience. Further, Gilbert (1998) observed that individuals who are involved in interdisciplinary should be familiar with and can use knowledge produced in more than one field. This usually requires trade off depth in a single field for breadth across the spectrum of interest.

CONFLICTING RESEARCH FINDINGS

Conflicting research findings occur when the findings in one discipline contradict with other discipline. It may occur when different methodologies were applied, ex; the findings from the qualitative method do not align well with the findings of the quantitative method, but captured different perspectives of the phenomenon. Morse (2005) illustrated examples of conflicting research findings in interdisciplinary studies and attributed it mainly to the methodological differences and the different approach, assumptions and theories involved in disciplines. Although mixed methods research allows an in-depth discovery of patterns, practices, and traditions, providing an opportunity for high generalization through large empirical research as well as providing an enriched understanding of the researched subject. Moreover, mixed methods provide a great transferability when exploring complex and multiplex social issues. The same concern was also raised by Bazeley (2004) and Giddings and Grant (2007) who observed the dangers of using mixed methods and increasing methodological issues. Researchers also tend to blame mixing the two methods approach as an excuse for their poor quality research. In such cases the problem is not

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in using the mixed approach but rather the research itself conducted poorly and this is because they are inexperienced researchers who are new to the field (Niglas, 2009). Nonetheless, researchers warned from using the term 'mixing' by clarifying what is being mixed and how it is being mixed. The "mixing" may be just the sequential use of different methods, or it may be different methods are being fully integrated in a single analysis (Caracelli & Greene, 1997).

Some researchers call for quality criteria to use mixed methods. For example, Onwuegbuzie and Johnson (2006) addressed three validity issues faced by mixed methods research representation (representing lived experience through text and numbers), legitimation (the trustworthiness of inferences), and integration (multiplicative and additive threats that result from combining methods). Thus, in order to implement mixed methods research and achieve high levels of integration, formal collaboration within and across teams is critical and can lead to greater synergy and new insights into emerging issues (Hall & Howard, 2008). Furthermore, mixed method design can be an effective to be used in one study but only if the researchers are experienced and skills in both quantitative and qualitative research methods. It is important that a team comprising members from different disciplines with different design experiences work together with experienced project leader in both quantitative and qualitative methods. For a researcher to be able to understand all these different methods and approaches it would become very time-consuming and expensive (Onwuegbuzie & Johnson, 2006).

Citing examples from interdisciplinary research, Slonim-Nevo and Nevo (2009) addressed a key issue in interdisciplinary research, i.e., conflicting findings upon using different methods. These inconsistencies arise when the findings from quantitative phase of research did not fit from those from qualitative phase and the findings using single-case evaluations using standardized scales did not fit with findings from self-made scales. Though such inconsistency poses to be a key methodological barrier, conflicting findings should be integrated, and consistency should be restored by admitting complexity in the phenomenon under investigation.

Add to this, validation of interdisciplinary work is a challenging task. Often, disciplines themselves bring a variety of, often conflicting, standards of validation. Developing validation criteria for interdisciplinary research is more challenging (Mansilla & Gardner, 2003).

METHODOLOGICAL PLURALISM

There is no "cookbook" of procedure or methodology for tackling interdisciplinary studies; indeed, "adaptive management" is common within many teams tackling questions that require bridges between the natural and social sciences (Turner & Carpenter, 1999). It is commonly known that the different aspects of a complex interdisciplinary research problem can only be understood through multiple methodologies. Those who argue in favor of multiple methodologies states that using different methodologies can contribute to building of a coherent and cumulative body of knowledge. Interdisciplinary studies, though warrants different methodologies, 'exhibit pressures to eliminate methodologies for the sake of conformity' (Norgaard, 1989).

Scholars often questions whether methodological pluralism is possible or whether the different research methodologies might not be incompatible and in direct conflict with each other (Kirsch & Sullivan, 1992). As observed by Johnson and Onwuegnizoe (2004) all the weaknesses of methodological pluralism are concerned with time, resources and training. Though methodological pluralism is considered as advantageous to improve the depth of the research, it is considered as a barrier in interdisciplinary research

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because of the integration of qualitative and quantitative methods (Davis, 2009), lack of integration (Bryman, 2007) and tension between the paradigms (Asif, 2014). Asif (2014) mentioned that it may be difficult for researchers (particularly who hold rigorous philosophical standpoints) to accept methods from competing paradigms. Similarly, Bryman (2007) based on interviews with social workers in UK identified nine types of barriers related to the integration of multiple methods. It is worth mentioning that these difficulties are, in fact, the basic problem with the mixed methods research, related to the fundamental philosophy or grounding of mixed research.

Golde and Gallagher (1999) observed that any interdisciplinary study requires conceptualizing and undertaking research in the absence of established and proven frameworks and models. Trying to integrate disciplines often means resolving conflicts between research paradigms and methods. The research paradigms in different fields (and within some fields) are predicated on different assumptions about what constitutes evidence, what standards of proof are, and what passes for “truth” in the discipline. (Heberlein, 1988).

TERMINOLOGICAL PROBLEM

Communication relies on terminology used by all members of a given community. In order to facilitate communication between the members, it is important to standardize terminology (Lah et al., 2013). The increase of interdisciplinary and multidisciplinary collaboration makes terminological ambiguity a problem for the researcher. A major obstacle to interdisciplinary communication is the constructive metaphors ie, the way researchers see the world around them. The greater the divergence, the more difficult it is for communication to be effective. For example, when an economist uses the term ‘competition’, they are bringing to the discussion powerful imagery that invokes neoclassical production theory. These deeper meanings are only clear to the properly initiated practitioner (Wear, 1999). Similarly National Academy of Sciences (2006) identified disciplinary jargons and cultural differences among disciplines as serious problems facing interdisciplinary studies.

Miller (2011) observed that there exists terminological problem across disciplines involved in interdisciplinary studies. Szostak (2014) asserted that one of the main difficulties in interdisciplinary research is the presence of concepts having different meaning across disciplines. The terms used in each discipline mean different things that problem arises due to disagreements over those definitions and how to use them. In a similar study, Lattuca (2001) pointed out that researchers found it difficult to learn the language of new disciplines and to understand the theories used. Language and communication have often been cited as barriers to interdisciplinary research (Bracken & Oughton, ‘What do you mean?’ The importance of language in developing interdisciplinary research, 2006). This impairs communication by creating both false disagreement and false agreement’ (O’Rourke, Crowley, Eigenbrode, & Wulfhorst, 2014). Aboeela et al. (2007) found that in collaborative research, team members will often share a research problem and interact with one another but still prefer to employ their respective disciplinary methods, conceptual frameworks, and languages. That is because researchers and scientists in a particular discipline learn to speak the specific language of that discipline and adopt its methodological approaches. Moreover, researchers rarely read outside the discipline in search of new information and new metaphors that can increase the precision and comparability of their own work.

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Successful collaboration between different interdisciplinary cannot occur unless this barrier is overcome (Sigma, 1998). The potential for “disciplinary distrust” interfering with interpersonal communications within interdisciplinary research teams is too often realized (Bracken & Oughton, 2006). However, communicating with another discipline requires time and effort to get acquainted with other disciplines. In a study conducted by Winkel, Ketsopoulou, and Churchouse (2015) the participants reported that when attending presentations in interdisciplinary events, they feel there is a lot of jargon in there and they find it difficult to follow what is said and thus lose the key message. In order to alleviate the communication problems which hinders interdisciplinary research, terminology need to be clarified. Szostak (2014) proved that breaking complex concepts, which are not shared across groups into basic concepts can facilitate interdisciplinary communication. Therefore, team members not only share a common question but also often exchange methods, create a common conceptual framework, and either learn each other’s disciplinary language or create a new common language.

According to Richards (2015), the effects of terminological dissonance are substantial in today’s interdisciplinary era. For example in the Information Technology field, if a web developer and a graphic designer work together on a website, differences in terminology such as “interface” can alter a project. The consequences become more severe in collaborations that pair technologists and the caretakers of life and death; medical systems, traffic control, emergency response, and disaster recovery are just few of the fields that use technology heavily. Failures to communicate between the designers and the users of critical systems can result in catastrophic failures. These communication failures happened because different terms refer to the same concept, or one term is overloaded with multiple meanings.

TIME BARRIERS

Unlike research studies in a particular discipline, interdisciplinary studies require more time, on account of the complexity of the issue addressed, team work and collaboration among different disciplines and on account of methodological pluralism. Often time constraints are recognized as one of important barrier in interdisciplinary research. It is included in methodological barrier, since time constraint results in either cutting down the scope of activity or pose challenges to the research approach. The issue is addressed in researches that include Griffin, Medhurst and Green (2006) in which it is mentioned that successful outcomes of collaborative work, which crosses disciplinary boundaries, needs more time. Similarly, Pfirman and Martin (2010) opined that interdisciplinary studies takes extra time for building consensus and for learning new methods, languages and cultures. Joyce Tait and Catherine Lyall (2001) commented that there is a need to schedule more time for networking and building interdisciplinary element from the outset.

Kahn and Prager (2004) opined that disciplines also have their own language and terminology which can be a barrier to communication when collaborating across disciplines. It often takes time, effort and self-confidence to establish effective communication across disciplines. Ledford (2008) commented that interdisciplinary studies are more time-consuming, difficult and risk compared to studies involving a single discipline. Further, in interdisciplinary studies, certain disciplines, on account of the importance in the problem under study, may take more time compared to other disciplines, which may create conflict, if not agreed upon by others. It is important that the research process is deliberated and agreed upon by the members so that the risk elements can be removed or minimized.

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Effective interdisciplinary integration takes time and this can have an impact on perceived value for money of projects. In another research study Bruce et al. (2004) stated that effective interdisciplinary research requires the research team to take time to explore a range of dimensions, to test several potential boundaries to a problem until apparently optimum boundary and a set of dimensions has been identified.

DIVERSE MOTIVATIONS

While motives for interdisciplinarity vary, they reflect different consequences of studying complex systems, not different kinds of interdisciplinarity (Newell, 2001). Each discipline will view the consequences based on their disciplinary framework, which may not be in alignment with the overall framework of the study. The motives for collaborative research may be perceived as normal in some disciplines but not others. This effect the researcher' willingness to develop the skills needed for interdisciplinary collaborative research which might be different from disciplinary research. These differences in traditions can lead to problems such as the choice of the research methods (Siedlok & Hibbert, 2014) which results in tensions among the team members, thereby hindering collaborative research.

Without a common framework, it is difficult for scholars from different disciplines to see how diverse fields, approaches and methodologies relate and fit together (O'Brien, 2010). Aram (2004) opined that claims of interdisciplinarity are dependent upon the clarity and distinctiveness of particular disciplinary boundaries. These boundaries and disciplinary assumptions contribute to different expectations of individual disciplines from interdisciplinary studies. Although drives to conduct the research inspires interdisciplinary collaborations, it also suggest that the researcher is frustrated with the limits of own discipline (Aboelela et al., 2007).

Newell (2001) further stated that there are diverse motivations for interdisciplinary studies, such as;

- General and liberal education
- Professional training
- Social, economic, and technological problem solving
- Social, political, and epistemological critique
- Faculty development
- Financial exigency (downsizing)
- Production of new knowledge

Other researchers (e.g. Beaver, 2001; Bruce et al., 2004; Van Rijnsoever & Hessels, 2011; Frost & Jean, 2003; Aboelela et al., 2007) have also found other motivation factors for conducting interdisciplinary research such as social relations and compatibility with collaborators, personal development, personal networks, access to funds, intellectual stimulation, and re-energizing excitement. Similarly, interdisciplinary studies need to stimulate broad inclusion of researches from different disciplines. While different expectations from interdisciplinary are common, it act as a methodological barrier when these expectations leads to conflicts in methodology, practices and procedures followed in the study.

As rightly pointed by Lyall & Meagher (2008), whatever the motivations, it is important to agree on a shared understanding of the purpose and goals of the research amongst the team and to identify agreed project milestones.

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RECOMMENDATIONS

The growth of interdisciplinary studies in the past decade is remarkable and is becoming common. Interdisciplinary as a pervasive form of knowledge production asserts the growing belief that most of the future needs for research studies require integration of two or more disciplines, to deal with the problem that are beyond the scope of a single field of research practice. However, it is important to understand that the notion that anyone can do interdisciplinary studies is not correct. Larson et al. (2011) pointed out that there is a common assumption among researchers that anyone can engage in interdisciplinary research, but it is clear that successful interdisciplinary efforts require mastery of specific competencies that can be learned and improved. Interdisciplinary studies need more focused attention and efforts should be taken to address its various barriers and challenges, most notably the methodological barriers. Barriers and challenges in interdisciplinary studies is the result of conflict and challenging use of scientific terms and merging scientific paradigms. Bracken & Oughton (2006) concluded that the underlying reasons for this difference are powerfully held assumptions about natural and human systems; the lack of mutual understanding that lead to a lack of mutual respect among scientists and lack of commitment to interdisciplinary practices. Hence, researchers involving in interdisciplinary studies should realize these challenges and take appropriate measures to overcome the challenges.

Interdisciplinary studies require proper measures to assess its validity, quality and dependability. Often, indirect measures are used to assess the quality, and measures that directly address the epistemic dimensions (such as experimental rigor, ability to deal with complex problems in its entirety, validity of assumptions) are rarely considered (Mansilla & Gardner, 2003). Morillo et al. (2003) quoted 'we do not have appropriate indicators to measure interdisciplinarity'. It is important to develop 'criteria for judgment' while evaluating the quality of interdisciplinary studies. Such standards will help to minimize the methodological conflicts, as the criteria decides the methodological choices and the need for methodological pluralism, if any. It is also important to note that the indicators and standards for interdisciplinarity should be based on the nature and content of the research outcome, not based on the level of integration or the team's membership.

In order to overcome the barriers, researchers in interdisciplinary studies try to evade 'conflicting views' by disregarding some of the critical research questions. Such attempts hinder the purpose of interdisciplinary studies itself. Interdisciplinarity is necessitated by complexity, specifically by the structure and behavior of complex systems (Newell, 2001). The plurality of perspectives, paradigms and/or ideologies within disciplines will often perpetuate epistemological conflicts and disunity (Fuchsman, 2011) and should not be avoided for the purpose of cohesion in interdisciplinary, such views should be addressed and agreements should be reached. Those who involve in interdisciplinary research need to understand the various methodological barriers, so that admissible measures can be taken to mitigate these barriers and complete the studies in its entirety.

To address the barriers and challenges, researchers engaging in interdisciplinary studies should establish a common "language" and research method so that it will enable them to work jointly and utilize the potential benefits of cross-fertilization of different disciplines. It is also important that researchers in interdisciplinary studies should demonstrate working knowledge and mastery of research competencies shown to be important for successful interdisciplinary collaborations; apply theories and methods of multiple disciplines in developing an integrated theoretical and research framework; give and receive constructive feedback that will foster efficient and effective information exchange, strong working rela-

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tionships, internal commitment among team members; and modify the work and/or research agenda as a result of interactions with colleagues from other fields (Larson et al., 2011).

Riper et al. (2012) suggested that the methodological barriers and challenges can be addressed through:

- Recognizing the interdependence of science and societal concerns.
- Valuing all disciplines (social and natural) and honor the validity of each other's work.
- Using approaches to understand the complexity of interlinked natural and social systems.
- Illuminating the complexity and interdependence of the biosphere as a coupled natural and social system.
- Developing rigor and depth from the strengths of participating disciplines.
- Providing an adaptable approach in which teams are organized explicitly to address scientific questions and/or societal concerns, and which allows members to feel free to move on and off teams when appropriate.
- Sharing common vision, authority, responsibility, accountability, trust and ownership of the endeavor, and
- Communicating knowledge and understanding to society in a relevant, timely, and readily accessible manner.

Successful interdisciplinary studies is the result of effective teamwork. As evident, the role of collaborative team work is widely acknowledged in previous research studies (McCallin & McCallin, 2009). It is not an option, but a prerequisite for effective interdisciplinary studies. However, professionalism does not guarantee effective collaboration always. Successful teamwork requires: positive leadership and management attributes; communication strategies and structures; personal rewards; training and development; appropriate resources and procedures; appropriate skill mix; supportive team climate; individual characteristics that support interdisciplinary teamwork; clarity of vision; quality and outcomes of care; and respecting and understand roles (Nancarrow, et al., 2013).

The need for interdisciplinary studies are acclaimed in earlier researches, for example, in Riley (1978) claimed that 'never more than at the present time has there been a need for citizens to be able to focus the insights of various disciplines on the problems and issues which beset our collective existence'. One of the key recommendations to promote interdisciplinarity is to develop a liberal education encompassing interdisciplinary focus in the curriculum. Newell and William (1982) observed that interdisciplinary education should encourage the breadth of vision and develop the skills of integration and synthesis so frequently demanded by the problems of a culture in the midst of profound transition.

In educational institutions that promote interdisciplinary studies, Golde and Gallagher (1999) stressed the availability of advisors who are competent in multiple disciplines, in order for the student to succeed in their research activities. In a similar study by Butler (2011) based on interviews with faculty members, the author observed that interdisciplinary research fails mainly because of lack of team unit or unequal contribution by team members and by lack of respect for team members' fields of study, methodology or disciplines.

Higher education institutions (HEIs) are currently offering many interdisciplinary programs in their curriculum. These programs are intended to improve interdisciplinary understanding that improves the capacity to integrate knowledge and modes of thinking in two or more disciplines. Interdisciplinary stud-

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ies are more relevant in today's context, hence, such programs are highly recommended in universities and colleges. Golding (2009) recommended that interdisciplinary programs in HEIs should focus on building student skills to;

- Understand that there are several important disciplinary perspectives that are relevant to every environmental decision, such as from an engineer, zoologist, landscape sociologist and architect;
- Understand the perspective of each relevant discipline;
- Judge how important each perspective is for the issue at hand;
- Evaluate the evidence or reasons supporting each of the perspectives;
- Balance, weigh-up or accommodate the pressures from the different perspectives in order to reach a reasonable and creative decision or outcome;
- Make a case for why this decision or outcome is better than alternatives.

Students who complete such programs will be in a better position to undertake interdisciplinary studies withstanding the major challenges and barriers.

FUTURE RESEARCH DIRECTIONS

Successful interdisciplinary studies require collaboration, integration and synthesis among the team members. However, the methodological barriers inhibit such collaboration and integration since 'disciplinary focus' may compel diverse research design. Further studies need to be carried out to address these challenges in detail, so that a mechanism can be suggested to incorporate diverging research design and to break the boundaries of disciplinary focus. Studies focusing on developing criteria to evaluate the quality of interdisciplinary studies is also required. The authors recommends further research studies to understand the 'methodological barriers' in detail in specific collaborations, such as collaboration between natural science and social science, between information technology and psychology, biology and so on. Other studies can also look into which of the barriers mentioned in this chapter (differing methodological approach, conflicting research findings, methodological pluralism, terminological problems, time barriers, and diverse motivations) effect interdisciplinary study more and to what extent each of these factors effect successful interdisciplinary study.

CONCLUSION

Interdisciplinary studies, exploring complex societal problems, require equally complex, research approaches to generate possible solutions to such 'wicked problems' (Siedlok & Hibbert, 2014; Anzai, et al., 2012; Buanes & Jentoft 2009). Interdisciplinary approach transcends disciplinary-bound knowledge in the exploration of a more unified and realistic view of knowledge (Mathison & Freeman, 1997). Buanes and Jentoft (2009) argued that disciplinary organization of knowledge is contained in the development of systems of beliefs and values shared by researchers. A discipline is defined by setting the boundaries of a particular intellectual community. These boundaries restrict the type of questions that can be asked and methods that can be used if an inquiry is to be considered robust and rigorous research. Similarly,

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Fuchsman (2011) observed that the plurality of perspectives, paradigms and/or ideologies within disciplines will often perpetuate epistemological conflicts and disunity. In other interdisciplinary efforts, it is unlikely that common ground can be created, because the fields are incompatible, incommensurable or ideologically opposed. Hence, any integration of disparate disciplines to explore complex research areas naturally brings conflicting views. This research highlighted that interdisciplinary studies require extra skills and efforts for bridging the barriers, particularly the methodological barriers.

Interdisciplinarity is criticized as ‘parasitical’ and cannot exist without disciplines (Chettiparamb, 2007). Hansson (1999) argued that when institutionalized, interdisciplinarity ‘uses up’ disciplines. Though such arguments persist, the last few decades witnessed considerable increase in the number of initiatives aiming to promote the development of knowledge through collaboration and integration of theories in various disciplines. These initiatives are pivotal in addressing many of the problems faced by the society. Add to this, research centers, higher education institutions, and other governmental and non-governmental organizations started ventures and centers, programs and courses, to promote interdisciplinary studies.

In addition, scholars have increasingly recognized the need to link disciplinary fields on the axiom that interdisciplinary studies is more able to respond to pressing societal questions or to deal with a particular problem. For instance, health may not be adequately studied through a single disciplinary framework. Instead, poor health results from a constellation of factors: malnutrition, bad eating habits, genetics, age, poverty, ignorance, pollution, environmental conditions, and peer pressure (Chavarro et al., 2014). It highlights that interdisciplinary studies are not an option, but a necessity many times.

Interdisciplinary studies promote creativity and innovation. The approach is unique, as the research issue is considered with all its complexity, and perspectives from different disciplines is taken care of. The methodological barriers discussed in this chapter highlight the need for ‘consensus’ in the collaboration among various disciplines. Many of methodological issues addressed are primarily results from the differing methodological focus, terminological issues and methodological pluralism. Though the differences cannot be marginalized, ‘acknowledging’ the differences and collaborating together for a social cause is highly recommended. As rightly pointed out by Knight et al. (2013) interdisciplinary studies promotes collaboration, which is a ‘good thing’, potentially offers a wide range of benefits and increased research achievements and increased research achievements. Maglaughlin and Sonnenwald (2005) opined that the strength of interdisciplinary scientific research collaboration is its capacity to bring together diverse scientific knowledge to address complex problems and questions. Lyall and Meagher (2008) observed that an effective interdisciplinary manager needs not only to exhibit leadership and possess research expertise but also be able to negotiate the collaboration from its earliest beginnings throughout the project.

In conclusion, this chapter offered theoretical understanding on different methodological barriers in interdisciplinary studies. In doing so, the authors highlighted the contributions from prominent researches and elaborated the views addressed in these researches to support the arguments. The analysis of methodological barriers to interdisciplinary studies highlighted that the issues and conflicts mainly arise from the tension existing between the disciplines to adhere to a common research method on account of the diverse nature of the assumptions, theories and practices of individual disciplines. Interdisciplinary is the ‘need of the hour’. Interdisciplinarity is necessitated by complexity, specifically by the structure and behavior of complex systems. Today’s complex issues such as global warming require interdisciplinary studies. Hence interdisciplinary studies need to be promoted and the ‘integration’ and ‘collaboration’ should be strengthened among disciplines. In order to promote interdisciplinary research, it is important to understand the distinct sources or areas of conflict among various disciplines so that

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potential solutions can be identified more critically and objectively. Future research studies are required to explore a mechanism to improve interdisciplinarity and to set a criteria to measure its validity, quality and dependability.

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KEY TERMS AND DEFINITIONS

Disciplinary Focus: The attention given to ‘own discipline’ in interdisciplinary studies, which limits the researcher to study isolated variables rather than the systems of interrelationship between the clusters of variables.

Disciplines: The socially constructed conventions that have their own ideological and institutional structures.

Interdisciplinarity: Research that involves integrating two or more disciplines, looking into a problem in its entirety.

Methodological Barriers: The challenges faced in interdisciplinary studies due to conflicting methodologies in an interdisciplinary study.

Methodological Pluralism: The existence of different and diverging research methods in interdisciplinary studies.

Terminology: The different terms used in interdisciplinary studies.

Unidisciplinary Research: Research studies that is focused on one discipline.

Chapter 13

Utilizing the Dimensions of Religion to Analyze Social Media Campaigns

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ABSTRACT

The objective of the current chapter is to analyze one of the most recent and successful social media campaigns namely #NotInMyName from the viewpoint of the seven dimensions of religion utilized by Van Esch and others as the main pillar of social marketing and media campaigns. Further #NotInMyName Public Relations (PR) campaign is scrutinized for PR strategies and message strategies utilized in formulating the campaign messages. To achieve that end, a qualitative analysis was implemented on three levels relating to each video and vine of the study sample: first locating the Dimensions of Religion (DOR taxonomy(ies) used in this video or vine, then emanating on the PR campaign strategies implemented in the video or vine and finally searching for the message strategies utilized in the video or vine. The major conclusion of this study was that although campaigns launched via social media lack the scientific known steps utilized to plan and launch media campaigns traditionally, those campaigns derive from the social media platform exacerbating an unprecedented power to stir political and social movements especially, regarding controversial and stagnant matters. Posts, comments and shares on different social media platforms go viral, stir discussions, and trigger public opinion both virtually and in reality. Dimensions of Religion taxonomies proved reliability as a viable platform stemming from another discipline to plan messages and to analyze campaigns based on the different aspects the model would provide. Ranging from simple aspects to more complicated aspects, Dimensions of Religion model must be subjected to further research to determine its feasibility to be applied to different campaigning structures and objectives.

INTRODUCTION

Citing the seminal work of Locker (1993, 1994), Ha and Riffle (2015) asserted that interdisciplinary approach can help researchers reframe knowledge using other fields' models and terminology, thus reshaping knowledge into something more than in its original state. Research is interdisciplinary if it draws on

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theories from more than one discipline or field and employs complementary methods and fundamental knowledge from diverse fields and disciplines (Ha & Riffle, 2015, p. 570).

While an interdisciplinary approach seems desirable because it allows researchers to connect with larger conversations that span fields and disciplines and raise new questions for research, some interdisciplinary topics seem challenging for a variety of reasons mentioned in Ha and Riffle (2015). Nonetheless, the main challenge behind the current research is fear of misapplying concepts and methods from other fields especially whilst tackling a very sensitive topic.

Media campaigns have always been studied in light of their planning, theories, components, appeals or effects, which are mostly communication aspects. However, interdisciplinary research has been spotted in planning and executing campaigns beforehand from multiple disciplines. For instance, Keller and Otien (2007) analyzed an interdisciplinary campaign employing marketing, communication and education disciplines. Drury (2011) employed increasing interdisciplinary research on chronic pain conditions and the education of both health care professionals and the public in a women health campaign. Lister et al. (2015) combined communication with public health strategies in a campaign to engage communities. Kristen et al. (2016) utilized a phased, mixed-methods and interdisciplinary approach, which blends transportation research and marketing in a safety campaign. Those examples being mentioned, it seems obvious that assessing a campaign in light of such a delicate construct employing religious studies as a secular discipline is mostly unprecedented.

The current interdisciplinary paper resides to merge between the areas of campaigning strategies and messaging particularly via social media and the tabooed area of religious taxonomies from a secular viewpoint in order to construct a solid analytical base that can be further utilized in campaign planning and production of such controversial issues.

RESEARCH OBJECTIVES AND QUESTIONS

The objective of the current research is to analyze one of the most recent and successful social media campaigns namely #NotInMyName from the viewpoint of the seven dimensions of religion utilized by Van Esch and others (2013, 2016) as the main pillar of social marketing and media campaigns. Further #NotInMyName Public Relations (PR) campaign is scrutinized for PR strategies and message strategies utilized in formulating the campaign messages.

The main reason behind subjecting #NotInMyName campaign material to further analysis is due to its apparent success in gaining worldwide attention of at least 85000 people and 14000 tweets in less than a week from its launch early September 2014; converting it from a local community campaign to being honorably mentioned by former President Barak Obama - when addressing the UN general assembly - and former UK PM David Cameron as well (Hausam, 2014; living safe together Australian report).

The current research poses three major research questions as follows:

1. Which dimensions of religion (DORs) are utilized by #NotInMyName campaign?
2. What are the PR strategies depicted in the campaign videos and vines?
3. What are the message strategies utilized in the campaign videos and vines?

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RESEARCH METHODOLOGY AND SAMPLING PROCEDURES

This research is an exploratory attempt to qualitatively analyze #NotInMyName social media campaign through a detailed study of the campaign production. The campaign messages that were originally launched in September 2014 by Young British Muslims of the Active Change Foundation, then revived immediately after Paris attacks in November 2015 are analyzed utilizing three constructs: the dimensions of religion as an underpinning construct employed to analyze media campaigns, Public Relations reactive strategies employed in the campaign and the message strategies apparent in the campaign.

The sample of the current research consists of all the videos and vines that were produced by the Active Change Foundation (ACF) as part of the official footage of the campaign #NotInMyName, proceeded by #messages to ISIS and #all stand together - as follow up of the original campaign - thus making the study sample 2 videos including the main video of the campaign posted on the campaign website and 15 vines. Other recent videos assembled from the official You Tube channel after being certain they are produced by ACF not UGC (user generated content) through using the same youth characters and filming ammo mounted up to 9 videos as the final sample of the campaign along with the 15 vines.

The qualitative analysis was implemented on three levels relating to each video and vine: first locating the DOR taxonomy(ies) used in this video or vine, then emanating on the PR campaign strategies implemented in the video or vine and finally searching for the message strategies utilized in the video or vine.

The research will be divided into two parts: the first part tackles a theoretical background on #NotInMyName campaign and theoretical framework of the study. The second part tackles the major findings regarding analysis of campaign materials and answering research questions. Recommendations will follow.

THEORETICAL BACKGROUND

Campaign

The term campaign in its general usage means a “connected series of operations designed to bring about a particular result”. The public relations campaign is a “concerted effort of an organization to build socially responsible relationships by achieving research-based goals through the application of communicative strategies and the measurement of outcomes” (Kendall, 1996, p. 3).

One of the campaign types most closely related to the public relations campaign is the public communication campaign. Public communication campaign refers to “someone’s intention to influence someone else’s beliefs or behavior, using communicated appeals. It tends to focus on an immediate objective, such as stopping smoking or reducing crime and it relies primarily on mass communication”. PR campaign though seeks such objectives as a means of building relationships with constituencies that may be involved and while it may use mass communication, it relies on the complete spectrum of communication media. The difference is in orientation. (Kendall, 1996, pp. 6-7).

Social media campaigns though have a different definition as Zimmerman and Brown (2012, p. 289) asserted that a campaign is “a systematic course of aggressive activities used to attain more likes for your fan page. Those likes translate into existing and potential clients”.

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Social Media Campaigns

Campaigns via social media are important in coordinating activism, and the challenges of building and maintaining strong connections. Social media has enabled the explosion of dialogue and information sharing by both proponents and critics (Brickner, 2016). Social media are rapidly evolving, requiring a responsive and flexible approach when used for campaigning. Uniquely, Twitter for example offers a direct means of communication with hard-to-reach targets, such as celebrities, creating access opportunities that were previously difficult to imagine. Another advantage of social media is that it is possible to track how information is being shared, and then monitor audience reaction as Tweetreach to track and analyze the effect of our social media advocacy. The open accessibility of Tweetreach and Twitter means that it is possible to see who has engaged with information and their responses, allowing campaign information and strategies to be amended and tailored in real time (Helfer et al., 2013).

Islam is a religion of mercy for the entire humanity. It is imperative to present the true picture of Islam, and for this, we have to employ all the advanced means of modern information technology and promote Islam on social media (Al- Hamid, 2012). The online Muslim community has demonstrated its ability to identify and counter harmful speech, but it needs to take the next step and seek more constructive and productive solutions. Instead of taking to the streets, Muslims are rallying on Twitter, Facebook and Tumblr. Social media is helping American Muslims for instance to embrace and reflect the American culture of self-expression to counter bad speech (Uddin, 2014).

Overview of #NOTINMYNAME Campaign

Muslim activists from several streams mounted an extensive, international campaign on Social Media Networks (SNS) in early September 2014 to drive home the point that ISIS does not represent the Muslim majority and is distorting the true nature of Islam, which preaches values of tolerance and acceptance of the other. Young British Muslims from the Active Change Foundation charity organization (ACF) launched an English language online PR campaign against ISIS under the heading “Not in My Name”. The campaign was launched on September 10 with the video embedded at the top of the post. This PR video – that has been viewed more than 60,000 times during the first week of its launch - explained not only why ISIS does not represent Islam, but also that its behavior and practices actually violate the laws and values of Islam. (Barak, 2014; Franceschi-Bicchierai, 2014; SBS News, 2014).

ACF called on Muslims around the world to join together in order to bring an end not only to ISIS and its activities, but also to the radicalization it represents. Since then, Young Muslims from all over the world have taken to social media to protest against the Islamic State militant group, saying the extremists do not represent Islam, posting messages on Twitter and other social media platforms denouncing ISIS’ actions as un-Islamic, with the hashtag #notinmyname. The social media campaign has since then gained steam with more than 14,000 tweets in only seven days from its launch (Zakir, 2014; ABC News, 2014; Franceschi-Bicchierai, 2014; SBS News, 2014).

In a comment on the campaign hashtag, Essert (2014) said: “It’s a simple but to-the-point hashtag that does an excellent job of summing one of the biggest problems of the increasing popularity and notoriety of the Islamic State: a glaring misrepresentation of an entire faith. As much as the Islamic State wants to claim it’s defending its religion and people, the fact of the matter is that it’s not, and it’s very important for people to clearly see the difference between the Islamic State terrorist group and the Islamic religion”.

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The campaign has been launched in the wake of the murder of David Haines the British Aid Worker, in a series of violent murders committed by ISIS since the organization's rapid spread throughout Northern Iraq and Syria earlier in 2014 (May, 2014; Naegelen, 2014).

Former President Barack Obama singled out this powerful campaign rejecting the actions of Islamic State militants in Iraq and Syria. Speaking at the United Nations General Assembly, Obama cited the #notinmyname campaign started by the ACF who have come together to take a stand against brutal violence espoused by the terror group; instead spreading a message of peace online, using the same social media platforms that the terrorist group are using to propagate hate - and it hasn't gone unnoticed by the President of the United States at the time (Meredith, 2014).

In July 2015, a follow up campaign was launched by ACF encouraging people to tell militants from the so-called Islamic State terrorist group exactly what they think of them. The Active Change Foundation (ACF) encouraged social media users to use #MessageToIsis alongside tweets, selfies, vines and any other formats to give the terror group a piece of their mind and show that they are not scared of them. (Harris, 2015).

#NotInMyName campaign was revived strongly following Paris Attacks in 13/11/2015. "As the terrorist attacks erupted in Paris, people throughout the world mourned with France, and appalled Muslims turned to social media using the hashtag #NotInMyName" (Pratt, 2015). Reviving the #NotInMyName hashtag campaign, many Muslims are sending messages and posting images that ISIS, the group claiming responsibility for the attacks that killed over 129 people and left 352 injured, does not represent Islam (Brown, 2015; Faget, 2015).

In light of Paris attacks, ACF revived #MessageToISIS hashtag campaign which represents a "direct message to ISIS that everything they stand for is wrong, and that trying to wear us down or scare us will only make us stronger". Twitter users have picked up on the campaigns, using them to send their own messages against the attacks (SBS News, 2015).

Since then Muslims worldwide have resided to the hashtag to condemn and denounce every terrorist attack launched under the name of Islam. Finally wrapping up (due to the time period of the current research analysis that ends 15 June 2016) with Orlando Shootings Sunday June, 12 after which Social media have been ablaze with posts bearing the hashtag #NotInMyName, with Muslims across the world calling for peace and refusing to be stereotyped after the devastating Orlando attacks. In the aftermath, many Muslims took to Twitter and Instagram to express empathy for the victims using the hashtag #NotInMyName. The hashtag, which has been used after previous hate crimes, is a reminder that violence is not condoned in the religion (Glover, 2016; Gouveia, 2016).

The campaign has been categorized by the Australian Government as one of the most successful campaigns launched via social media against violent extremism for "challenging negative views in positive ways" (living safe together Australian report).

ANALYTICAL CONSTRUCTS

The current research tends to analyze not in my name campaign according to three major theoretical constructs: Dimensions of Religion (DOR), Reactive Public Relations Campaign Strategies and Campaign Message Strategy.

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Dimensions of Religion (DOR) taxonomies

The current research intends to use the seminal and widely accepted works of Ninian Smart's seven dimensions of religion as outlined by (Van Esch, P., 2013: 96-106 and Van Esch, 2016) which help characterize the constructs and under-pinning themes of religion(s) and their existence in the world today.

The seven dimensions of religion are: (1) The practical and ritual dimension (2) experiential and emotional dimension (3) narrative or mythic dimension (4) doctrinal and philosophical dimension (5) ethical and legal dimension (6) social and institutional dimension and (7) the material dimension (Smart, 1999, pp. 10-11)

Practical and Ritual Dimension

This is the aspect of religion, which involves such activities as worship, meditation, pilgrimage, sacrifice, sacramental rites, healing activities, preaching and prayers, which fulfil a function in developing both spiritual awareness and ethical insight.

Experiential and Emotional Dimension

It is obvious that certain experiences can be important in religious history as the prophetic visions of Mohamed (peace be upon him). It mainly deals with evoking religious feelings including but not limited to: assurance of salvation, awe, bliss, brilliant emptiness, comfort, devotion, direct experiences of the divine, dread, ecstasy, enlightenment, expanded sense of identity, guilt, inexplicable presence, inner peace, liberation, mystery, security and visions.

Narrative or Mythic Dimension

Myths are the sacred stories, which pass from generation to generation and from a religious perspective refer to stories about "The Sacred". They are sacred because such stories work on several levels to amalgamate the narratives and explain what a particular tradition believes through a systematic and complete interpretation of God, the nature of humans and their place in the universe. Delivered orally or written, the stories may have historical accounts mixed with symbolism.

Doctrinal and Philosophical Dimension

Many religions have a philosophy or system of doctrines, a systematic formulation of religious teachings and beliefs in an intellectually coherent form that maybe written down in a sacred text or orally transmitted about the nature of divinity or ultimate reality and the relationship of humans to that ultimate, real, divinity.

Doctrines play a significant part in all religions, because faith has to 'become' which then requires a type of intellectual statement as the basis of the faith. The values of a tradition can be both positively and negatively affected by its doctrines because it is the doctrines that provide a type of worldly view whilst addressing the ultimate question of salvation.

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Ethical and Legal Dimension

A religious tradition or sub tradition affirms not only a number of doctrines and myths, but also some ethical and often legal imperatives. The ethical and legal dimension focuses on laws in which a tradition incorporates into its fabric, which is both formal and informal, either written or orally transmitted which followers are expected to adopt. Furthermore, evident in every tradition are sets of rules, guidelines or behavioral precepts for conduct according to which the community, employees, employers, consumers, producers and citizens at every level of existence judge a person depending on the level of conformity to those precepts. In Islam the Shari'a is the main source of this dimension.

Sharia is Arabic for Islamic Law. The word has gained lots of negative publicity lately that some countries would use the word Islamic principles instead and some will not even refer to the term (see: Selby, 2013).

Social and Institutional (Organizational) Dimension

A religious tradition or belief system that is a sort of social organization with shared and implied attitudes practiced by the group, which is self-perpetuating. As with any religion, there are often rules for identifying community membership and participation in public but may also contain individuals who are exemplary or religious specialists (gurus, lawyers, pastors, imams...etc.). Smart suggests that the teachings of the tradition/belief system are preserved and passed on through the social organization, which almost inevitably becomes incarnate in material form such as buildings, cities, idols, other creations, places of worship, symbols and works of art.

Organizations surrounding a religion can be truly complex and formally organized which allows for a sense of normative values and group bonding. Therefore, religions could be considered a necessary component of a functioning society since they supply rules to live by and importantly, a community to live in.

Material or Artistic Dimension

Ordinary objects or places that symbolize or manifest in material form that help connect the believer to the sacred. A religion will express itself typically in material creations, from chapels to mosques. Recognizing the fact that there are often many specific religious artefacts from a material perspective, the relative importance of these varies from religion to religion. Consequently, a better understanding must prevail on the effects of sacred objects, sacred tourism, pilgrimage and sacred areas and/or places.

Utilizing dimensions of Religion as an underpinning construct in different campaigns was tackled practically twice, by Van Esch et. al. (2013) and Van Esch (2016). The first was a theoretical research using 'religious affiliation' statistics to indicate that such a high percentage of people are connected with religion, therefore; if the dimensions of religion could be used/incorporated into mass media social marketing campaigns, the successful achievement of mass voluntary behavior change could occur in Australia.

Further investigation occurred with 2016 research where Van Esch wondered whether the seven dimensions of religion (DOR) could be identified within five Australian mass media social marketing campaigns and campaign planners views of implementing DOR and their effect? The research proved via qualitative analysis and in-depth interviews that dimensions of religion can be utilized in such cam-

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paings especially the practical and ritual dimension, experiential and emotional dimension, doctrinal and philosophical dimension, ethical and legal dimension and finally social and institutional dimension.

Proactive vs. Reactive Public Relations Strategies

Proactive strategy means that: an organization takes the initiative to engage its publics. Such a proactive strategy enables an organization to launch a communication program under the conditions and according to timelines that seem to best fit the organization's interests.

There are two types of proactive strategies: action and communication. Under action, key proactive strategies are organizational performance, audience engagement, special events, alliances and coalitions, sponsorships, strategic philanthropy and activism. Under communication, key proactive strategies are publicity, generating new newsworthy information and transparent communication (Smith, 2013, pp. 113-114).

Reactive strategy though is the current field of study because all Islam image campaigns were never proactive. Conversely, a reactive strategy responds to influences and opportunities from an organization's environment. In responding to outside forces, organizations should develop objectives such as gaining public understanding, maintaining and restoring reputation and rebuilding trust and support (Smith, 2013, p. 144).

The following represents the whole range of Reactive strategies presented by the researcher through organizing Smith's work (144-171). (For matters of preciseness and summation, only reactive strategies discovered relevant through the analysis will be detailed hereafter):

Reactive Strategy 1: Pre-Emptive Action

One type of strategy involves a pre-emptive strike, which is taken before the opposition launches its first charge against the organization.

Reactive Strategy 2: Offensive Response

Public relations planners sometimes use offensive response strategies such as attack, embarrassment, shock, or threat in the response to criticism. Here is an overview of each of these strategies.

Attack

An attack is an offensive response strategy of claiming that an accusation of wrongdoing is an attempt to impugn the organization's reputation by an accuser who is negligent or malicious. Often the objective behind this strategy is to encourage an opponent to retreat or at less to refrain from future criticism.

Embarrassment

A related offensive strategy deals with embarrassment, in which an organization tries to lessen an opponent's influence by using shame or humiliation.

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Shock

Sometimes, in an effort to make point, embarrassment may take a turn toward alarm. In public relations and strategic communication, shock is the deliberate agitation of the mind or emotions, particularly through the use of surprise, disgust or some other strong and unexpected stimulus.

Threat

Making a threat is another offensive strategy, involves the promise that harm will come to the accuser.

Reactive Strategy 3: Defensive Response

Another strategic communication response involves defensive response strategies such as denial, excuse or justification, all of which involve the organization reacting less aggressively to criticism. Reversal though is the sub-strategy of importance. The phrase “turning the tables” come from table game such as chess or backgammon. In public relations, this is an apt analogy for strategic reversal, in which the weakened party becomes the stronger one. It is a strategy in which an organization that finds itself under criticism, gains the upper hand.

Reactive Strategy 4: Diversionary Response

Several diversionary response strategies also are open to communication planners. They include concessions, ingratiation, disassociation and relabeling, all of which are attempts to shift the gaze of the publics from the problem associated with the organization.

Reactive Strategy 5: Vocal Commiseration

Another family of strategies deals with vocal commiseration, in which the organization expresses empathy and understanding about the misfortune suffered by its public. These include concern, condolence, regret, and apology.

Reactive Strategy 6: Rectifying Behavior

A positive response to opposition and criticism involves rectifying behavior strategies, in which the organization does something to repair the damage done to its public. These include investigation, corrective action, restitution and repentance. Corrective action is the sub-strategy in hand. A stronger rectifying behavior is corrective action, which involves taking steps to contain a problem, repair the damage, and/or prevent its recurrence.

Reactive Strategy 7: Deliberate Inaction

The final category of public relations responses involves deliberate inaction, the considered decision by an organization under siege to offer no substantive comment through perhaps to take some action (strategic silence), to respond vaguely and indistinctly (strategic ambiguity) or to say and do nothing and let the problem blow over (strategic inaction).

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Message Strategy

In campaign planning developing the message strategy is a step of maximum importance which Smith (2013, pp. 178-201) elaborated into categorizing it further into three major types:

1. **Ethos:** Is communication effectiveness based on the character of the speaker and on the common ground shared by speakers and audiences. The three Cs of ethos effective communication are:
 - a. **Credibility:** Power to Inspire Belief (status – expertise – honesty – competence)
 - b. **Control:** Power of command (power – scrutiny – authority)
 - c. **Charisma:** Power of personal charm (familiarity – likability – similarity – attractiveness)
2. **Logos:** Focusing on the content of the message, there are messages based on logic and messages based on sentiment. Logos are messages appealing to reason. Communication effectiveness based on the rational appeal of the message was known to the ancient Greeks as logos. There are four different propositions or claims encountered in this logic argument:
 - a. Factual proposition states that something exists, based on provable evidence. The communication objectives intended are focused on awareness, which seek to increase attention or build greater understanding.
 - b. Conjecture proposition states that something probably exists, based on reasoned conclusion drawn from physical evidence. The communication objectives consider dealing with acceptance and fostering supportive attitudes.
 - c. Value proposition identifies the virtues and follies of something. The communication objectives here as the last proposition consider dealing with acceptance which try to increase interest or build positive attitudes.
 - d. Policy proposition identifies a course of action and encourages its adoption. Policy claims often reflect objectives associated with opinion and action.
3. **Pathos:** Focusing on the content of the message, there are messages based on sentiment known as pathos. An important part of the communication strategy is to link the message to an emotional appeal, either positive or negative. Positive emotional appeals seek to generate responses based on a variety of positive emotions on love, virtue, humor and sex.

Some messages invoke responses based on negative emotions: fear, guilt and hatred.

MAJOR FINDINGS

The second part tackles the major findings regarding analysis of campaign materials resulting from extensive qualitative analysis of 9 videos and 15 vines according to the DOR taxonomies, Reactive PR strategies and message strategies. Reliability of the results was confirmed by the researcher in re-analysis within 15 days of the preliminary analysis.

Table 1 discusses each video separately.

Major Findings of Video Analysis were as follows:

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Table 1. Discussion of each campaign video

No	DOR	PR Strategy	Message Strategy
1- Main Video: ISIS don't represent British Muslims first published (10/9/2014)	All DOR taxonomies were employed in this 1:19 minute video for stating all the traits of Islam covering the seven dimensions.	<ul style="list-style-type: none"> • Offensive strategy was used in its sub-categories: attack of ISIS ideologies, embarrassment through shaming their thought, and shock of their actions. • Defensive strategy was also apparent in the sub-category reversal utilized in the title "not in my name" that turned tables on the opponent. • Rectifying behavior strategy was evident through its sub- category corrective action asking Muslims to unite to take a step to contain the problems and repair the damage through image restoration of Islam. 	<ul style="list-style-type: none"> • Ethos strategy was emphasized relating to charisma in its sub category similarity using different youths from different backgrounds. • Logos was utilized through the factual proposition and value proposition stating the virtues of Islam. • Pathos was also apparent based on positive emotions towards Islam and negative emotions, basically hatred for ISIS's actions.
2 Join thousands of Muslims saying #not in my name to ISIS	Published October 10 2014, the 3:22 minute video, presented practical ritual dimension and the experiential emotional dimension.	Offensive strategy, defensive and rectifying behavior were similarly used as the former video.	<ul style="list-style-type: none"> • Ethos strategy relating to credibility and control filming famous political leaders and charisma were broadcasted. • Logos and Pathos were utilized exactly as the former video.
3 #All stand together uniting with Paris against Extremism	Published January 23 rd 2015, the 1:10 minute video included all DOR dimensions to show that ISIS doesn't represent Islam.	Offensive strategy and rectifying behavior were similarly used as the former video without residing to defensive strategy.	<ul style="list-style-type: none"> • Ethos strategy relating to charisma only was presented • Logos and Pathos were similarly employed as the previous two videos.
4 ACF #All Stand Together Against ISIS	Published February 4 th 2015, the 1:05 minute video again employed all DOR dimensions to show that ISIS does not represent Islam, on the contrary represents inhumanity.	Offensive strategy and rectifying behavior were similarly used as the former video without residing to defensive strategy as previously mentioned.	Ethos, Logos and Pathos were similarly employed as the previous video suggesting a constant message tonality of the campaign.
5 #Message to ISIS: Enough is enough	The video published in July 3 rd 2015 and lasted for 1:03 minutes posted message to ISIS through graffiti, balloons and paper kites. DORs were related to practical ritual dimension, emotional experiential dimension and doctrine philosophical dimension.	Offensive strategy and rectifying behavior were similarly used as the former videos.	Ethos, Logos and Pathos were similarly employed as the previous videos suggesting a constant message tonality of the campaign.
6 #Message to ISIS: Global Condemnation	The video published in July 17 th 2015 and lasted for 1:09 minutes was a new filming style depending on footage of demonstrations all around the world condemning ISIS. All DORs were used to represent Islam's true face.	Offensive strategy and rectifying behavior were similarly used as the former videos.	<ul style="list-style-type: none"> • Ethos strategy relating to credibility and control filming famous leaders and charisma were broadcasted as the analysis of the second video. • Logos and Pathos were utilized exactly as the former videos.
7 ACF Young leaders send their #message to ISIS	The video published in August 14 th 2015 and lasted for 0:52 seconds filmed ACF young leaders sending special messages to combat terrorism utilizing all DORs to represent Islam.	Only offensive strategy was used in its sub-categories: attack of ISIS ideologies, embarrassment through shaming their thought and shock of their actions.	Ethos, Logos and Pathos were similarly employed as most of the previous videos suggesting a constant message tonality of the campaign.
8 #Message to ISIS: Get Involved	The video published in September 4 th 2015 and lasted for 1:01 minutes posted messages to ISIS through young people. No DOR was located in this footage.	Offensive strategy and rectifying behavior were similarly used as the former videos.	<ul style="list-style-type: none"> • Ethos and Pathos were similarly employed as most of the previous videos • Logos though was apparent through Policy proposition to identify a course of action via speaking out against ISIS.
9 #Message to ISIS: The world as one against you2	The video published in December 11 th 2015 and lasted for 1:34 minutes depended on footage of demonstrations all around the world condemning ISIS in different languages after Paris Attacks. No DORs were employed.	Offensive strategy and rectifying behavior were similarly used as the former videos.	Ethos, Logos and Pathos were similarly employed as most of the previous videos suggesting a constant message tonality of the campaign.

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- Some videos represented all DORs, others didn't tackle any DORs and a few tackled some of the 7 taxonomies, *mounting both practical ritual dimension and emotional experiential dimension to the top dimensions used followed by the doctrine philosophical dimension.*
- Offensive reactive strategies were mostly used throughout the campaign videos followed by the Defensive reactive strategies in the sub-category reversal apparent in the title not in my name that turned tables on the opponent ISIS. Other videos not carrying not in my name title mostly adopted Rectifying behavior strategy that was evident through its sub- category corrective action to stop this group, contain the problems and repair the damage. This unity is normal in fulfilling campaign objectives.
- Message strategies were almost consistent throughout #NotinMyName campaign followed by #MessagettoIsis and #AllstandTogether follow up campaigns. Ethos strategy focused on charisma in its sub category similarity using different people from different backgrounds to shoot the footage; for the purpose of empathy arousal of different people especially youth around the world. The videos rarely showed Political celebs, thus using credibility and control ethos aspects.
- Logos was apparent in appealing to reason through the factual proposition stating the truth about ISIS mostly throughout the campaign; other sub-strategies were also utilized though not frequent, regarding the straightforward messages of the campaign denying Islam's relation to ISIS and asking people around the world to face terrorism.
- Pathos was also apparent based on positive emotions towards Islam's messages of peace and coexistence and negative emotions, basically hatred for ISIS's terrorism, resentment and denying extreme actions.

The following table analyzes 15 vines posted onto the campaign website all dated October 1st 2014. A vine is a twitter micro-video with a time limit of six seconds per video. The 15 vines show 15 different male youths citing quick reasons why ISIS does not represent them. All the vines belong to the main campaign #notinmyname contrary to the longer videos. The analysis will be in the order of the vines posted onto the website as shown in Table 2.

Major Findings of Vine Analysis were as follows:

1. Vines had some unified themes presented by different young people 6 seconds each. 4 of the 15 vines mentioned killing innocents, 2 asserted that Islam is a religion of peace, 2 confirmed that ISIS tampers with Mosques and Shrines and 2 mentioned peaceful coexistence. Other vines tackled single ideas.
2. All vines represented DORs except one. The rest differed in the number of DORs represented in each: mostly only one and some more than one. The presence of less DORs than the videos is normal since vines are only six seconds each, while the shortest video analyzed was 52 seconds.
3. All DORs were used in vines in different percentages. The most used DOR was the *experiential emotional dimension as with videos, followed by the social institutional dimension, followed by the Doctrine Philosophical dimension that also ranked third in videos.*
4. Offensive reactive strategies were mostly used throughout the campaign videos followed by the Defensive reactive strategies in the sub-category reversal apparent in the title not in my name that turned tables on the opponent ISIS, relating to their actions not being in the name of Islam. Similar results were located in videos carrying the title #notinmyname. This unity is normal in fulfilling campaign objectives.

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Table 2. Analysis of vines posted onto the campaign website

No	DOR	PR Strategy	Message Strategy
1-2-3-4 (same message transmitted via different characters)	Experiential & Emotional aspect relating to evoking religious feelings connected to killing the innocent that is forbidden in Islam	Offensive and defensive strategies were similarly used as per the longer videos.	<ul style="list-style-type: none"> • Ethos strategy and Logos strategy were employed as per most of the longer videos • Pathos though was apparent based on negative emotions only basically hatred for ISIS.
5-6 (same message transmitted via different character)	Social and institutional aspect was employed relating to bonding and peaceful coexistence between community members.	Offensive and defensive strategies were similarly used as per previous vines.	<ul style="list-style-type: none"> • Ethos strategy was constant. • Logos was apparent through the Conjecture proposition based on reasoned conclusion drawn from physical evidence of peaceful coexistence. • Pathos depended on fostering positive emotional appeals only.
7-8 (same message transmitted via different characters)	The material aspect relating to mosques as sacred shrines being tampered with.	Offensive and defensive strategies were similarly used as per previous vines.	<ul style="list-style-type: none"> • Ethos strategy seemed constant and Logos utilized the Factual proposition as per most of the campaign messages. • Pathos was also apparent based on negative emotions only, basically hatred.
9-10 (same message transmitted via different characters)	Islam is a religion of peace implies a set of DORs as one of the most prominent rules of Islam: the practical and ritual dimension, the experiential and emotional dimension, doctrinal and philosophical dimension, ethical and legal dimension and social institutional dimension.	Offensive and defensive strategies were similarly used as per previous vines.	<ul style="list-style-type: none"> • Ethos strategy seemed constant and Logos utilized the Factual proposition as per most of the campaign messages. • Pathos depended on fostering positive emotional appeals only.
11	Believing in the rights of women and minorities presents the DOR: practical ritual, experiential emotional and social institutional dimensions.	Offensive and defensive strategies were similarly used as per previous vines.	Ethos strategy, Logos and Pathos utilized similar sub-categories as the last vine.
12	Challenging the Caliphate system of ISIS reflects the institutional dimension of rule.	Offensive strategies were similarly used as per previous vines.	Ethos strategy seemed constant and Logos utilized the Factual proposition, but Pathos depended on negative emotions, basically resentment.
13	“This is not the Islam I recognize” is a general statement implying utilizing all the seven dimensions of religion that mark Islam.	Offensive and defensive strategies were similarly used as per previous vines.	Ethos strategy seemed constant and Logos utilized the Conjecture proposition as some past vines, and Pathos depended on negative emotions, basically resentment.
14	“ISIS are not helping anyone but themselves” doesn’t include any DOR	Offensive and defensive strategies were similarly used as per previous vines.	Ethos strategy seemed constant and Logos utilized the Factual proposition, while Pathos depended on negative emotions, basically resentment.
15	“True Muslims help people in need not prosecute them” indicates usage of: practical ritual dimension, emotional dimension, doctrine philosophical dimension and social dimension.	Offensive and defensive strategies were similarly used as per previous vines.	<ul style="list-style-type: none"> • Ethos strategy is consistent all over the vines. • Logos apparent through the factual proposition and Pathos was also apparent based on positive emotions of help and altruism and negative emotions, basically resentment.

5. Message strategies were almost consistent throughout #NotinMyName campaign. Ethos strategy relating to charisma in its sub category similarity using different people from different backgrounds to shoot the footage was apparent in all vines.

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6. Logos was apparent in appealing to reason through the factual proposition stating the truth about ISIS mostly throughout the campaign; other conjecture sub-strategy was also utilized though not frequent. Conjecture proposition stated that something probably existed, based on reasoned conclusion drawn from physical evidence dealing with doctrine and Islamic Values.
7. Pathos was also apparent based on positive emotions towards Islam's messages of peace and co-existence; and negative emotions, basically hatred for ISIS's actions, resentment and denying their actions.

ANSWERING RESEARCH QUESTIONS AND DISCUSSION

The following lines will hold the answer to the three key research questions followed by a general discussion and conclusion:

1. Which dimensions of religion (DORs) are utilized by #NotInMyName campaign?
 - a. The current research spotted the seven DOR taxonomies with different proportions in most of the campaign messages relating to Islam pillars, virtues and doctrine proving the eligibility of Dimensions of Religion taxonomies to be executed in non- religious scientific fields as guidelines; paving the way for a new interdisciplinary study area .
 - b. Longer videos signaled all or most DORs, other shorter videos tackled one or a few taxonomies. Out of a sample of 15 vines and 9 videos, only one vine and two videos didn't display DORs.
 - c. The campaign videos utilized the practical ritual dimension and emotional experiential dimension the most followed by the doctrine philosophical dimension, while the campaign vines displayed the experiential emotional dimension as per videos, followed by the social institutional dimension, followed by the doctrine philosophical dimension that also ranked third in videos. This result was consistent with what Van Esch uncovered in 2016 that practical and ritual dimension, experiential and emotional dimension, doctrinal and philosophical dimension, ethical and legal dimension and finally social and institutional are mostly the dimensions utilized when organizing campaign messages.
 - d. The extensive usage of the experiential and emotional dimension was expected in #NotInMyName Campaign, due to the nature of experiential and emotional dimension; being the most emotionally appealing positive taxonomy that could be utilized in such campaigns in order to evoke religious feelings related to: assurance of salvation, bliss, comfort, devotion, enlightenment, inner peace, liberation, mystery, security and visions. The campaign was built on such messages relating to compassion, love, peace and protecting the innocent, which matched the dimension perfectly denying ISIS all rights to speak in the name of Islam.
 - e. The doctrine philosophical dimension that was a common ground in both videos and vines as well relates to a systematic formulation of religious teachings and beliefs. All ISIS stands for is totally remote from the Islamic Doctrine, so how can they kill humans (God's sophisticated creations on earth) while shouting God is Great and how they argue for an afterlife in heaven while they are doing all the forbidden. These messages were intended to reach audience of the campaign in a simple direct ammo and judging from the fame of the campaign, it probably did.

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- f. Finally, agreeing with Van Esch (2013, 2016), that while the seven dimensions of religion help characterize the constructs and under-pinning themes of religion and their existence in the world today, there does not appear to be a definitive approach as to the way they can be professionally implemented in constructing campaigns, let alone their effect on message success. Moreover the casual tone of some campaign messages wouldn't give a chance for actual utilization of such crucial dimensions, which can be subject to more detailed future research.
2. What are the PR strategies depicted in the campaign videos and vines?
 - a. The campaign used reactive PR strategies that were consistent throughout the messages boosting the sense of unified message structure. Proactive strategies though would have been more effective detaching the campaign from the sense of random reaction to every terrorist or extremist endeavor. Followers of the hashtags tweeted such comments proving the reactive strategy of the campaign.
 - b. Offensive reactive strategies were mostly used throughout the campaign videos and vines: specifically attack of ISIS's ideologies, embarrassment of their actions that are defaming Islam and shock of their deeds.
 - c. The Defensive reactive strategy in the sub-category reversal was used wisely. Reversal was apparent in the title "not in my name" that turned the table on the opponent ISIS, so as not to tie their appalling actions to the name of Islam or any Muslim, so don't kill people, destroy mosques and terrify the innocent "in my name".
 - d. Other videos not carrying "not in my name title" from the follow-up campaigns mostly adopted Rectifying behavior reactive strategy that was evident through its sub- category corrective action asking people to take action to stop this group from defaming Islam. The message was well received as UGC (user-generated content) footage swamped the internet denouncing ISIS's terrorist deeds.
 - e. The analysis showed that the campaign used the Offensive reactive strategies followed by the Defensive reactive strategies followed by the Rectifying behavior reactive strategies. This unity is normal and successful in in fulfilling campaign objectives especially the Reversal sub-strategy.
 3. What are the message strategies utilized in the campaign videos and vines?
 - a. Message strategies were almost consistent throughout #NotinMyName campaign as evident with the PR strategies. Ethos strategy was used in the characters used to film the campaign footage. Different ages, sexes and backgrounds related to charisma in its sub category *similarity* to arouse empathy of different people especially youth around the world with the characters featured in the videos. Other Ethos strategy used only twice was credibility and control in two videos featuring political leaders of the world.
 - b. Logos was apparent in appealing to reason through the factual proposition stating the truth about ISIS mostly throughout the campaign so they are killing the innocent, destroying mosques and terrorizing countries and this is physical proof they are not representing Islam in any way possible.

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- c. The second Logos strategy used was the conjecture sub-strategy, though not frequent. Conjecture proposition states that something probably exists, based on reasoned conclusion drawn from physical evidence dealing with doctrine and Islamic traits. So messages stating that ISIS does not represent Islam without further reasoning are categorized under this sub-strategy. The campaign rarely used the value and policy propositions as the campaign projected simple messages and these last strategies are reflected in much-complicated messages.
- d. Pathos was also apparent based on both positive and negative emotions interchangeably. Positive emotions were evoked relating to Islam's messages of peace and coexistence and negative emotions, basically hatred for ISIS's actions, resentment and denying their deeds.

DISCUSSION

The major conclusion of this study was that although campaigns launched via social media lack the scientific known steps utilized to plan and launch media campaigns traditionally, those campaigns derive from the social media platform exacerbating an unprecedented power to stir political and social movements especially, regarding controversial and stagnant matters. Posts, comments and shares on different social media platforms go viral, stir discussions, and trigger public opinion both virtually and in reality.

Dimensions of Religion taxonomies proved reliability as a viable platform to plan messages and to analyze campaigns based on the different aspects the model would provide. Ranging from simple aspects to more complicated aspects, Dimensions of Religion model must be subjected to further research to determine its feasibility to be applied to different campaigning structures and objectives.

Utilizing Dimensions of Religion in such an interdisciplinary research to analyze a social media campaign into its seven taxonomies justifies the validity of residing to other sciences to study communication. Removing theories from their normal scientific contexts to execute them in other disciplines as communication proves the interdisciplinary nature of communication. Religious Studies is, however, interested in why people believe that their religious statements or experience is true, thus description, although vital, must "transcend the informative" and engage in dialogue with "the para-historical claims of religions and anti-religious outlooks". Residing to such sensitive and abstract constructs to study practical and vital variables as campaigns ensures the validity of the construct to be methodologically employed in another discipline given tuning of research procedures to fit the model in hand.

Waiting to launch those campaigns after tragic and disastrous events ousts efforts of their ultimate goals of image restoration and confines them to achieve temporary goals rather than permanent ones. A well planned Proactive PR campaign that teaches people abroad the true meaning of Islam; through full use of Islam DORs via employing well-organized long term objectives; can be launched using social media and offline acculturation activities as the Islamic awareness weeks, lectures, advocacy...etc. This move can help abandon the scant ineffective individual efforts to achieve more systematic collaborative endeavors thus maximizing the ultimate positive outcomes.

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KEY TERMS AND DEFINITIONS

Campaign: A connected series of communication operations employed to bring about a desired outcome.

Dimensions of Religion (DOR): Taxonomies categorized by Ninian Smart as a methodological secular construct that help characterize the under-pinning themes of religion(s).

Message Campaigning Strategy: The major component of every communication campaign and can be further divided into: Ethos, which is communication effectiveness based on the personality of the speaker and on the common ground between speakers and audiences; Logos which are messages appealing to reason; and Pathos which are messages appealing to emotions whether positive or negative.

Proactive Public Relations Strategy: Represents an initiative inaugurated by an organization to involve its publics in a pre-planned communication program.

Public Relations (PR) Campaign: An orchestrated effort launched by an organization to establish widely acceptable relationships through achieving pre-set goals.

Reactive Public Relations Strategy: Responds to influences from an organization's environment such as gaining public understanding, maintaining and restoring reputation and rebuilding trust.

Vine: A short form video service where users could share six-second looping video clips. Vines comprised themselves as major and primary components of #Not in My Name Campaign.

Section 4

The Case for Interdisciplinary Education

Chapter 14

Historical Development of the Interdisciplinary Studies

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ABSTRACT

In a fast-changing world, which depends on science and technology, it is very hard for disciplines to remain isolated and hide away from each other. When disciplines are isolated, students' outcomes and achievements are affected negatively. A graduate will be equipped with multi skills, when disciplines interact with each other instead of just one skill when a particular discipline exists in isolation. To address this problem of graduates, many universities offer "interdisciplinary studies". This chapter discusses the "interdisciplinary studies" and their history. To discover the history of the "interdisciplinary studies", the current study aims to explore the definition of the "interdisciplinary studies", as well as their historical development. This study is a theoretical study designed to trace the history of "interdisciplinary studies". The study adopted a qualitative research methodology, as the essential purpose of the qualitative methodology is to understand reality. The findings revealed that the literature is full of studies that define "interdisciplinary studies", and all the studies that related to the "interdisciplinary studies" agreed that the "interdisciplinary studies" involve researchers from different institutes and disciplines to solve a problem that is hard to solve by a single discipline. With respect to historical development of "interdisciplinary studies", the study found that, as a term, it appeared in the 20th century, but as a practice, it is imbedded in the work of old societies, where several millennia ago, the Mesopotamians, the Egyptians, and the Greeks put interdisciplinary into practice.

INTRODUCTION

In this changing world, which depends on research, science and technology the integration of disciplines is to solve the problems of humanity and to bring innovations. We need the interdisciplinary studies because as Stephenson (2017) believes single-discipline research may have limited effectiveness if it fails to take into account cogent knowledge from other fields, and especially if it fails to communicate using terms that are meaningful to other disciplines and to policy makers. The problem for humanity

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as a group and as an individual is not the same and is not related to a single factor or a reason by itself; it is related and connected to different reasons. Therefore, it needs several disciplines to solve it too. In other words, it means that we need an interdisciplinary vision to address any problem from different angles. Klein & Newell (1998) introduced interdisciplinary researcher as: a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to deal with adequately by a single discipline or profession. The feature of interdisciplinary research as Klein & Newell (1998) continue [It] draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective (p. 393-4). This is in agreement with Sternberg (2009) who says when a society faces a problem, it needs an individual who has some background in each of the areas so that he or she can understand the issues from a variety of disciplinary standpoints, rather than just his or her own. In the absence of such background, the individual is like a blind person feeling one part of an elephant, but not understanding that it is an elephant that he or she is feeling.

In our world, there is no way to avoid interdisciplinary research if we want to develop the humanity and if we want to understand the whole picture of the problem. In the last five years, the humankind has faced several diseases such as bird flu, Ebola, Salmonellosis, etc. These diseases need different visions and several disciplines to understand the disease and to find a way to prescribe an effective treatment. For example, we need to understand the environment of that place, so we need someone from Geography. In the Arab world, the concept of interdisciplinary studies is new and recent (only around seven years old concept) and it is the same in the West world. For example, in Europe the concept of “interdisciplinary studies” is novel too. For ages, the scientific world was isolated from each other and depended on the individual research. It did not know the interdisciplinary studies. So, is the “interdisciplinary studies” a novel field? What is “interdisciplinary studies”? Is it an achievement of the new era? How did these “interdisciplinary studies” develop? Do we need it in our modern life?

BACKGROUND

Researchers from different disciplines use different terminology to understand “interdisciplinary studies”. For example, we hear about “interdisciplinary studies”, “multidisciplinary” as well as “the study of interdisciplinary”. In this literature review, we will focus on “interdisciplinary studies”. i.e. the “definition of interdisciplinary studies”.

The study by McGonagill (1995) titled “Defining, developing, and modeling interdisciplinary curriculum” attempts to define the interdisciplinary curriculum starting by defining the “interdisciplinary” itself. The problem of the study was that those teachers who are under increasing pressure from district and building administrators are expected to develop interdisciplinary units. Unfortunately, neither they nor local administrators are able to describe interdisciplinary curriculum in specific terms. Therefore, this study analyzed the theoretical foundations of interdisciplinary curriculum as a means of providing a definition for such a curriculum. A conceptual definition of interdisciplinary curriculum was developed based on a systematic review of the structure of knowledge, conceptualizations of curriculum, and curricular terms that are often used synonymously with interdisciplinary curriculum. This conceptual definition provided the foundation for a multi-step process to create curriculum that addresses the critical attributes of the definition and enabled developers to distinguish it from other curricular terms.

The study by La Fever, (2008) about the interdisciplinary teacher education: Reform in the Global Age believes that the global age can be understood as an era of interdisciplinary studies and the complex

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global problems increasingly require interdisciplinary approaches. The study view “interdisciplinary” as a relatively budding curricular approach yet increasingly needed in the field of education. The study aims to support postsecondary interdisciplinary teacher education reforms that effectively integrate discipline-based coursework with interdisciplinary courses to prepare future teachers to utilize interdisciplinary curricular approaches in K-12 education. This is a study of interdisciplinary but also an interdisciplinary study. It conceptualizes interdisciplinary teacher education based on a constructivist theoretical approach indebted primarily to Maxine Greene, and focuses especially on literature in the field of interdisciplinary studies, published in the United States since 1997. The confluence of interdisciplinary and constructivist approaches, as well as interdisciplinary and disciplinarily are examined. Existing interdisciplinary teacher education programs, interdisciplinary teaching strategies, and curricular designs are explored. This study provides a conceptual model that addresses teacher professionalization, interdisciplinary vision, global consciousness and the democratic dimensions of interdisciplinary teacher education. It conceptualizes critical and sociocultural relevant education, learning communities, student-centered education, novice and non-specialist interdisciplinary inquiry, cognitive disequilibrium, interdisciplinary research questions and questioning skills, interdisciplinary integration, and alternative academic structures and resources in interdisciplinary teacher education.

With regard to the development and historical development for the interdisciplinary studies, Augsburg (2008) in her book title “Becoming Interdisciplinary: An Introduction to Interdisciplinary Studies”, the author discusses the development of the interdisciplinary studies. He says that although the term interdisciplinary is frequently viewed as twentieth century term, the concept has historical antecedents, most notably Greek philosophy.

Also, the study by Huggins (2002) titled “The Scientific Voice: the 17th century: the coming of science” aims to find roots of the history of interdisciplinary studies. The study concludes that the 17th Century stands out as a time when God provided humanity with special ingredients that would result in the development of science and scientific thought; so much so that it has been called the century of genius. Many scientists were seemingly set into motion in numerous scientific arenas: Giovanni Borelli worked with lenses and microscopes, Robert Boyle discovered that the pressure of a gas in a closed container is inversely proportional to the volume of the container, i.e. Boyle’s Law; Galileo Galilei defined mathematical laws that described the movement of bodies on the earth; Isaac Newton articulated the Law of Gravity etc. The study concluded that without an interaction among different scientists of the 17th century their innovation would not have been complete. So interdisciplinary studies exist since 17th century.

With regard to the advantages of “interdisciplinary studies”, we see that more and more disciplines are becoming interdisciplinary and integrated with each other to solve both human and scientific problems from all perspectives. This approach, thus appears to reflect the advantages of interdisciplinary studies. An example of this is a study by Cesar, Cortés, Espinosa, Margoles, Moure, Sikora & Suppi (2017) who introduced the interdisciplinary between computer science and engineering. The study believes that many fields of science and engineering are progressing through the joint contribution of complementary fields. Computer science, and especially High-Performance Computing, has become a key factor in the development of many research fields, establishing a new paradigm called computational science. Researchers and professionals from many different fields require knowledge of High Performance Computing, including parallel programming, to develop fruitful and efficient work in their particular field. Therefore, at Universitat Autònoma of Barcelona (Spain), an interdisciplinary Master’s degree on “Modeling for Science and Engineering” was started 5 years ago to provide a thorough knowledge

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of the application of modeling and simulation to graduate students in different fields (Mathematics, Physics, Chemistry, Engineering, Geology, etc.). In this the study, the methodology and the experience in introducing computational thinking, parallel programming and performance engineering in this interdisciplinary Master's degree are shown. This overall approach has been refined through the Master's degree leading to excellent academic results and improving the industry and student's appraisal of this programme. The study found an advantage of interdisciplinary program is that after 5 years of teaching in this interdisciplinary Master's they observed that students achieve a much wider range of knowledge, which allows them to tackle problems from disciplines different from their original background. Actually, most of them get jobs in companies where they apply the concepts of computational thinking and performance engineering to improve the applications developed at those companies in areas such as traffic simulation, geophysical simulation, water pollution simulation, spread of disease simulation, etc.

In a study about interdisciplinary approach - Advantages, Disadvantages, and the Future Benefits of Interdisciplinary Studies, Jones (2010) aims to introduce the interdisciplinary approach. The study presents an approach that combines more than one discipline and creates teams of teachers and students that enhance the overall educational experience. In addition, this study discusses the advantages of this approach such as the students who were taught with an interdisciplinary technique master higher order thinking skills and integrated pedagogy thus getting admissions to top colleges and getting recruited to big business.

The literature review shows that interdisciplinary studies exist and there is a huge literature available on the topic which means that various disciplines welcome the integration and formation of interdisciplinary branch of studies. For example, the study about tourism education Zhang & Xing (2017). The study aims to understand the meaning of a place from the perspective of interdisciplinary learning in tourism and education It is an empirical study and it explores how graduate students from tourism major in China perceive place through participating field trip in Yong Ding earth building. Which is one of the World Cultural Heritage Site (WCHS) and develops tourism village through an in-depth interview, questionnaire surveys and so on. Research results indicate that such cultural heritage village is the place that is not only a geographic site but also means a political ecological system, regional cultural pattern and traditional lifestyle. Participatory learning enriched the postgraduate students' skills in both academic study and social contact which is necessary for their future career development.

The literature review, here, proves that interdisciplinary field exists in most of the disciplines, as the disciplines could not reject the integration between each other. Kyle, Atherton, Kesby, Sothern & Andrews (2016) conducted a study about the interdisciplinary interaction between health, geography and nurse education. The study aimed to argue that agenda for encouraging 'impact' would be well-served if impact through teaching was identified and stimulated more explicitly, and if academics better recognized and seized the opportunities that already exist for such an impact. The study shows how engagement between health geography and nurse education could demonstrate research impact through inter-disciplinary involvement in the education of health care professionals, specifically student nurses. A comprehensive overview of international scholarship of the intersection between geography and nursing is then presented. The study traces three 'waves of enquiry' that have focused on research interactions before calling for a fourth which is focused on critical pedagogy. To illustrate the possibilities of this fourth wave, the study sketches a case study that outlines how engagement with research around blood donation could help provide a foundation for critical pedagogy that challenges student nurses to practice reflexively, think geographically and act justly. Finally, the study calls for closer engagement between

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health, geography and nurse education by encouraging educators to translate, teach, and transfer ideas and people between health, geography and nurse education.

Another study emphasizes the importance of interdisciplinary between disciplines to raise student achievement, increase student engagement, and inspire teachers to create relevant, meaningful lessons. Di Camillo (2015) conducted a study about exploring an interdisciplinary expedition in a global history class. It is a qualitative study and the purpose of it was to examine an interdisciplinary expedition (based on the Expeditionary Learning Outward Bound model) in a Global history class in an urban Expeditionary Learning (EL) charter high school. The researcher wanted to gain stronger understandings of what happens during an expedition, how students view expedition, and what, if any, challenges the teacher encounter in enacting an expedition. Findings indicated students were engaged in learning about issues of security and privacy, but failed to make interdisciplinary connections between global history and their other classes. Additionally, the Global History teacher encountered challenges in enacting interdisciplinary, expeditionary curricula with racially, ethnically, and socioeconomically diverse students. This study highlights the benefits and challenges of implementing an interdisciplinary approach to teaching, as well as the need for additional support for teachers who want to implement interdisciplinary curricula.

In addition to this study, another study by Stephenson (2017) focusses on the importance of interdisciplinary integration between disciplines because single-discipline research has limited effectiveness as it fails to take into account cogent knowledge from other fields, and especially it fails to communicate using terms that are meaningful to other disciplines and to policy makers. The study, shows the importance of understanding the terminology between disciplines, as each science social and physical has to know the terminology of each other. One of those disciplines is the energy. In energy, interdisciplinary research is needed to address many complex and urgent socio-technical issues involved in achieving a more sustainable future. However, the terminology and specialized concepts that are integral to disciplines can create barriers to a comprehensive understanding of a shared field of inquiry. In energy sciences, the common language of mathematics is used to help understand the quantitative concepts of energy and its transformations, while the social sciences use both qualitative and quantitative means to describe society and social relationships using the different languages that are associated with different social theories. If these barriers to communication can be bridged, the benefits can be immense. The study, illustrated some of the misunderstandings that can occur in conversations between social and physical scientists with an imaginary dialogue. The study, concluded that, to work effectively across disciplines, social scientists will need to learn something of what energy means, and physical scientists will need to learn something of what energy means.

DEFINITIONS OF “INTERDISCIPLINARY STUDIES”

The Literature is full of studies that define “interdisciplinary studies” such as Easton (1991), Dikomitou-Eliadou and Kassianidou (2016), Klein and Newell (1998), Thorleuchter and den Poe (2016), etc. All these studies agree on that the “interdisciplinary studies” involves researchers from different schools and disciplines to solve a problem that is hard to solve by a single discipline. For instance, Easton (1991) defines interdisciplinary research as a research that covers numerous different disciplines. Klein and Newell (1998) say that interdisciplinary studies is a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to deal with adequately by a single discipline or

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profession... [It] draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective (p. 393-4). Thorleuchter & den Poe (2016) view interdisciplinary research as an essential driver for innovation. They define innovation when we join different disciplines and several researchers to create new things to solve a problem and come up with new thing. Millar (2013) believes that interdisciplinary research often goes beyond the existing scope of a specific discipline. It often finds and pushes new technological fields, and it often speeds up scientific discovery. Also the National Academy of Sciences, National Academy of Engineering, & Institute of Medicine (2004) defined interdisciplinary as a research that is a made by teams or individuals that integrate information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.

The researcher thinks that interdisciplinary has to involve several different disciplines because it focuses on particular problem or questions that are too complex to answer satisfactorily by any one discipline. The interdisciplinary aims to connect several disciplines with each other this is because as Thorleuchter and den Poe (2016) believe the probability of processing a successful innovation or projects is normally larger by applying interdisciplinary research than by applying research that is focused on a single discipline. In addition to this a single view or discipline has a limited effect as echoed by Stephenson (2017) who believes a single-discipline research may have limited effectiveness if it fails to take into account cogent knowledge from other fields, and especially if fails to communicate using terms that are meaningful to other disciplines and to policy makers.

Interdisciplinary, thus, means that any research is related to several disciplines and it is important to know that disciplines change over time e.g. as an area of research that suddenly appears, that grows, that shrinks, that melts, and that transforms. According to the National Academy of Sciences, National Academy of Engineering, & Institute of Medicine (2004) an idea that is considered as interdisciplinary today may possibly be considered as single disciplinary tomorrow. Thus, the interdisciplinary nature of an idea depends on current disciplines and their current definitions.

HISTORICAL DEVELOPMENT OF INTERDISCIPLINARY STUDIES: EXPLORING THE EXACT DATE FOR THE “INTERDISCIPLINARY STUDIES”

The literature review shows that, in general, in our days interdisciplinary, as Dikomitou-Eliadou and Kassianidou (2016) assume, has become a hymn for every field of research. Whether one is an archaeologist, psychologist or experimental physicist, one ought to find ways to cross boundaries in their research, to collaborate, and to explore complementarity and interoperability in the most fascinating ways, among the most diverse fields of research. This is a sign that nowadays: interdisciplinary in research is rewarding. Funding and research institutions applaud the crossing of disciplinary boundaries, and promote partnerships among researchers and scholars from diverse fields of research and also among representatives of differing approaches and methodologies. However, we have to understand that, because the modern era accepts crossing boundaries in research and welcomes interdisciplinary, it does not mean that (Dikomitou-Eliadou & Kassianidou, 2016) the concept of interdisciplinary is novel and certainly cannot be considered as an achievement of the modern era. Klein (1990, p. 19) thinks while the actual term appeared for the first time in the 20th century, While Montgomery and Kumar (2016)

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believe interdisciplinary is manifested as a dynamic characteristic of past human behavior and it can be traced throughout human history.

Several millennia ago, the Mesopotamians, the Egyptians, and the Greeks put interdisciplinary into practice. Many scholars of that time excelled while intersecting various disciplines and their work becoming the ground for the development of natural sciences and humanities (Montgomery & Kumar, 2016). Ausburg (2006) agrees with Montgomery and Kumar and assumed that although interdisciplinary and interdisciplinary are frequently viewed as twentieth century terms, however, the concept has historical antecedents, most notably Greek philosophy. Also Slavicek (2012) agrees with this and he is of the view that it originated in ancient Greece and initiated the academic dispute about the division and hierarchical classification of knowledge. In addition, Gunn (1992) says that Greek historians and dramatists took elements from other realms of knowledge (such as medicine or philosophy) to further understand their own material. According to Andrés-Gallego (2015), any permissive humanist project involves interdisciplinary and history shows a number of cases, as seventeenth-century Leibniz's task to create a system of universal justice, which requires linguistics, economics, management, ethics, law philosophy, politics, and even sinology.

The researcher believes that the concept of interdisciplinary did not start on the 17th century, but it was a result of the efforts of the former scientist from 16th century because nothing started from scratch or zero. Huggins (2002) is of the view that the 17th Century scientists were aware of the work of Copernicus (16th Century), and Copernicus to previous works such as the Pythagorean Theory and the truths and fallacies of thinkers such as Aristotle, Plato, Occam and other great minds. Russell (1945) added several works of the masterful minds of the 17th Century were proofs of what Copernicus began e.g. the Laws of Planetary Motion for Kepler and the Law of Inertia for Galileo.

The researcher believes that interdisciplinary started before 17th century, Osborne & Nussbaum (2012, pp. 159–163) are of the view that Aristotle (4th c. BC) is a classic example of an interdisciplinary polymath who contributed to philosophy, politics and ethics, biology, physics, botany, anatomy and physiology, logic, education, music and theatre. Aristotle belonged to (4th c. BC (before Christ) so that mean even the old societies knew the interdisciplinary, they used it without give it a name of interdisciplinary. Kemp (2006) thinks Aristotle is somewhat closer to our era, Leonardo Da Vinci (15th–16th c. AD (Anno Domini), the ultimate homo universals, served with the same passion with arts and humanities, architecture and engineering, botany, geology, zoology, hydraulics, aeronautics and physics. The legacy of Aristotle and Da Vinci and of all the other great scholars in multifaceted history of science is essentially the extinction of boundaries between science and art, between the natural sciences and humanities. Their heritage is the affirmation that the various research disciplines are intertwined and should communicate and interoperate, encouraging the development of more holistic and comprehensive studies, the unceasing generation of new questions and hypotheses, and accordingly, the development of new methodologies, and the combination of differing, old and new techniques to experiment and address ever increasing and complex research questions.

From the above examples, the researcher agrees with Dikomitou-Eliadou and Kassianidou (2016) in that the concept and the idea of interdisciplinary could not be considered as the attainments in the modern era. As well as, she is in agreement with Gunn (1992) in that Greek historians took elements from other disciplines to get the whole picture about their specialization because they did not want their (Yates, 1990) knowledge to be fragmented and they wanted to develop a sense of how knowledge is in-

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terrelated. When scientists and historians opened doors for other disciplines and crossed the boundaries, they got varying specialties and gave the opportunity to cross disciplinary lines and break the isolation of knowledge or fields (Clark & Clark, 1987). As a result, their communities were given the opportunity to see how knowledge is used in problem solving outside the artificial divisions of community knowledge.

Also the researcher believes that, in the past humans used the interdisciplinary somehow as they knew the field that they were interested in was not complete and to make it right and complete their tasks they had to look for the knowledge from other disciplines. In the past, the Egyptians and the Greeks tried to solve the problem that faced their community and life from a single discipline but what they found was that “solving problems and answering questions that cannot be satisfactorily addressed using methods or approaches of any single disciplinary perspective” (Klein, 1990, p. 196).

Ackoff (1973) believes that in the age of the great scientific revolutions of 17th century Europe, its towering geniuses – Isaac Newton, Robert Hooke, Edmond Halley, Robert Boyle, and others – brought their curiosity to bear not only on subjects that would lead to basic discoveries that bear their names but also on every kind of interdisciplinary challenge, including military and mining questions.

So the literature review, here, proves that “interdisciplinary” was applied in 4th century BC. So it means there is no way to identify the exact date but we have to accept that “interdisciplinary” was practiced in all era, but as a fix term it appeared as Ausburg (2006) assumes in twentieth century only. The communities realize the importance of “interdisciplinary” that can be proved by the literature review. It is true, the societies have developed and from one era to another the problems and the issues of each society are different and more complicated. The societies depend on their development of science and technology. Slavicek (2012) agreed with this and views that, “interdisciplinary” has become necessary because of the emergence and rapid development of modern natural sciences. However, the sciences in the old centuries in part depended on beliefs not knowledge. For societies to be science based, they had to depend on knowledge. Slavicek (2012) thinks that the increasing rejection of knowledge is based on belief and the advancing orientation towards science-based conclusions support this evolutionary process. – “interdisciplinary” became necessary. Klein (1990), believes “interdisciplinary” becomes necessary for societies because of the industrial revolution, accompanied by advancing technological developments and changes in agriculture (Agrarian Agitation). Chichilnisky (1996) views the evolutionary era of discovery as “knowledge revolution” driven by knowledge and by the technologies for processing and communicating it. She continues, this leads to a vision of society that is very innovative in the use of knowledge and very conservative in the use of the earth’s resources, a new society centered on diversity and human capital and offering the prospect of substantial economic progress without damaging the ecosystems that support life on earth.

University-based institutions reacted to these tendencies by the establishment of suitable disciplines. Therefore, these are not to be regarded as driving forces: research within the individual disciplines is not primarily pursued by university-based institutions. Rather, scientific societies are founded and then called upon to assume the task of conducting research. Serageldin (2017) found there are seven pillars of tomorrow’s universities and the seven pillars of the knowledge revolution and, one of the them is the “interdisciplinary”. The author believes, there is real value in crossing disciplines. Both in academic organization and in tackling real-life problems, we note that the old “silos” of disciplines when functioning alone are counterproductive.

This tendency has changed in the current university landscape: university research is regarded as a principal task of a university and the quality of the university or institute is closely linked to the production of the research facility. Obviously, one of the desired goals is to implement the conclusions derived

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from science in financial projects which can then be established as spin-offs in the international market. This task usually requires the cooperation of several disciplines. Therefore, the increasing number of disciplines and the consequent specializations and sub-specializations at universities are creating a demand for traditional dissemination of knowledge - a renaissance of the idealized concept of universal university education. Wilhelm von Humboldt refers to the general “formation of man”, which should not be abandoned under any circumstances (Klein, 1990).

Due to this evolution, and particularly the rigid structure of the individual disciplines, many university facilities are experiencing difficulties in implementing the interdisciplinary approach. The traditional policy of clearly demarcated disciplines renders interdisciplinary team work difficult. Quite often the potential of interdisciplinary is not realized in sufficient measure because of the fear of losing one’s independence and significance when working jointly on interdisciplinary projects.

The researcher agrees with the discussion above and she is of the view that the development of “interdisciplinary studies” depends on the development of the sciences and technology, and their integration. As we know, there are two kinds of knowledge - nature and human sciences (Daston & Vidal, 2017) and within each one of them, there are sub divisions. These sub - division although emanated from the same root of science, but they did not overlap in the beginning. Timmons, (2005, pp. 1–9) says that the development of distinct science areas and the evolution of disciplines is a gradual process, with many milestones in human history. The Renaissance, and the age of Enlightenment provided the foundations for the growing specialization in science in the 18th century, which was then succeeded by rigorous and rapidly accelerating scientific advances in the 19th and 20th centuries, fueled by the Industrial Revolution. It is during this time that science and technology encompassed a more intimate relationship, science heavily dependent on technological advances and vice versa. It was at this time that the idea of interdisciplinary delineated, strongly associated with innovation, change and the unexpected (Klein, 1990, p. 12), and thereby consciously sought to practice.

The universities welcomed the “interdisciplinary” because it will give students the chance to cross disciplines, and new connections will rise as well as significant contributions could be made to the world of higher education and beyond. Students will be able to combine multiple disciplines and pursue different ways of thinking about the same problem or subject and the students will develop critical thinking skills. This will make the students to be confident about themselves. Ryan (2016) believes that “businesses are looking for someone who is confident of what they want in a career, confident about the successful tasks they have completed, know their strengths, are independent thinkers, ambitious problem solvers, goal-oriented proactive workers, work well on a team, enjoy learning new things, and finally, someone who is reliable and responsible”

CONCLUSION

This study has found that the “interdisciplinary studies” as a term appeared in the 20th century, but as a practice, it is rooted in the work of old societies, where several millennia ago, the Mesopotamians, the Egyptians, and the Greeks put interdisciplinary into practice. We have also found that “interdisciplinary” is necessary in new era as a pure discipline will not be able to answer a question, solve a problem, or address a topic that is too broad or complex.

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KEY TERMS AND DEFINITIONS

Century: The era of time that the interdisciplinary studies took to develop and it means a period of a 100 year.

Discipline: Different fields of studies that are integrated together to shape or compose the interdisciplinary studies.

History: The record or the construction of the interdisciplinary studies and their development.

Interdisciplinary: The integration between two or more specializations of knowledge.

Science: The knowledge that is already structured or shaped depending on some rules.

Technology: The use of technical skills and tools to facilitate the development of sciences.

Chapter 15

Effect of Accreditation on Quality of Teaching and Learning and Multi- Disciplinary Collaboration: Case Study

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ABSTRACT

Usually, so far, formal education mostly focuses on treating only strictly separated and specialized topic areas, called disciplines. However, as the need for cooperation between professionals oriented from different disciplines grows, the need for a multidisciplinary educational approach becomes more and more important. For a technical education to be completed, it is no longer enough to train scientists and engineers solely in technical areas. In development and implementation of technology-driven applications, multidisciplinary issues should be properly addressed in the academic sense. The College of Engineering at Sultan Qaboos University (SQU) has addressed this issue of multidisciplinary education by developing and offering interdisciplinary programs such as Mechatronics program, which is jointly offered by the Department of Electrical and Computer Engineering (ECE) and Department of Mechanical and Industrial Engineering (MIE), and also transdisciplinary programs such as a specialization in biomedical signals and medical devices (approved, but not yet offered at the time of writing this book chapter, 2016) and a program in agricultural engineering. Also, to make engineering graduates capable of working effectively in multidisciplinary teams, final-year projects (FYP) of multidisciplinary nature has been defined and implemented by the students under the supervision of faculty members.

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INTRODUCTION

Education should have two objectives: 1) give definite knowledge; 2) create those mental habits which will enable people to acquire knowledge and form sound judgements (Ertas, Maxwell, Rainey, & Tanik, 2003). Most university teachers adopt a classical teaching style, although these formal teaching approaches may not be suitable for concrete transitional thinkers (Cinquepalmi, Dell'Aquila, Fogli-Mu-Ciaccia, Picciarelli, Stella, & Verrone, 1985). In order to be able to operate better in an environment of rapid change of technology, transdisciplinary approach in education is necessary. Transdisciplinary approach is a way of curriculum integration which dissolves the boundaries between the conventional disciplines and organizes teaching and learning around the construction of meaning in the context of real-world problems or themes. A multidisciplinary curriculum is one in which the same topic is studied from the viewpoint of more than one discipline. Frequently multidisciplinary and crossdisciplinary are used as synonyms describing the aim to cross boundaries between disciplines. In the 21st century, an engineer must be able to deal with a rapid pace of technological change, a highly interconnected world, and complex problems that require multidisciplinary approaches and the effective use of human and natural resources (Tafa, Rakocevic, Mihailovic, & Milutinovic, 2011). In fact, effective development of products is an interdisciplinary process (Eppinger & Kressy, 2002). Interdisciplinary education allows the student to learn by making connections between ideas and concepts across different disciplinary boundaries. Students learning in this way are able to apply the knowledge gained in one discipline to another different discipline as a way to deepen the learning experience. The most effective approach to interdisciplinary study enables students to build their own interdisciplinary pathway by choosing courses which make sense to them.

George Kozmetsky defines transdisciplinary education as the notion of the integrated use of the tools, techniques, and methods from various disciplines (Kozmetsky, 1997). A particular area of study can be called a discipline provided that it has unified tools, techniques, and methods, and a well-developed jargon. Disciplines develop into self-contained hard shells, which tends to minimize interaction with other disciplines. The longer a discipline evolves, the longer its shell becomes (Ertas, Tanik, & Maxwell, 2000). In spite of these hard shells, the graduates of modern educational institutes need to tackle multidisciplinary problems. They need skills in their own discipline, but also need basic understanding of other disciplines, and the ability to apply the skills in one discipline to the problems of another. For example, Roberts (2011) talks about the challenges of multidisciplinary education in computer science (CS). It states that modern training in computer science needs to prepare students to work in other disciplines or to work on multidisciplinary problems. The paper, then, describes successful examples of multidisciplinary education at the interface between CS and the biological sciences, as well as other examples involving CS and security, CS and sustainability, and CS and the social and economic sciences.

Organizations who are responsible for the accreditation of engineering and science programs, or perhaps in other disciplines too, have emphasized the need for multidisciplinary education. The Accreditation Board for Engineering and Technology (ABET) establishes criteria for accrediting educational programs in applied science, computing, engineering, and engineering technology. In its Engineering Criteria, Engineering Accreditation Commission (EAC) of ABET established a set of student outcomes. For the set of student outcomes, each program must have processes that demonstrate that (1) program performance with respect to its outcomes is being assessed, (2) results of program evaluation are being used to develop and improve the program, and (3) results and processes are being documented. Criterion 3 of the ABET Engineering Criteria requires “(d) an ability to function on multidisciplinary teams”

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(ABET, 2016). Being able to function on diverse teams is highly valued by engineering organizations. The ability to share knowledge with others while being open to new and creative solutions to problems greatly impacts academic and professional careers of engineers. Engineering practice will continue to require working on diverse teams; thus, function on multidisciplinary teams is one of the most sought-after characteristics of new graduates.

The SQU College of Engineering has accredited its programs through EAC of ABET. In the year 2000, the College started preparing for accreditation of its programs offered by the four Departments in the College. The College decided to use ABET Agency, which is a non-governmental, not-for-profit, accrediting agency and is recognized as an accreditor by the USA Council for Higher Education Accreditation. ABET accreditation provides assurance that a college or university program meets the quality standards required by the profession which employs the graduates of that program. ABET accreditation is a proof that the program has met standards essential to produce graduates ready to enter the market. Graduates from an ABET-accredited program have a solid educational foundation and are capable of leading the way in innovation, emerging technologies, and in anticipating the welfare and safety needs of the public. As a result of this accreditation process, considerable progress has been made in the implementation of the continuous quality improvement processes adopted by the different programs. As one of the outcomes, the emphasis on teamwork, particularly in the final-year when all engineering students carry out a final-year project, has made the new graduates more capable of functioning on multidisciplinary teams (Mnif, Jervase, Ould-Khaoua, & Hosseinzadeh, 2015).

ASSESSMENT AND EVALUATION OF STUDENT OUTCOMES

Student outcomes (SOs) are statements identifying the specific knowledge, skills, attitudes and/or behaviour that should have attained by students at the time of their graduation. The following are EAC of ABET a to k outcomes which are adopted by all programs at the College of Engineering.

(a) An ability to apply knowledge of mathematics, science, and engineering; (b) An ability to design and conduct experiments, as well as to analyze and interpret data; (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability; (d) An ability to function on multidisciplinary teams; (e) An ability to identify, formulate, and solve engineering problems; (f) An understanding of professional and ethical responsibility; (g) An ability to communicate effectively; (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; (i) A recognition of the need for, and an ability to engage in life-long learning; (j) A knowledge of contemporary issues; (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Student outcomes (a) to (k) are found to be too general for direct measurement of student outcome attainment. The accreditation committee for each program suggested associating with each student outcome a number of performance indicators (PIs). These were intended to be specific and measurable. Both direct and indirect assessment methods were used. Since the accreditation reviews will occur regularly, the assessment of the student outcomes should happen on a continuous basis. In fact all programs in the College of Engineering are currently engaged in this continuous assessment of student outcomes. Indirect assessment is performed once in a cycle targeting graduating students through an exit survey.

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For direct assessment SOs, a sampling policy of the courses is adopted. It has been agreed that each SO is to go through two assessment cycles; where each cycle can span two to three years for data collection, assessment and evaluation.

CONTINUOUS IMPROVEMENT

The continuous improvement process for the eight programs at the College of Engineering involves the revision of the program educational objectives (PEOs) to be in line with university mission and to meet the requirements of the program constituents, and the assessment of student outcomes (SOs) on regular intervals. Results of the assessment and evaluation process identify the improvement areas and opportunities for program development. Recommended actions are then compiled and suggested for implementation in the curriculum. Coordination and leadership of this process is assigned by the department board to a committee. Reports and recommended actions by this committee are reviewed and approved by the department board. In addition to the actions resulting from evaluation of the SOs, the review and update process of the curriculum can result from direct recommendations made by the program constituents, external examiners, and the review of the PEOs.

MULTI/INTER DISCIPLINARY PROGRAMS AT COLLEGE OF ENGINEERING

As the need for transdisciplinary education became clear, the College of Engineering at SQU decided to develop new programs that promote the students skills across disciplines. Also, the faculty members were encouraged to define projects of multidisciplinary nature and supervise the final-year students for implementing them. In the following sections three transdisciplinary programs/specialization and some examples of final-year projects (FYP) are explained.

Mechatronics

The College of Engineering launched the Mechatronics Engineering program in 2002. The program is jointly run by the Department of Electrical & Computer Engineering and the Department of Mechanical & Industrial Engineering. The program has been designed in line with the College of Engineering's mission to continuously strive excellence and to fulfil the needs of human resources for country's industrial process in an increasingly competitive environment. The goal of the program is to integrate mechanical, electrical and computer engineering into one program to produce engineers knowledgeable with all of the relevant technologies needed by the present and future industry of Oman.

A typical Mechatronics system is characterised by close integration of mechanical components (e.g., a moving arm, or a hybrid vehicle), electrical sensors and measuring devices (e.g., speed sensor), actuators (e.g., electrical motor) and computer controllers (e.g., a microcontroller, a PLC, or a DSP board) into products and systems useful for the society. Several students preferred to be specialized in this program compared to other programs in the college.

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Agricultural Engineering Program

The Agricultural Engineering program is jointly offered by the College of Engineering and the College of Agricultural and Marine Sciences (CAMS) since 2007, awarding the degree of Baccalaureate in Engineering. The program is hosted in CAMS. A joint committee was formed between the two colleges to manage the program. This multidisciplinary program is not only comparable to those offered in internationally reputed Universities, but also designed and benchmarked with the Accreditation Board for Engineering and Technology (ABET), USA. It concerns education and research in the engineering and physical sciences to understand, model, process or enhance biological systems for sustainable developments in agriculture, food, land use and the environment (SQU, College of Agricultural and Marine Sciences, 2016). However, it has been observed that there is a decline in students' enrolment in this program. This is due to several reasons such as the total number of credit hours is more in this program compared with other programs running in CAMS, and only students from CAMS are enrolled in this program. To improve the students' enrolment several recommendation were made recently.

Biomedical Signals and Medical Devices Specialization

University Council approved this specialization in 2016. The Biomedical Signals and Medical Devices specialization is hosted in the Department of Electrical and Computer Engineering (ECE) in collaboration with College of Medicine and Health Sciences. This specialization was initiated due to the highly interdisciplinary nature of Biomedical Engineering which includes biomedical electronics and instrumentation, analysis and recognition of biomedical signals and images for diagnosis purposes, application of robotics in medicine, medical physics, and physiology.

The Biomedical Signals and Medical Devices specialization will be unique in the Sultanate of Oman in terms of depth and quality and will help to meet the needs of the local and regional biomedical engineering constituents. It will also fill the need to train the nationals in a variety of Biomedical Engineering disciplines to allow for sustainable exploitation of the country's biomedical resources. This new specialization will further assist in diversifying the available programs within SQU to meet increasing enrolments as well as to give wide spectrum of choices to students. It is cost effective as it was designed to use the existing resources within the university system in an optimal way. The Biomedical Signals and Medical Devices student must complete a total of 136 credit hours after the foundation program, similar to students in the other ECE Department specialization tracks. Out of these 136 credits, 33 credits will be as Biomedical Signals and Medical Devices core courses and 9 credit hours will be electives. Graduates from this track will obtain the degree of Bachelor of Engineering in Electrical and Computer Engineering/Biomedical Signals and Medical Devices.

Transdisciplinary Final-Year Projects

In many engineering applications, a system or product needs to be developed which is a multidisciplinary in nature. For example, making an electric vehicle requires skills in mechanical engineering, electrical engineering, control, electronics and instrumentation, and computer engineering. There are two ways of providing these skills: (1) by employing experts from all disciplines, (2) by employing experts who have skills in more than one discipline. The first option has two problems; firstly, it is costly; secondly, the coordination between teams from different disciplines may not be easy.

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As an example, in Cousland, Ciaravolo, Blieden, and Hosseinzadeh (2010), a team of electrical and electronics engineering students report on their work on the design of a charger and charging management system for an electric vehicle. In fact, one of the authors of this book chapter was their supervisor. This team worked with another team of mechanical engineers. During the team work, some issues arose between the two teams, which made the progress of the project difficult. The supervisors of the two teams had to intervene to solve the problem. However, with the second option, we could have one team of mechatronics engineers who would do both parts of mechanical and electrical engineering. In this case, the cost would be lower (assuming that the two teams were not students and would be paid) and the coordination issue would be easier.

At SQU, many FYP's have been carried out which are of multidisciplinary or interdisciplinary nature. Examples are given in Table 1. Students have worked in teams comprising of two to four students, supervised by supervisors from various disciplines. The faculty members from the Department of Electrical and Computer Engineering (ECE) have specializations in the broad areas of ECE discipline such as Control Systems and Instrumentation, Communications Engineering, Computer Engineering, Electronics, Signal Processing, Power and Energy Systems, Biomedical Engineering, etc. Then, there are collaborations from other faculty members in the Mechatronics area, Mechanical and Industrial engineering, Agricultural Engineering, and so on. In some cases, co-supervisors are invited from the associated industries.

Table 1. Examples of multidisciplinary final-year projects carried out at the College of Engineering, SQU

#	Title of the Project	Number of Students in a Team	Supervisors Specialization	Relevant Disciplines
1	Brain-controlled Wheelchair	Two Mechatronics Students	One Mechatronics & One Signal Processing	Biomedical engineering, signal processing, data acquisition, and control
2	Remotely Operated Underwater Vehicle	Four ECE Students	Control Systems	Mechanical design, electronics, electrical drives and control
3	Brain Controlled Hand Exoskeleton for Locked-In Syndrome Patients	Two Mechatronics Students	One Mechatronics, One Mechanical Engineering, One Signal Processing	Biomechatronics, signal processing, data acquisition, and control
4	Design and Manufacturing of all-terrain Unmanned Ground Vehicle (UGV)	Three Mechatronics Students	One Mechatronics	Mechanical design, sensors technology, electronics, electrical drives and control
5	Design and Development of A Robot-Assisted Needle Steering Device	Four Mechatronics Students	One Mechanical Engineering	Mechanical design, sensors technology, electronics and control
6	Design of a solar power auto-irrigation system	Four ECE Students	One Power Engineering, One Control Systems, One Agricultural Engineering	Power Engineering, Control, Agriculture
7	Augmented Reality for Deaf and Hard-of-Hearing Individuals	Four ECE Students	One Computer Engineering	Computer Engineering, Biomedical Engineering
8	Smart Dolphins Protection system	Four ECE Students	One Control Systems, One Communication Systems	Control Systems, Communication Systems, Biomedical Engineering

Note: ECE stands for Electrical and Computer Engineering.

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EFFECT OF MULTI-DISCIPLINARY PROGRAMS

In many cases, an engineer is needed with capabilities of working in a multidisciplinary environment. For example, in oil and gas industry, heavy mechanical machinery is driven by electrical motors and controlled by sophisticated computer systems. An engineer who can work with several multidisciplinary engineering fields, i.e., mechanical engineering, electrical engineering, instrumentation engineering, and computer systems engineering would be much more effective and economical than three to four engineers each specialized only in one of these areas. In multi-disciplinary programs, students can still have the major specialization in one specific discipline, but with the knowledge and ability to learn and work in other disciplines.

Making connections between different concepts is essential in multi-disciplinary study. Here are some other benefits of studying in this way:

- The content of multi-disciplinary course is usually related to a real world context. Consequently, the learning becomes meaningful resulting in learning experiences that stay with the student for a lifetime.
- Students cover topics in more depth because they are considering the many and varied perspectives from which a topic can be explored.
- Critical thinking skills are used and developed as students look across disciplinary boundaries to consider other viewpoints and also begin to compare and contrast concepts across subject areas.
- Students begin to consolidate learning by synthesising ideas from many perspectives and consider an alternative way of acquiring knowledge.
- Exploring topics across a range of subject boundaries motivates students to pursue new knowledge in different subject areas.
- Transferable skills of critical thinking, synthesis and research are developed and are applicable to future learning experiences.
- Interdisciplinary knowledge and application of different disciplines can lead to greater creativity.
- Worthwhile topics of research can fall in the 'spaces' between the traditional disciplines.

Creating multidisciplinary learning environments can enrich the educational experience of students beyond that of a single-discipline approach. The multidisciplinary programs or specialization tracks in the SQU College of Engineering, namely Mechatronics Program, Agricultural Engineering Program, and Biomedical Signals and Medical Devices plus the implementation of ABET processes have positively affected the students learning. These include improving communication and collaboration skills necessary for the workplace, graduating professional, ethical, and team-focused individuals able to effectively improve the lives of others. The multidisciplinary programs have continued to evolve and have been highly effective in meeting the established goals and objectives. Furthermore, as the College of Engineering at SQU put more emphasis on multidisciplinary aspects of its educational programs from several years ago, there were positive changes observed in the attributes of its graduates noticed by their employers. This was confirmed by receiving feedback from the Industrial Advisory Boards (IAB), and also by getting feedback in other events such as the FYP Demo Day (which is run by some departments in the College of Engineering) and the Engineering Alumni Gathering.

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CONCLUSION

It is obvious that functioning well in a global, technology-driven, multidisciplinary environment necessitates educational programs in science and engineering which can generate graduates capable of performing in multidisciplinary environments. This kind of educational framework should properly prepare students for the real challenges they are likely to encounter in the global marketplace.

To address this very important aspect of graduate attributes of SQU educational system, the College of Engineering in collaboration with other colleges at SQU has developed and offered several programs of interdisciplinary or multidisciplinary nature. Examples are Mechatronics Program, Agricultural Engineering Program, and a specialization recently approved by the University Council called Biomedical Signals and Medical Devices.

In addition, the engineering students do a capstone design final-year project (FYP) at their last stage of their studies, which is done across two full semesters. Most of these FYPs are defined and executed for multidisciplinary applications, which makes students capable of performing effectively in multidisciplinary teams.

Going through a process of accreditation by the Accreditation Board for Engineering and Technology (ABET), which is based on the USA educational system, has helped the College of Engineering adopt modern educational practices including multidisciplinary features. The feedback received from industry partners has shown a positive impact on the capabilities of SQU engineering graduates in tackling real-world multidisciplinary problems.

NOTE

In the literature, we may find slightly different definitions from the ones presented here. Sometimes, these terms are loosely used without distinctions between different terms. The following definitions are used in the context of this book chapter.

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KEY TERMS AND DEFINITIONS

Accreditation: The process in which certification of competency or credibility is granted by an official review board.

Discipline: A certain branch of knowledge or a field of study that is taught and researched as part of higher education.

Interdisciplinary: Interdisciplinary education allows the student to learn by making connections between ideas and concepts across different disciplinary boundaries. Students learning in this way are able to apply the knowledge gained in one discipline to another different discipline as a way to deepen the learning experience.

Learning: Change in an individual's behavior (knowledge, skill and Learning attitude) that can occur at any time or place.

Multidisciplinary Curriculum: A multidisciplinary curriculum is one in which the same topic is studied from the viewpoint of more than one discipline.

Student Outcomes: Statements identifying the specific knowledge, skills, attitudes and/or behavior that should have attained by students at the time of their graduation.

Teaching: It is deliberate intervention that involves the planning and implementation of instructional activities to meet intended student outcomes according to a specified plan.

Transdisciplinary: Transdisciplinary approach is a way of curriculum integration which dissolves the boundaries between the conventional disciplines and organizes teaching and learning around the construction of meaning in the context of real-world problems or themes.

Chapter 16

Soft Systems Methodology (SSM) as an Interdisciplinary Approach: Reflection on the Use of SSM in Adoption of Web 2.0 Applications in Omani Academic Libraries

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ABSTRACT

Soft Systems Methodology (SSM) provides an inquiry process for taking a systemic view of a problem situation, incorporating elements of intervention, social and political analysis, and then understanding of the real-world problem situation. The holistic view embodied by SSM facilitated capture of the relationships, procedures, attitudes, culture and structure of each participating organizations through thematic analysis and developing rich pictures. Furthermore, the use of SSM enabled creation of homogeneous groups of actors and system owners to go through different intervention processes. This chapter aims mainly to introduce SSM as interdisciplinary approach that can be applied in complex situation and deal effectively with different viewpoints about the definition of the problem. In the current research, reflection on the use of SSM in adoption of Web 2.0 applications in Omani academic libraries is reported. It focuses on contributions of SSM in enhancing knowledge and practice of participants and researchers through different stages of SSM. This study approves that SSM is a methodology rather than a method. A set of tools and techniques can be adapted to investigate the problematical situation and deal with complexity and different perspectives of organizational people. In this research, SSM is described by participants as a learning process that not only define the problem but also improve the situation.

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Soft Systems Methodology (SSM) as an Interdisciplinary Approach

INTRODUCTION

Soft Systems Methodology is one of the prominent research approaches for understanding issues that involve perceptions of human beings, using techniques of continuous interaction with them. SSM offers various techniques for investigating research problems. The development of this approach is based on viewing the system not as “stable and closed” but as “dynamic and open and always requiring improvement” in order to survive. Proponents of SSM research believe that human beings are an important component in all social issues (Checkland, 1981). People engaging with a research problem guide the development and change according to their needs and understanding. In addition, cultural, social, and economic considerations all interact with the issue under investigation to create a special dimension that makes every problem situation unique.

SSM is characterized by its flexibility and applicability in different fields. This method employs qualitative techniques in thinking and learning and uses special ways to generate information according to deductive methodologies that are based on understanding individuals’ attitudes and the differences in their opinions and expectations. This approach also views issues related to humans as being ill-structured, problematical and affected by the nature of humans and therefore impossible to define except by employing intervention methods that involve all key actors in the situation.

SSM, moreover, creates interdisciplinary relations among different disciplines. This has helped the approach to become widespread, with many SSM studies having been published in the last three decades. In addition, it has now gained popularity among researchers in the US and Canada, whereas in the first decade after its emergence (1981-1991) its use was restricted to Europe, in particular the UK.

Confirming this rise in popularity is the application of SSM in numerous studies to accomplish different goals. In commerce, for example, Paucar-Caceres, Hart Verges, and Sierra-Lozano (2015) used SSM to address the complexity of managing family companies in the Catalonia region in Spain. In medicine, electronic databases indicate that this approach has been used in researches focused on managing health institutions or in investigating how to raise people’s awareness of various health issues (Kish, Bunch & Xu, 2015). In Management and Strategic Sciences, this approach can be used in people management, analysis of the organizational culture (Wang, Liu & Mingers, 2015), making decisions (Li., Sun, Bi & Wang, 2014), and strategic planning (Diaz-Parra et al., 2014).

The various studies which have applied this approach have demonstrated that it offers special features that contribute to understanding research problems and how to address them. In the first phase, the approach helps in identifying different perspectives related to the issue under investigation. It has also been described as effective for identifying internal and external factors of the problematical situation. The study by Kurbanoglu (1991), for example, applied different techniques of SSM to assist in understanding the requirements of internal electronic network developments in academic libraries and categorize them according to human, financial, and technical requirements. The approach was also used to study the roles of key actors and their responsibilities. SSM, moreover, allows understanding of individuals’ behaviour and their perceptions in relation to different research issues that are mainly based on accomplishing institutions’ public interests or achieving individual goals such as performance development or gaining specific privileges (Brember, 1985). In other studies, Al Harrasi (2012) and Delbridge (2008) demonstrated that more than one technique of SSM can be applied to collect data in order to access full knowledge of the research issue. The techniques used include interviews, document analysis, note taking, and questionnaires.

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In the second developmental phase of this approach, it was shown through scientific research that SSM can deal with two types of issue: Concrete and Abstract, which later contributed to development of various systems that can be implemented to conceptualize the problematical situation. In the study by Knowles (1993) the aim was to develop an electronic system to manage information in health libraries; and this approach enabled the improvement of abstract systems through such as raising people's awareness of the importance of the system and development of the project work plan and other abstract systems that can be applied in reality, including saving information in magnetized CDs and networking inside the institution.

The third phase discussed the possibility of applying different activity systems to improve the problematical situation. The literature emphasized the importance of this phase and its relevance to the reality of the situation. Time, human resources, skills, awareness, infrastructure may play a significant role in hindering the application of the proposed activities. Delbridge (2008), for example, pointed out the difficulty in applying new electronic systems in libraries if staff awareness and the necessary infrastructure are lacking. This phase was also concerned with filling in additional details related to the proposed systems, including the requirements of the system and the possibility of implementation at the current time. All of this information leads toward the fourth and last phase that is concerned with application. Checkland (1985) pointed out that the different phases of the system's development contribute to accessing a comprehensive knowledge outcome that enables the researcher to assess the required changes and identify the most suitable method for implementation that meets the needs of organizational people.

This chapter attempts to introduce SSM as an interdisciplinary approach. The methodology has been applied in a four-year project about using Web 2.0 applications in Omani academic libraries. This project encompassed both human and technical aspects. People of Omani universities of different levels were involved in all the stages of SSM and their reflections were reported. In addition, the authors of the project reported the different processes of using the methodology and the learning and improvement that were achieved by the end of the project. The next section gives a brief description of this project.

ABOUT THE PROJECT

This study aims to gain understanding of the situation regarding enhancing information services through the implementation of Web 2.0 applications in OALs based on viewpoints of participants concerned with the problematical situation. By using SSM, the study also attempts to achieve the following specific objectives that reflect the different stages of SSM as used for collecting data in this study:

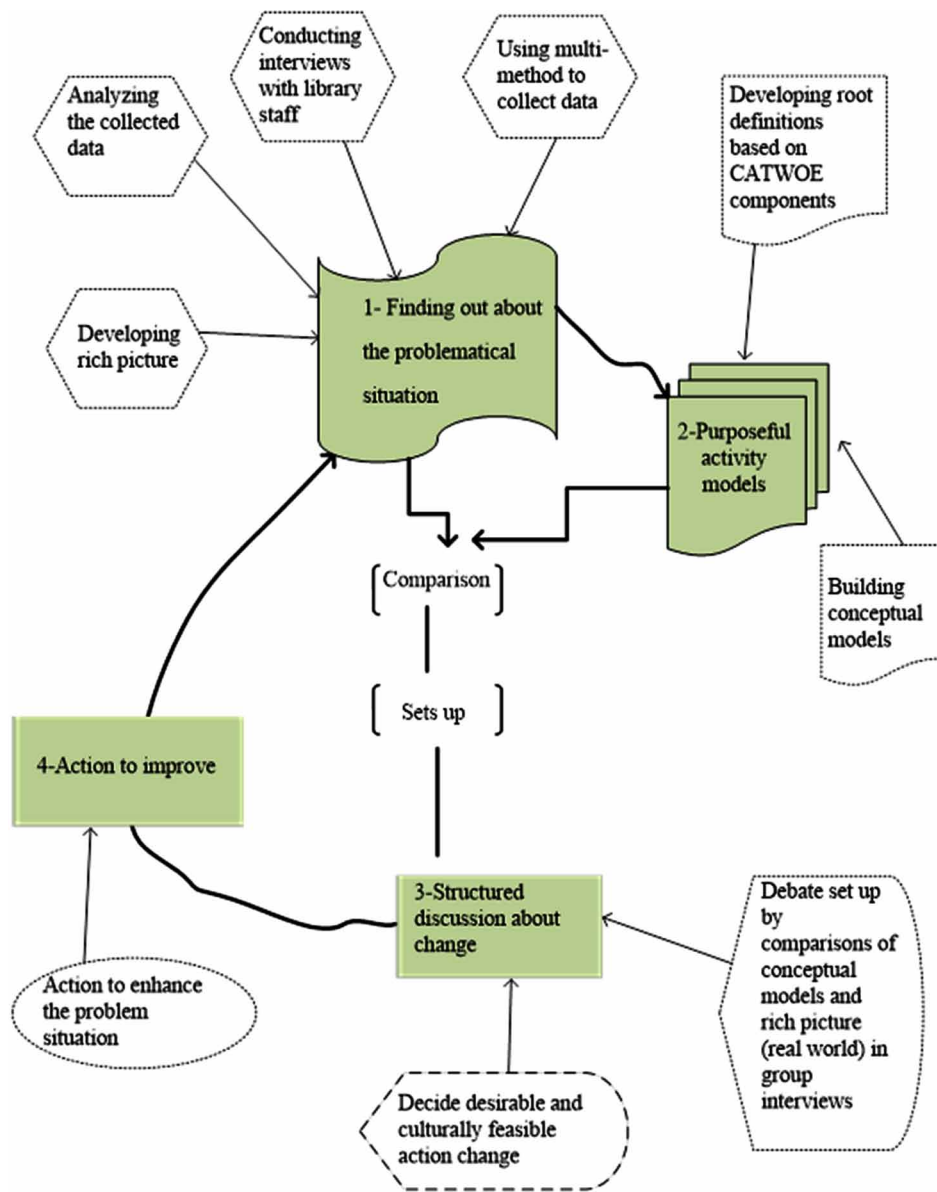
1. Investigate the reality of implantation of Web 2.0 applications in Omani academic libraries (OALs).
2. Develop conceptual models that reflect different worldviews of organizational people in order to improve the implantation of Web 2.0 applications in OALs.
3. Accommodate different participants' views regarding the activities required to support the implantation of Web 2.0 applications in OALs.
4. Define changes which are systematically feasible and culturally desirable to improve the implantation of Web 2.0 applications in OALs.
5. Implement the models agreed on by actors of OALs in order to achieve the desired change.
6. Examine the validity of applying SSM in improving information services in OALs.

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Figure 1 presents the process of the current project, based on the four-stage SSM model developed by Checkland and Poulter (2006), as well as the methods of data collection used at the various stages.

The population of this study comprised personnel at SQU Main Library, LRCs at applied sciences colleges, technical college libraries, and private libraries of universities and colleges in Oman. The six Learning Resource Centres (LRC) at applied sciences colleges are under the auspices of the Ministry of Higher Education and the seven education technology centres (ETCs) at technical colleges are under the Ministry of Manpower. The private libraries of seven universities and twenty one colleges are represented.

Figure 1. Study model of the current project



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REFLECTION OF SSM ON PARTICIPANTS' PRACTICE

The researchers contacted the participating libraries asking them to select representatives for a WhatsApp social group. The aim of this group was to discuss the views of participants regarding the contribution of SSM to changing their awareness, attitude and culture in relation to use of Web 2.0 applications in their libraries. Most of the responses were positive as the libraries strongly welcomed the idea of being involved in the WhatsApp group. During the ensuing discussions the participants were first asked about their prior experience of SSM-based studies. Their answers confirmed that they had never participated in SSM research before their involvement in the present study. According to participants, the reason behind their lack of awareness of soft system methodology is that "library staff do not conduct academic research and this methodology is rarely applied in Oman for tackling problematical situations in the real world". Therefore, the researcher provided brief information about SSM, and gave them examples of the SSM techniques applied, some of which they would be required to assess, such as rich pictures and conceptual models.

Then, the discussion focused on the learning that had been achieved through implementing SSM methods. Regarding stage one of SSM: 'finding out about the problematical situation', the participants underlined that

... this stage helped to raise our awareness about the significance of use of Web 2.0 applications in academic libraries. This stage also contributed to changing the attitudes and thinking of the decision makers in regard to the importance of using these applications to improve our work and increase interaction between the centre sections themselves, and between the centre sections and different departments of the college as well as the outside community.

In addition, user staff commented that

... after the researchers conducted interviews with the dean and assistant dean, they became more interested and started to continuously track the use of Facebook in our library and encourage us to implement more social network applications.

However, another user staff stated:

I think rich pictures cannot show all details of the situation and some readers cannot understand these pictures.

Therefore, the researchers illustrated rich pictures in words to ensure that they were able to express their understanding of the situation clearly.

Relative to stage two of SSM, 'modelling', the participants stated that "each Omani academic library has special situations, such as the mother culture of the organization and capabilities, budget and number of employees, which affect the adoption of Web 2.0 applications, so how can these conceptual models reflect the needs of each library?" On this point, the researcher, according to results of 'finding out about the problematical situation', developed two kinds of ideas for responding to abstract and concrete viewpoints: issue-based root definitions were used to develop several issue-based conceptual models and primary task-based root definitions were used to develop two primary task-based conceptual models. The

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nine conceptual models were developed to address all the issues related to improving the problematical situation in Omani academic libraries and to reduce the conflicts between them, in order to enhance communication and shared experience towards their adoption of Web 2.0 applications.

In relation to stage three of SSM: 'comparison between the real world and the models', group discussions were conducted with decision-makers and IT staff to facilitate implementing activities that were required to support effective implementation of Web 2.0 applications and building a strategic plan for using these applications in Omani academic libraries.

In this regard, the participants mentioned that several benefits emerged from stage three of SSM. First, decision makers such as Heads of Learning Resources Centres and directors of libraries implemented vital changes in their centres to meet the needs of adoption of Web 2.0 applications in their Learning Resources Centre. For example, some participants described their efforts as follows:

On the next day after the head of the centre had attended the workshop regarding the adoption of Web 2.0 applications in Omani academic Libraries, he conducted a meeting with library staff and explained to them that the Centre was going to implement these applications in the near future. Then, he provided all staff who work in the Centre with a detailed report about the workshops. Then, he asked them to benefit from the report in implementing the required activities that will facilitate implementing Web 2.0 applications. A committee was established to manage and monitor the use of Web 2.0 applications in our Centre. This committee contains three staff to represent the Centre's IT section, Library section and Teaching aids section. The committee was helpful because we worked together as a team from different specialties and this gave us a good opportunity to share knowledge and experiences and fulfil the work in less time. Our achievement was to develop Facebook, Twitter and Instagram and we are currently starting to offer our services to users through them. It is a successful experience because there has been excellent interaction recently between Centre staff and users, in particular with library staff. In addition, the head of the centre suggested to top management that they develop a strategy plan for implementation of Web 2.0 applications in our Centre in 2015.

The second benefit achieved by the workshops was that adoption of Web 2.0 applications came to be considered by top management as vital for enhancing the quality of learning in colleges. One of the attendees at the workshops mentioned that

... this methodology definitely changed the culture of our college administration regarding the use of Web 2.0 applications. This is because the dean of college received a number of letters that invited library staff to participate in this project. Besides, the researchers conducted an interview with him in this regard. This led to the dean always wanting to know and follow up what was discussed in the workshops regarding the use of Web 2.0 applications in academic libraries. After these workshops, the deans established a committee to manage and control the use of social networks in college and I am the representative of the Learning Resources Centre. Then, I was asked to present what I learned from the workshops and I explained we should start to develop a strategic plan and action plan about the use of social networks in college. We are working to develop a strategic plan right now.

The third benefit was that the committee contributed to increasing awareness of organizational staff about the use of these applications in academic libraries because it involved different staff from all departments of colleges. User staff from L5 highlighted that

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... this methodology increased the awareness of the use of these applications in academic libraries. Yes, before we implemented Facebook but interaction was low between library staff and users. However, after we participated in this project the interaction improved and we focus now on quality and professionalism and continuity of the use of social networks in our library.

The fourth benefit was that each participating library recognized their role in enhancing the quality of information services offered to users. This point was raised by an assistant director:

... the discussion group helped us to identify and evaluate our work and effort regarding the use of social media for effective service delivery in this digital era. Besides, it provides evidence that there are studies in the field of the use of Web 2.0 applications in academic libraries that encourage us to focus more on this topic.

The fifth benefit was emphasized by the assistant director who stated that: “it is proven that developing policy on the use of Web 2.0 applications in OALs is vital because this policy facilitates managing and controlling the use of these applications”.

The participants thought that stage four of SSM, ‘action to improve’, achieved a number of objectives. The training course gave the library staff in participating libraries an opportunity to undertake advanced training on adoption of Web 2.0 applications. Furthermore, this training course contributed by providing appropriate meetings to share knowledge and experience among librarians from different academic libraries in Oman. This was facilitated by the decision of the researchers and head of the Omani Library Association to select two librarians from each of the participating libraries in the current study and then to give the other libraries a chance to attend the courses. This decision was taken because some librarians who attended the workshops of stage three of SSM discussed the issue of workshops on Facebook, and other librarians then commented, “Please let us participate in workshops towards use of Web 2.0 applications in the future”. Besides, the researchers thought the training course could maximize sharing of experiences and enhancement of communication if it involved librarians from different academic libraries in Oman.

In regard to ‘action to improve’, user staff mentioned that the

... training course provided essential knowledge and practice as well as exchange of experiences with other librarians. So, this training course gave us ideas for implementing the Instagram application in our library and now we have an active account.

Another staff highlighted that

Although we started developing policy for using social networks before participating in this study, we benefited from the training course, in particular learning about the ‘SOSTAC Strategic Planning Model’ and ‘Social Media Policy’, which the trainer explained clearly. Moreover, the trainer was asked to evaluate the experience of our library in use of social media in offering library services and his evaluation was excellent and motivates us to keep going.

Finally, the participants expressed that “the discussion through WhatsApp group, contributed to raising awareness of the use of this methodology in tackling problematical situations”.

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REFLECTION OF SSM ON THE RESEARCHERS' UNDERSTANDING ABOUT THE PROBLEMATIC SITUATION

The researchers have written their reflection based on the views of participants and their own observation of the use of SSM in Omani academic libraries. The participants recognized important benefits in using the processes of SSM investigation as well as the usage of Web 2.0 applications in Omani academic libraries in this study and the researchers agreed with their view. Below are the points of interest that emerged:

- Regarding the shortage of experience and knowledge in applying Web 2.0 applications in Omani academic libraries, it has been recognized that SSM approaches played a major role in promoting the system owners' learning and understanding through an on-going process of investigation and examination of the intricate situations from various viewpoints. Additionally, they were important in developing conceptual models and determining the appropriate resources for applying and refining the conceptual models, and putting in place activities to boost the adoption of Web 2.0 applications in Omani academic libraries.
- SSM techniques such as rich pictures, root definitions, CATWOE elements, and conceptual models helped greatly in identifying the various issues related to adoption of Web 2.0 applications in Omani academic libraries and in deducing the complexity of the situation.
- Different methods applied in relation to the participants, such as personal and group interviews and workshops, helped greatly in accumulating a broad range of data that provided in-depth understanding of the perspectives of organizational staff.
- The extended time spent on this project for implementation of Web 2.0 applications and the participation of organizational people in each SSM stage assisted emergence of the main changes and sharing of the main goals and interests of all participating libraries.
- The use of SSM in this study and the truthfulness of the various participants, with different positions, in sharing their motivations, thoughts and opinions also contributed to decision making.
- The comparison phase of SSM contributed mainly to determining the appropriate sources of information for the conceptual models and gaining access to that information. Therefore, the desirability and feasibility of the conceptual models reflected the actual issues in Omani academic libraries.
- The SSM approach used in this study contributed in boosting the validity and effectiveness of the results by affording participants in this study the chance to express their opinions and work together to find solutions that could alter the real situation in regard to implementation of Web 2.0 applications in Oman.
- SSM is regarded as a main pillar in a thinking mechanism that involved participants from various levels in order to empower them to apply the required changes consistently and through meeting the requirements of individuals and their organizations in every contributing library.
- It is worth mentioning that the conversational and perspective sessions of SSM reinforced the examination process in terms of allowing comparison of intricate situations that are common among different organizations.

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CONTRIBUTION OF SSM IN CREATING KNOWLEDGE

The importance of this study lies basically in its core objectives which are related to the exploration of the real world complexity of the implementation of Web 2.0 applications in OALs and achievement of improvements to the original problematical situation. At the beginning of the process, many obstacles existed, including difficulties with human resources, IT infrastructure, financial resources and viewpoints of the library personnel in terms of the implementation of Web 2.0 applications in their libraries.

However, application of a range of SSM strategies was instrumental in addressing the complexity of the problematical situation. Therefore, the results provide useful insights into how to implement Web 2.0 applications in Omani academic libraries. This SSM study was able to extract vital information based on the different viewpoints of individuals and groups, and to explore in-and out of house factors that had direct and indirect impacts on the problematical situation, enabling comparisons to be drawn between reality and thinking.

SSM was regarded in this study as an influential method for achieving compromises among the various viewpoints of participants in order to improve the implementation of Web 2.0 applications activities.

This study also had the positive effect of improving and reinforcing the thinking and comprehension of the decision-makers and library personnel in regard to implementation of Web 2.0 applications in academic libraries. For example, this study enabled some of the decision-makers to develop a proper Web 2.0 applications implementation plan and form clear objectives of what they intend to achieve by adopting particular Web 2.0 applications in a way that would encourage staff from different libraries to take part in the process of learning about the implementation of Web 2.0 applications.

Accordingly, libraries will be motivated to exchange experiences and acquire new know-how about their circumstances. Generally, the reinforcement of people's thinking affects their perceptions in everyday life; therefore, they come to understand fully the tasks and activities necessary for boosting implementation of Web 2.0 applications in academic libraries, such as creating a committee to promote projects and administer Web 2.0 applications activities. The next four sections explain the development of the research through different stages of SSM.

First Stage: Finding Out About the Implementation of Web 2.0 Applications in Omani Academic Libraries

As illustrated above, the use of rich pictures made it possible to subdivide the stakeholders into the following groups: deans and assistants deans, directors and assistant directors, users service staff, IT staff, and head of the Omani Library Association, on the basis of whether the primary concern of the stakeholders was implementation of Web 2.0 applications activities, taking decisions to facilitate and support carrying out activities for implementation of these applications or a mixture of both. The rich pictures also identified the key actors and the role of stakeholders in the project of implementation of Web 2.0 applications in Omani academic libraries, different viewpoints of participants involved and factors that affect the adoption of these applications in Omani academic libraries.

The results of 'finding out about the implementation of Web 2.0 applications in Omani academic libraries' indicated that two out of the seven libraries use Facebook, and only one library uses Twitter.

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Currently, the library of Sultan Qaboos University is starting to apply the YouTube channel and Instagram on its Beta website. Also, the findings of the study acknowledge Web 2.0 applications could enhance academic libraries in such fields as: giving the library an identity, promoting library information services, marketing library services, providing current awareness services, providing new acquisitions and communicating with library users and other libraries. Therefore, it was concluded that academic libraries should educate librarians and users regarding the use of Web 2.0 applications in library services, as well as formulate a policy and laws for use of these applications in Omani academic libraries.

The results also revealed 14 internal factors, 4 external factors and 3 administrative factors that affect use of Web 2.0 applications in Omani academic libraries. Internal factors include the low motivation of directors and library staff regarding using Web 2.0 applications, lack of awareness and training, lack of communication between academic libraries and library staff and IT staff. Meanwhile, the external factors relate to lack of policy and regulations, weakness and low speed of the internet, sustainability and data conservation. Finally, administrative factors include centralized systems, bureaucracy in management and constant changes in the management structure.

The results of this stage contributed to achieving the first objective of the current study: 'to investigate the reality and factors that affect the use of Web 2.0 applications in Omani academic libraries.'

Second Stage: Building Conceptual Models

The different worldviews of participants were considered in selecting relevant systems that were expressed as root definitions and these were then developed into conceptual models. These modelling processes first require the root definitions to be clearly identified and the use of CATWOE elements to ensure that the root definition is accurately formulated. Thus, modelling started in accordance with the particular worldviews (Ws) of participants. For example, participants identified lack of training of library staff as hindering implementation of Web 2.0 applications in Omani academic libraries. Based on this particular worldview a system for training library staff was selected. Then the other CATWOE elements were identified in order to define and develop a root definition of each conceptual model.

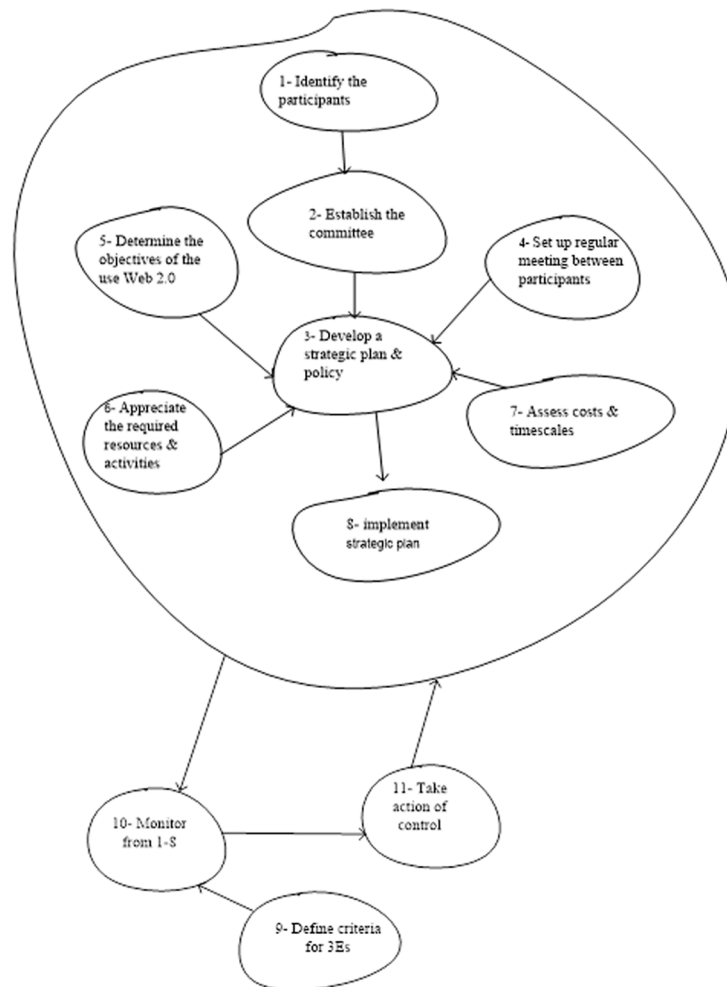
Consequently, in the current study two kinds of root definition emerged: primary task root definitions and issue-based root definitions. "The relationship between a root definition and conceptual model in SSM is therefore a relationship between 'being' and a 'doing' or between a 'schema' and the 'performance' of that schema" (Checkland & Tsouvalis, 1997, p. 158). Hence, in this study nine conceptual models were developed to detail the way in which the identified root definitions were to be applied. This study developed seven issue-based conceptual models to reflect issues related to attitudes of participants regarding the implementation of activities that needed to be accomplished in order to utilize Web 2.0 applications in Omani academic libraries. These issue-based models include: a system for raising awareness, a system to improve communication between academic libraries and top management in Oman, a system for training library staff, a system for marketing Web 2.0 applications, a system for identifying financial resources, a system for identifying the needs of Web 2.0 applications through a strategic plan, and a system for developing an action plan for implementing Web 2.0 applications. Meanwhile, two primary task systems were developed: a system for designing the library Website and a system for promoting E-resources. The next picture gives an example of the System for identifying needed Web 2.0 applications through a strategic plan.

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Third Stage: Comparing the Conceptual Models With the Real World

SSM is based on main steps that contribute to the forming of conceptual models that can be compared with the real world. This process assists in applying changes that will contribute to solving the problem situation (Chilvers, 2000). Therefore, by following the SSM stages, this study constructed nine conceptual models and identified changes to be applied in the problem situation of implementing Web 2.0 applications. Hence, a meeting was held in the third stage of SSM in order to define the extent to which the conceptual models could be employed in implementing Web 2.0 applications in Omani academic libraries. This meeting involved representatives from each participating library. The activities of the nine conceptual models were used to structure discussion regarding the real world situation. The questions focused on whether the activities of the conceptual models existed, needed development, could be established and who was responsible for carrying them out, and the timescales for achievement of different activities for implementation of Web 2.0 applications in Omani academic libraries. This phase

Figure 2. System for identifying needed Web 2.0 applications through a strategic plan



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was also intended to determine that the tasks identified were affordable, acceptable to the organization and culturally appropriate.

The intervention process of this stage involved discussion aimed at reducing clashes of worldviews and enabling the participants to find areas of accommodation regarding the conceptual models. This was an important but difficult process on account of the library personnel all having unique perceptions and norms that reflect the library's character and affect the situation of the implementation of Web 2.0 applications in Omani academic libraries. However, this stage enhanced participants' understanding of issues relating to adoption of Web 2.0 applications and contributed to identification of conceptual activities that could facilitate their implementation. Furthermore, this stage motivated some of the directors of academic libraries to implement some of the activities immediately in their libraries, which also served to improve the problem situation.

The main outcomes of this stage related to establishing a committee with the authority to make a strategic plan and action plan to implement Web 2.0 applications and facilitating communication among Omani academic libraries. Besides, the participants shared their views and identified activities that facilitate selecting changes that are systemically feasible and culturally desirable for improving the situation of lack of implementation of Web 2.0 applications in Omani academic libraries and for bringing about the necessary changes in structure, procedure, and attitudes of people, based on learning achieved through implementing the three stages of SSM.

Fourth Stage: Taking Action to Improve the Situation

The third and fourth stages of SSM contributed to achieving action to improve the situation of the implementation of Web 2.0 applications in Omani academic libraries. The third stage facilitated selection of required activities that were agreed on and accepted by the participants for building a successful system for implementation of Web 2.0 applications in Omani academic libraries and taking decisions on changes to the situation.

As an example of taking action, one of the participating libraries established a strategic planning committee to plan and manage the use of social networking in the College, including the library. Establishing this committee assisted in achieving certain objectives and implementing activities required for successful adoption of Web 2.0 applications in the College. These objectives include enhancing communication between top management and staff, and among staff of the college (committee contains one person from each department), sharing ideas, experiences and discussing ongoing complaints issues, and setting rules and regulations that would facilitate the college's implementation of Web 2.0 applications. This committee would impact positively on the commitment of staff towards the proposed system for adoption of Web 2.0 applications.

Moreover, stage four of SSM in this study contributed to introducing a training course for library staff. This course covered vital issues that needed to be dealt with in order to achieve effective implementation of Web 2.0 applications in Omani academic libraries. Hence, change was also realized in terms of the procedure of the participating libraries through their agreement for staff to participate in a training course. Training was considered a critical issue by all participants in this study, who cited it as one of the main reasons for the limited use of Web 2.0 applications in Omani academic libraries.

Furthermore, in the training course (second workshop) attendees discussed other relevant issues such as how to interact with the Omani library association effectively to achieve their objectives in regard to enhancing the quality of their information services. Besides, they stated that new Web 2.0 applications are

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constantly being introduced and it is important to know how to deal with them and select which meet the needs of beneficiaries, for example, how to implement Snapchat in academic libraries. Participants were united in showing willingness to adopt Web 2.0 applications in order to enhance services for their users.

CONTRIBUTION OF SSM IN ENHANCING INTERVENTION PROCESSES

The analytical method used in the current study was to clarify, explore and achieve apperception of the implementation of Web 2.0 applications in OALs. The basic addition to methodology was the combination of intervention processes into an SSM model. Also, conducting individual interviews allowed better comprehension of the individuals' perceptions of the authentic world. This study also utilized group interviews with members of seven participating libraries in order to form conceptual activities and explain them in group discussions. Workshop method was thus applied as a strategy in this study, mainly to implement the newly recognized alterations. Besides, the intervention methods helped greatly in elucidating the required information to improve the current circumstances. These methods played effective and reciprocal roles along with other SSM tools such as rich pictures, root definitions and conceptual models.

SSM, moreover, allowed using the workshop to bring about changes to the situation. The workshop provided a practical framework for introducing modifications and improvements that needed to be applied in the real situation in terms of perspectives, methods and strategies. Throughout the process of assessment of the study, participants admitted that the workshop was an adequate system to develop learning and create new changes.

As a third contribution, the intercommunication through debates and assessment of the findings was a crucial and significant step. The knowledge gained in this study was related to the findings of the previous literature. The discussion of the literature in this phase reinforced the validity and reliability of the outcomes of this study. The discussion provided a worldwide analysis of the implementation of Web 2.0 applications in academic libraries. Additionally, the literature offered further information about factors that hindered the implementation of Web 2.0 applications in academic libraries. Meanwhile, the viewpoints of participants indicated the validity of the implementation of SSM in the current study.

Nevertheless, this study introduced major modifications and new innovations. The process of intervention and application of SSM realized the process of learning that was needed to develop the current situation. Therefore, the situation was greatly enhanced in terms of the implementation of Web 2.0 applications and broadening the scope of applying SSM in information services domains. Further, this study covered largely unexplored ground in terms of SSM application by examining particular problem situations associated with emerging technologies in the information services age, such as virtual reality (the use of Web 2.0 applications to offer certain academic library services).

CONCLUSION

Checkland and Poulter (2006) proposed Soft Systems Methodology as a learning tool. Following the different phases of SSM development and its usage in Europe, the US, and Canada, it has become apparent that it is capable of creating clear understanding about research issues and dealing effectively

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with the complexity of the situation identified at the beginning of conducting a research. It can also be used as a continuous learning tool since the different stages of SSM form an endless cycle in which, by the end of the research, new phenomena emerge that need to be addressed.

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KEY TERMS AND DEFINITIONS

Comparison Stage: In this stage of SSM, participants compare between ‘conceptual models’ that improved by the researcher in the second stage, and the reality of the situation as described by participants in the first stage. The aim of this stage is to ensure that the agreed changes are reflecting with reality of the situation.

Feasible and Desirable Change: According to the nature of SSM, the changes that are suggested to take place within the situation need to be systematically feasible and culturally desirable. They must reflect the interests of all the stakeholders involved. The analyst needs to make sure that the available resources within the situation support implementation of the required changes.

Four-Stage Model of SSM: This model developed by Checkland and Poulter in their book “Learning for action: A short definitive account of soft systems methodology and its use for practitioners, teachers and students”. It consists of four stages which are (1) defining of problematical situation, (2) developing conceptual models, (3) identifying the desired change, (4) making action.

Intervention Processes: SSM is an approach that allows participants to intervene effectively in problem situation in order to identify the changes that are systematically desirable and culturally feasible. Through different intervention processes, the accommodation between conflicting interests is important to enable the desired change.

Social Network: An online platform allows social interaction between people. Individuals with very low technical skills can develop their own website and interact over the internet. The most famous Social networking sites are Facebook, Twitter, Google+, YouTube, and Snapchat.

Soft Systems Methodology (SSM): A methodology founded in 1981 by Peter Checkland and colleagues in Lancaster University. It develops to deal with complexity of situation where human are the main actors of research problem and intervene in order to improve their situation. The classic model of the methodology consists of seven steps. In the most recent SSM model, the seven stages reduced to four stages.

Systems Owners: According to the philosophy of SSM, every investigated situation consider as open system that are dynamic and require improvement in order to survive. Systems include many human activity systems that interact with each other and involve human and technical elements. System owners are the decision makers who own the system and control it and can support or reject the proposed changes.

Chapter 17

Economic Journalists’ Qualifications in the Arab World: A Proposed Interdisciplinary Academic Program Offered by Sultan Qaboos University, Sultanate of Oman

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ABSTRACT

As regards the issue of journalists’ qualifications and media professionals in general in the field of media work, evidently including economics, the countries of the world are divided into two main directions: the direction of general scholastic qualification, and the trend of specialized qualitative qualification that separates work fields and distinguishes between the skills and conditions to be provided by journalists working in a specialized field. In fact, working in the field of economic journalism requires a qualitative qualification that responds to the nature and special work conditions in this area. Furthermore, when some international universities offer quality qualification programs in the field of economic journalism, the majority of Arab world media qualification institutions continue to adopt the classical approach in qualifying economic journalists. Actually, academic institutions give professional institutions, where journalists are supposed to work after graduation, the task of compensating for their lack of information and skills in deferent areas of specialization. Hence, this study presents a proposal for the establishment of an academic program between the media and economics, called “Economic Journalism”, throughout which journalists specialized in economics, are trained through a university qualification program that combines journalism knowledge and its arts with the fundamentals and principles of economics. This program is suggested to be offered by Sultan Qaboos University, in the Sultanate of Oman and could be adopted by other Arab universities and could well benefit from international experiences in qualifying economic journalists so as to build an academic program model that would reflect the importance of an overlap across science disciplines. This will help in having qualified human cadres in the economic journalism. Eventually, the study is based on an analysis of the current global economic journalists’ qualification trends through a close reading of the available university programs worldwide.

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THEORETICAL FRAMEWORK

Interdisciplinary

In simple and concise terms, many dictionaries and scientific sources agree to define the term Interdisciplinary as an area that combines two branches of knowledge. The Oxford Dictionary, for example, defines "Interdisciplinary as relating to more than one branch of knowledge."

A number of researchers (Newell & Green, 1982, p. 24) define this term as: "specialized area of knowledge which critically draws upon two or more disciplines and which leads to an integration of disciplinary insight". It may seem obvious that interdisciplinary studies would involve the integration of disciplinary materials or insights, but considerable misunderstanding exists on this point among purported interdisciplinarians themselves—a fact which has resulted in the overuse and misuse of the term.

Interdisciplinary relations have affected modern human knowledge, be it at the level of knowledge production in general, or at the level of advancing new solutions to problems that could not be solved when dealt with from one limited and narrow knowledge portal. This could be added to the skills generated by the interrelationship between sciences and what it offers to researchers and intellectuals acting in different fields of knowledge. Interdisciplinary relations between disparate disciplines are of a remarkable importance in modern human knowledge, because of their contributions to the rapid development in the distinct fields of knowledge, scientific research and its methods. The interrelationship between social sciences and other sciences in modern times is one of the modern trends in the fields of university education and scientific research which has begun to renew its characteristics and review its traditional approaches; these are unable to provide explanations and solutions to some complex social problems. Therefore, social sciences have recently moved to interact and collaborate with other sciences in order to solve many contemporary social and humanitarian problems.

Social sciences interests in interdisciplinary scientific approaches has evolved as a product of human thought in interrelationship with other sciences, and since the social aspect in other fields of science has become recognized and sometimes necessary. Many instances can exemplify this case. For example, medicine is not limited to diagnosing physiological factors and diseases treatment solely, but again to taking social and psychological factors into account, and many social and human sciences look at the physiological aspects as they often affect the level of social performance, mental health or individuals' social relationships. Consequently, there is a continuous confluence between the two fields, but this does not diminish from their distinctiveness because they are separate areas of knowledge.

Social and human sciences need for numbers, ratios and mathematical equations is indispensable to understanding trends and responses and turning them into indicators through which accurate plans can be drawn up to solve problems. At the same time, there will be no place for 'mute' figures unless they contribute to humanitarian and theoretical explanations and relate them to the societal reality through social statistics. The same applies to the science of biomechanics which is co-developed by the science of physical education, mechanical engineering and physiotherapy. The study of economics can, for instance, tackle the phenomenon of desertification in terms of its impact on the level of production and national income. In sociology, it deals with its influence on social relations and prevailing culture. Geography studies it as a geographical phenomenon, while psychology analyzes its impact on the behavior of individuals. Hence, it is a phenomenon that calls the attention of economic, social, psychological, geographical and environmental sciences all at once.

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The interdependence and synergy between sciences in general and social sciences with other sciences in particular, has deepened if compared to the past. There is no doubt that social sciences continuous pursuit in order to develop new scientific curricula and invent modern techniques in testing, measurement and investigation, is ensured to move away from the traditional patterns of classical knowledge leading the human phenomenon to go beyond the specificity of the subject to eventually interact with other fields of knowledge.

The current reality in many international universities today is indicative of advanced steps that reflect interest in the interrelationship between sciences in the form of academic programs and departments. It is, more importantly, manifested in institutes and colleges at international universities in the United States of America, for instance, as in Stanford University, Carnegie Mellon, Illinois, Southern California, College of William & Mary at Williamsburg, and ancient prestige's Japanese universities such as the University of Tokyo, the University of Osaka, and at British universities, such as Glasgow University, Essex University, and the University of Manchester.

The list of universities and colleges interested in interdisciplinary programs is actually long; these are but a few instances. Another example of this interest in inter-sciences relations in the global academic community today is the emergence of a number of scientific associations, unions and journals on inter-sciences relations in different regions of the world, as it will be indicated in the coming sections of this chapter. Universities and research centers around the world also hold ongoing conferences on this subject.

In the Arab world, interest and activities in the interrelationship between sciences is still limited to some programs within one college or between colleges. To the best of my knowledge, this subject matter did not exceed this level, which is mainly related to individual initiatives and to some academic leaders' personal convictions.

In the future, Arab universities need to go beyond individual or fragmented initiatives to reach institutional initiatives and regular projects that have the appropriate visions and clarity to promote the concept interdisciplinary and its applications in the form of ongoing study programs or research projects to obtain a better academic qualification on the one hand, and to provide more comprehensive and powerful scientific solutions to multidimensional societal problems on the other.

In the Arab academic institutions, we also need better convictions to overcome the fragmentation of knowledge and sciences that reflects a picture of isolated and unconnected islands. We need to bring sciences closer to each other and to transcend the desire to control the sciences to which we belong. More than that, we need to surmount easy personal questions when thinking about linking our knowledge to other sciences, such as: who runs the program? Who issues the certificate? Will the names of our departments remain when new programs are created? And some other similar narrowed and closed minded questions.

These questions need to be more profound and forward-looking if we want to achieve a prospective university education and a qualitative scientific research that reflects this interrelationship of knowledge and sciences and offers interdisciplinary programs.

Media Education

There is no doubt that there is a relationship between the mass media, its various means and effects in many sciences, knowledge and theories that explain the nature of the mass media message, its objectives, targeted audience, and the expected echo received from all these means. It is also known that mass media work in different sectors of life is both influenced and influential, ranging from politics, economy,

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environment, science, law, and many other fields. Therefore, it was not surprising that an independent field was developed in different branches and fields within the media work called “specialized media” or “specialized journalism”, which – and still – requires knowledge, science and special skills; thus a special or specialized preparation. There are many specialties in the field of media work such as scientific journalism, economic journalism, sports journalism, cultural journalism, health journalism, military journalism, and security journalism, to name but these. Universities and other qualification institutions reactions and dealings around the world have varied with regard to these exact disciplines. Some have been launched to provide degrees that offer academic qualification to those interested in these disciplines at the undergraduate or postgraduate levels. In contrast, some academic schools have stopped providing university degrees to the study of specific areas of specialization to finally provide general knowledge and academic qualification without meeting the requirements of specializations. This conflicting relation between the two types of academic media qualifications – general and specialized – has been linked to a larger subject which is that of academic media professionals’ qualification around the world.

The American School influenced the establishment of an American-oriented academic media qualification that first appeared in the late 19th and early 20th centuries. Some sources point out that until 1870, the teaching of journalism in the United States was in the hands of the “typists”; some of whom tried to establish associations or unions among themselves to teach the principles and values of journalism and printing (Dickson, 2000).

One of the important and early thoughts that led to the establishment of a global trend for academic media education is the ideas that began in mid-1800 by some pioneers in education and journalism together. Some of the first articles and public lectures focused on the importance of teaching individuals to engage in journalism, because learners are difficult to control, guide or categorize under either category, so serious claims began to spread to establish departments in some US universities allocated the task of teaching media issues and preparing their curricula (Dickson, 2000).

In 1875, Cornell University’s rector suggested that a program and a university degree in journalism be offered. This proposal was followed by the efforts of Joseph Pulitzer since 1892 to establish a journalism school at Columbia University, which culminated in the establishment of this school in 1913; one year after Blitzer died (David, 1990, pp. 6-7).

The second step was the efforts made by the Missouri Journalism Association in the beginning of 1896 to establish journalism schools. But it is the efforts of the University of Wisconsin which led to the establishment of the first journalism school in the United States in 1904 (Wisconsin Journalism School, Wisconsin University), followed by another school at the University of Missouri in 1908 (Missouri Journalism School, Missouri University), and then at Columbia University in 1912 (Columbia Graduate Journalism School, Columbia University).

In the United Kingdom, a BA in Social Sciences and Journalism at the University of Wales, Cardiff, was the first of its kind in journalism (Williams, 1999). It was first launched in 1970 and founded by Sir Tom Hopkinson, followed by City University in 1976.

Academic journalism qualification in the Arab world started in the department of Journalism at the American University in Cairo in 1935. Then, the institute of Editing, Translation and Journalism was established at Cairo University in 1939, which has developed little by little in relation to the years of study and the scientific degrees it awards. In 1975, the name settled on the College of Communication (Al-Jammal, 1991).

Generally speaking, the countries worldwide are divided – as regards the field of journalists’ qualification and that of those specialists in any field of journalism – into two main directions. The first is a

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general scientific and/or vocational qualification that has prevailed – and is still prevailing – in the poor developing countries of the South. The second is a specialized qualitative qualification that separates the work places and distinguishes between the skills and conditions that must be provided for journalists working in any field of specialization known in the media work: economics, sport, science, wars, culture, religion, etc. This is an orientation that has characterized the states of the North. Besides, it has never been difficult to reach this conclusion, namely because a broad overview of the academic programs offered by many scientific institutions in a number of countries, North and South, shows these fundamental differences. When talking about the experiences of preparing journalists scientifically and professionally and comparing between both directions, it is not possible to make only rough numerical comparisons since the comparison, here, will be vain and unfair. This is because the institutions of scientific qualification for journalists in the North are more present and more numerous. These two qualities – precedence and quantity – apply to media institutions that employ those qualified graduates. But the countries of the South should not always be ignorant of the time difference, since the establishment of modern experiences in scientific and professional training usually depends on the latest and most recent experiences. This means that they do not always have to start their steps from scratch and repeat decades of qualification projects. If, for example, the trend in the world today is to take advantage of an overlap across science disciplines and knowledge in qualifying media professionals and journalists, this trend should not be ignored and postponed for decades.

The media qualification, either general or specialized, occupies an important place today, and the best proof of that is the spread of specialized departments, institutes, colleges and centers for media education in different countries of the world. This type of qualification is part of the system of education in various fields and the journalism and media education are no exception to this global norm. Again, scientific qualification programs play a pivotal role in the development of the general knowledge systems, the theoretical, intellectual and philosophical foundations of journalism and media sciences, as well as in determining their relevance to other knowledge and sciences. The scientific qualification of media professionals also contributes to making them understand the essence of their communicative function and their media and interpretive role. Moreover, these programs aim at providing basic theoretical and philosophical knowledge in the sciences of journalism, media and other related sciences, as well as supporting the basic skills associated with journalism and media sciences and coordinating with the concerned institutions to refine and develop these skills. These programs and the academic institutions they belong to also reduce the gap between theoretical and research education and the practical application of media work, as they do help learners understand this relationship.

The issue of media education has preoccupied both scholars and researchers to the extent that it has become a research path in the fields of the journalism and media represented by research groups and scientific journals, and discussed in many scientific conferences. *Journalism & Mass Communication Educator* is one of the most prominent scientific journals founded to serve this issue (*Journal of Mass Communication Educator*). The journal is the voice of the Association of Education in Journalism & Mass Communication (*Association of Education in Journalism & Mass Communication*).

Among the works advanced in this vain, a book entitled “*The Training of Journalists: A World-Wide Survey on Training of Personnel for Mass Media*” published by the UNESCO in 1958. The book has three sections: (1) international cooperation in the training of journalists, (2) the role of the UNESCO in the training of journalists; and (3) the possibilities of media and journalism training in a number of countries around the world; notably Egypt, the United States, Canada, China, Japan, Britain, France and Australia. The book reflects the UNESCO’s advanced interest in the issue of media education in

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the world, an interest that has not stopped but has rather evolved over time. This issue is still under consideration in the UNESCO.

Studies in the field of journalism and media education are normally focusing on specific countries or taking wider international perspectives. Some of the main themes under investigation in these studies are; history of media education, media and journalism environments, needed skills for the journalism job markets, students' and experts' views on media education, curriculum development, journalists' field training, challenges facing media education, etc.

Among the most important questions forwarded by these studies are:

1. What is the situation of media education in a country, a region, or worldwide?
2. What are the most important developments, failures, and problems facing media education?
3. Are there new trends in media education that have emerged lately?
4. What are the students' views about media education?
5. How do the experts evaluate media education in a country, a region, or worldwide?
6. Is it necessary to introduce compulsory courses on media education in the pre-university school curricula?

And more general and specific questions related to this field of research (Read for example: Quinn (1999); Dickson, (2000); Fedorov (2007); Hume (2007); Sahid Ullah (2008); Toit (2013); Sahid Ullah (2014); and Fedorov (2014)).

Related to the Sultanate of Oman, where the proposed program on economic journalism is going to be launched in the first place, it is worth mentioning three studies about media education in Oman. A study by Al-Rawas (2002) evaluated the views of graduates from the Department of Mass Communication at Sultan Qaboos University on their study program. The study recommended that minors should be created instead of providing general media education, enhance English language skills, and encourage more of critical thinking.

Al-Hasani study (2006) entitled "Teaching Journalism in the Arab World: Recent Obstacles and Future Plans in Oman", suggested a future proposal for media education taking into consideration media/government relationship, contents of the local media, and students and faculty members in the Department of Mass Communication at Sultan Qaboos University. The most two shortage in the DMC program as found by Al-Hasani, were English language skills and field training.

Another study by Susan O'Rourke (2011) discussed teaching journalism in Oman after the Arab Spring. The study focused on the Bachelor of Communication Studies offered by the Omani Colleges of Applied Sciences, under the administration and supervision of the Ministry of Higher Education. The study examined the offered courses within the major, and some other related issues. The main conclusion of that study, as understood by the researcher, was teaching communication in the above mentioned colleges should be restructured taking in consideration the changes took place in the country after the Arab Spring.

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A PROPOSAL FOR AN ACADEMIC PROGRAM ENTITLED "ECONOMIC JOURNALISM"

Specialized Journalism and Economic Journalism

Specialized journalism, as well as the specialized journalist in a particular field, is as old a phenomenon as journalism itself. Some media schools confirm that journalism in the world has begun as a specialized one in terms of the audience it addresses and the content it provides to the public. In its beginnings, journalism began to address specific sectors of the masses to provide them with a specific content as well. Opting for a specialized press, in the initial period, was guaranteed and an audience linked to the limited reading-ability of the masses as a luxury and a privilege that not all community members had access to. Then, because of the material capacity that was only in the hands of influential men and traders, newspapers as other means of mass communication became a public practice after a long historical period of monopolization of certain groups "able" to get it and deal with it (Al-Hietti, 2015, p. 10). Today, things have come back to their initial state, where the mass media began to focus on its specialties constantly searching for a specific audience. However, the reasons for specialization today differ from those that were behind the first specialized beginnings of newspapers and magazines. This is because moving towards encyclopedic and inclusive knowledge is constantly restricted. The disciplines and areas of life, at the present time, are deepening the fragmentation of their subjects, hence the fragmentation of the interested masses. Here, newspapers and other media outlets have returned to the specialized audience and content. The segments of the masses in all countries and regions of the world are witnessing this deepening in programs specialization and information materials. Today, the topics of radio channels and periodicals vary from sport to economy, passing by children, politics, women, science, and military affairs. It appears that there are those who demand that these general headings be addressed in a more specialized way since sciences are diverse, much like economics, sport, etc.

Scientific sources that study the phenomenon of specialized journalism agree that these show a close link with some of the most important factors: the spread of education, political, economic and social developments, and readers' special interests development. (Shafeeq, 2009, p. 37). In fact, specialized journalism appears as a result of the community's needs and circumstances; as if responding to actual needs that reflect developments in this area of life or so. The examples provided by the advanced sources in this subject confirm this idea. *Scientists* is the first specialized magazine in the world. It appeared in France in 1665 associated with the Renaissance Project. In 1785 Britain, *The Times* specialized newspaper began to offer only commercials and news of the financial market and the movement of ships. In this context, it is possible to respond to some of today's critics who point at the specialized journalism, blaming it for fragmenting the public and splitting up its knowledge and information as this was not caused by journalism or other mass media outlet, but was a natural result of developments in the social, economic and cultural life in various countries of the world. Rather, this contributed in broadening the areas of human activity in all walks of life. It is no longer possible for the human being to care for or study all sciences, as he has no time to practice more than three hobbies at one period of his life and so on (Abdel Latif, 2002).

I think it is, perhaps, appropriate at this juncture to introduce one of the definitions that I find suitable for the specialized journalism. It is a periodical that: "focuses the most attention on one branch of disciplines in which a particular type of readers is interested. Then, all or most of its journalistic activ-

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ity becomes invested in this branch or field” (Abdel Latif, 2002, p. 11). Yet, this does not prevent this periodical from caring about other areas of interest, but with less focus than on the main area.

The economic journalism is considered as an important type of the specialized journalism and its beginnings go back to 1793 when Hampden Journal was established as an economic journal in the United State of America (Al-Hieti, 2015, p. 54).

Later, after the First World War, economic developments attracted many people into the financial markets and stock buying, which helped to increase the interest of ordinary readers in business and finance. The economic journal is defined as one that “deals with the economic content in all its main and secondary issues, and focuses directly on its various influences on the multiple aspects of life” (Ismail, 2001, p. 275).

For long time economic journalism has been described as “boring” and “complex” because of its emphasis on “equations, statistics and figures”, but the masses of people around the world began to take care of this specialized type of journalism, whether in the form of pages, supplements in public newspapers and journals, periodicals specialized in the general economy or one of its branches. Perhaps that the growing number of headlines in the economic journalism in various branches shows this interest in it, while recognizing the differences between one community and another. As noted previously, the specialized journalism in general, including the economic journalism, spreads, affects and multiplies directly with the increasing interest of its audience. Some websites have fostered economic journals with more than 500 journals around the world, with the emphasis that such sites usually exclude many of renowned economic journals, either because of the language (Arabic, Chinese, Russian, etc.) or because some famous periodicals in some regional domains have not introduced themselves electronically (All business).

Some scientific sources agree that the economic journalism is characterized by a number of characteristics. The most important of these is that it is a serious type of journalism dealing with serious content. It relies mainly on information, data, statistics and figures. It transcends the coverage of the event to attain its interpretation by linking it to other events. Additionally, because of the nature of its topics, it melts in public policy and adopts a frequent use of standard models and mathematical equations, as it is based on fact-based analysis rather than opinion (Ismail, 2001, p. 276).

These characteristics are reflected in the economic journalist, who is also obliged to have a number of characteristics and features so that he/she can perform the functions of this type of specialized journalism. He/she should also be accurate in presenting and interpreting information, figures and statistics, and be able to compare the numbers he/she uses in order to turn them into journalistic subjects. Add to it, the courage to present facts, honesty and truthfulness which will prevent him/her from being victimized by financial temptations, possessing the scientific background to understand economic terms, and familiarity with the local, regional and international systems in the fields of finance and business.

Global Trends in Economic Journalists Qualification

The countries of the world’s orientation in qualifying specialized journalists follow the general direction of these countries as far as qualification and media education in general are concerned. In the developed countries of the North, which went from an early period to the disciplines of precision and precise specialization, and which adopted an overlap across science disciplines, established a lot of specialized programs that need a qualitative qualification in the fields of economics and else. In the developing countries or the South, the mainstream is public media education which is facing a few initiatives and a number of specialized programs in economics or other fields.

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Although the researcher recognize that media education institutions in the developed North countries are considered the oldest in presence, this does not justify the lagging behind of media education institutions in the South to provide quality academic programs in specialized journalists qualification in each field. These differences are evident in the trends of media qualification for economic journalists in the world through a review of the American experience, which can be considered the most important because of its historical progress as I mentioned earlier, all due to the diversity and multiplicity of media schools offering media qualification programs (See Appendix 1: Media Education Programs in the United States of America). Added to this, the Arab experience in media education, especially for economic journalists, should be also reviewed, so that the reader can understand the context of the proposed economic journalism program in this study.

In the United States, programs for the preparation of economic journalists vary between academic programs, short training courses and seminars. Table 1 provides some background information on different types of academic programs that offered for economic journalists in the United States (Business Journalism).

The following notes can be recorded on these programs:

1. The institutions referred in Table 1 provide qualification programs in the field of economic journalism. This does not mean that this result is applicable to all American journalists' academic institutions. However, the examples confirm the trend towards qualification of specialized economic journalists in general or specific programs.
2. By reading the study plans of the programs referred to in Table 1, the researcher is assured of the correlation between the programs that give a university media or journalism and that grant a sub-specialization in the economic journalism linking its students, and a specialized faculty offering courses in economics, finance and business.
3. As in Table 1, nine American institutions tend to offer specialized master's programs in economic journalism, which is a suitable way out, since those who apply for these types of programs are specialized in economics.

Table 1. Some academic programs offered for economic journalists in the United States

No.	Program Type	Total	Examples
1	Academic Fellowships	7	Columbia University Graduate School of Journalism, Knight-Bagehot Fellowship Program in Economics and Business Journalism.
2	Graduate Degrees	9	American University, Graduate Specialization in Economic Communications.
3	Certification Programs	4	Franklin College in Indiana, Business-Journalism Certification.
4	Undergraduate Majors	5	Washington & Lee University, Business Journalism Sequence: Combination of Journalism Department and Williams School of Commerce.
5	College Courses	14	Columbia University Graduate School of Journalism, John S. and James L. Knight Chair in Business Journalism.
6	Educator Training	2	Society of American Business Editors and Writers.
7	Faculty Chairs	4	University of Missouri, The SABEW Endowed Missouri Chair in Business and Financial Journalism: Martha Steffens.
8	Primary Schooling	1	American Society of Business Publication Editors, "What in the world is a Magazine editor?"

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4. Among the important ideas presented in table 1 above, is that of establishing supported scientific chairs specialized in the economic journalism. This will but symbolize its importance. Besides, the idea of teaching the principles of writing economic subjects and the specifications of economic editor students in the first stages of education are very important ideas.

It can be said that these academic and research programs are now supported by a number of steps and projects that strengthened the convictions of economic journalists in what they do. Among the most important of these:

1. A large number of training courses and ongoing panel discussions that help economic journalists continue their qualification program and develop their skills in their field of specialization.
2. Recognition and gratitude awards for economic journalists are granted periodically, most notably:
 - a. The Gerald Loeb Awards
 - b. Pulitzer Prizes Associated with Business Writing
 - c. Other Business Journalism Awards (15 awards according to Business Journalism.org).
3. Special organizations and trade unions for economic journalists, such as:
 - a. Society of American Business Editors and Writers (SABEW).
 - b. American Society of Business Publication Editors (ASBPE).

In the Arab world, media education programs have begun in various media areas such as journalism, radio, public relations and advertising at the college level or at the level of departments within colleges of social sciences. As time goes by, and with the development of media education experiences, some academic institutions are moving towards a more specialized qualification in journalism, radio, public relations and advertising. But media qualification institutions in the Arab world have not moved beyond a broader step in qualifying media professionals in specific fields.

Table 2 provides background information on some Arab world academic institutions that offer qualifications in the field of journalism and mass media, and how these institutions deal with economic journalism in term of courses or specialization.

The following notes could be made about the educational programs provided by some academic institutions in the Arab World in the field of media and journalism in general and specialized journalists, including economists, in particular:

1. These institutions offer general qualification programs, most of which offer sub-specialties in the fields of media, journalism, radio, public relations and advertising, and occasionally in design.
2. These institutions do not provide specialized qualification programs for economic journalists or other specialists. They rely on providing the basic knowledge and skills related to the media work in general and leave to the institutions they will join after graduation, the opportunity to qualify and compensate for their lack of fieldwork information and skills.
3. The majority of the Arab world media academic institutions continue to adopt the classical trend in media education, which focuses on the fact that specializing in a particular media field is ensured by the institutions in which the media graduate is going to join for work, because the academic program cannot bear many branches in terms of the time or effort required to achieve the goal of qualifying specialized journalists.

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Table 2. Some media education institutions in the Arab world and their economic journalism courses

No.	Academic Institution	Type of Program	Economic Journalism/ Communication
1	College of Communication, Cairo University	Minors in mass media	Within a course
2	College of Communication and Documentation, Lebanese University	Minors in mass media	Within a course
3	College of Mass Communication, Sharjah University-UAE	Minors in mass media	None
4	College of Political and Communication Sciences, Algeria University	Minors in mass media	None
5	Institute of Journalism and News, Manuba University-Tunisia	Minors in mass media	One elective course
6	College of Communication, Zaid University-UAE	Minors in mass media	None
7	Department of Mass Communication, Sultan Qaboos University-Oman	Minors in mass media	Within a course
8	Department of Mass Communication, Kuwait University	Minors in mass media	None
9	Department of Mass Communication, Qatar University	General mass media	Within a course
10	Department of Mass Communication, American University Sharjah-UAE	Minors in mass media	Within a course
12	Department of Mass Communication, American University Cairo	Minors in mass media	Within a course

4. The general trend in the Arab world media professionals' qualification is dominated by the inability of the labor markets in some Arab countries to absorb more specialized journalists in a particular field. This is also due to the small number of media institutions that these professionals can join after graduation.
5. It seems that these institutions convictions in general media qualification are the most influential ones on their orientations. In case they fear the non-absorption of the markets and the availability limitation of media institutions, why don't these institutions provide periodic programs of short training (diplomas, courses, workshops), and why do some of them – in some small population countries – accept over 600 students per year?

These observations lead to the need to think about some proposals that can help to provide specialized and qualitative media qualifications in the Arab world. The most prominent of these proposals might be:

1. Producing and presenting more scientific studies on the reality of economic journalism in the Arab world, the nature of its content, and the characteristics of its employees.
2. Encouraging media education institutions in the Arab world to start implementing the programs of preparing economic journalists and other specialized journalists, whether within the currently available general programs, or by opening special programs for them (Short and mid-term diplomas).
3. Benefiting from the experiences of economic journalists qualifying institutions in the world and seeking to apply some of the ideas of those institutions in the Arab world.
4. Opening more training programs and continuing qualification for economic journalists currently working in the journalism or economic institutions in order to continue their scientific qualification, especially in economic fields or those that emphasize the link between the media and economics.

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5. Encouraging the establishment of specialized associations concerned with the economic journalist at the local and regional levels, under the condition that these associations hold and organize periodic meetings and workshops to develop workers skills in the field of economic journalism.
6. Launching awards for the economic journalists and other areas of specialized journalism that would highlight the recognition and importance of specialized journalism and the appreciation of the specialized journalist's work.

PROPOSED INTERDISCIPLINARY PROGRAM: ECONOMIC JOURNALISM

Depending on the researcher's survey, and based on the previous remarks which confirm the lack of an established academic program in economic journalism in the Arab World, the following section of this chapter will propose this program. The initiation of this proposed program will start in Sultan Qaboos University in the first place, and could be applied in other Arab universities later on. Before specifying the detailed structure of the proposed program, it is important to provide the reader with some basic information and background about SQU.

Sultan Qaboos University is the only national university in the Sultanate of Oman, and it could be confidently considered the leading academic institution in the country among 58 colleges and universities; (32 governmental) and (26 private) (Ministry of Higher Education, Oman).

SQU started its educational operation officially in September 1986 with five colleges: Education, Medicine, Agriculture, Engineering, and Science. Gradually more colleges and programs were inaugurated in this university, and students' annual intake increased from 500 in its early years to 3300 in the most recent years. Table 3 illustrates the numbers and types of programs offered by SQU through its different colleges (Sultan Qaboos University, 2014-2015 Annual Report, pp. 40-43).

In relation to interdisciplinary education, SQU projected a great attention to this issue in its Strategic Plan 2016-2040. One of the strategies for undergraduate teaching and learning in the above mentioned plan mentioned literally interdisciplinary programs as follows: "Initiate interdisciplinary programs and

Table 3. Numbers and types of programs offered by SQU until the end of 2015

No.	College	Program Types				Total
		BA	MD	MA	PH.D	
1	Agriculture and Marine Sciences	10	-	8	5	23
2	Arts and Social Sciences	11	-	10	3	24
3	Economic and Political Sciences	9	-	3	-	12
4	Education	11	-	10	5	26
5	Engineering	8	-	9	6	23
6	Law	1	-	4	-	5
7	Medicine and Health Sciences	1	1	8	8	18
8	Nursing	1	-	1	-	2
9	Science	11	-	9	7	27
Total		63	1	62	37	160

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expand multidisciplinary programs in line with stakeholders' needs". The suggested initiatives to implement this strategy include the following:

1. Review multidisciplinary programs currently implemented.
2. Identify interdisciplinary programs and expand multidisciplinary programs that meet the needs of the local market and international trends.
3. Develop team-taught courses across disciplines as a prelude to introducing interdisciplinary programs.
4. Establish departments/units to operate multidisciplinary programs and interdisciplinary programs (Sultan Qaboos University Strategic Plan, 2016-2040).

In the level of postgraduate teaching and learning, the same plan stated in strategy B: "Initiate interdisciplinary programs and expand multidisciplinary programs in line with stakeholders' needs". One of the initiatives to make that strategy executable is: Identify interdisciplinary programs and expand multidisciplinary programs that meet the needs of the local market and international trends (Sultan Qaboos University Strategic Plan, 2016-2040).

Currently there are some valuable examples of interdisciplinary programs at SQU both in undergraduate and postgraduate levels as follows:

1. BA in Agricultural Engineering between Colleges of Agriculture and Engineering,
2. BA in Biomedical Engineering between Colleges of Medicine & Health Sciences and Engineering,
3. BA in Chemical Engineering between Colleges of Engineering and Science,
4. MA in Archology between Colleges of Arts & Social Sciences and Science,
5. Ph.D. in Information Studies between Colleges of Arts & Social Sciences, Economic & political Science, and Science.

It is obvious from SQU Strategic Plan 2016-2040 and some examples of interdisciplinary programs mentioned above that SQU's environment and context are ready and encouraging more initiatives related to interdisciplinary education in the future. Accordingly, the researcher will invest all these factors and propose a new BA program entitled "Economic Journalism" to be offered by SQU and could be adopted by any Arab University later. The proposed program will be a joint initiative between colleges of Arts & Social Sciences and Economic & Political Sciences. In this section, the program's structure, courses, and degree plan are presented, followed by some comments and clarifications.

BA in Economic Journalism
Sultan Qaboos University
College: Arts and Social Sciences
Degree: BA
Major: Mass Communication
Minor: Economic Journalism

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COMMENTS AND CLARIFICATIONS

1. The structure of the proposed program coincides with how the programs are structured at SQU in terms of semesters, division, course distributions, and requirements of different levels; university, college, major, and minor.
2. The proposed program will be executed as a collaboration between the College of Arts and Social Sciences, mainly Mass Communication Department and College of Economic and Political Sciences. The major will be mass communication while the minor is intended to be economic journalism.
3. The graduates will obtain the BA in "Economic Journalism" from the College of Arts and Social Sciences, and in their transcripts it will be indicated that they did two specializations (major/minor): journalism and economic sciences.

Table 4. Economic journalism summary of credits

No.	Course Type	Credits Number
1	University Requirements (UR)	6
2	University Electives (UE)	6
3	College Requirements (CR)	11
4	College Electives (CE)	3
5	Major Requirements (MJR)	52
6	Major Electives (MJE)	6
7	Minor Requirements (MNR)	30
8	Minor Electives (MNE)	6
Total		120

Table 5. Economic journalism degree plan (semesters 1-8)

	Code	Course Title	Credits	Course Category
Semester 1	ARAB1001	Arabic Language	3	UR
	HIST1010/ ISLM1010	Oman& Islamic Civilization or Islamic Culture	2	UR
	ACCT1112	Introductory Financial Accounting	3	MNR
	ARAB2031	Arabic Language Skills1	3	CR
	MASS1112	Introduction to Mass Communication	3	MJR
	Total			14
Semester 2	MATH11105	Business Mathematics	3	MNR
	ECON1211	Principles of Microeconomics	3	MNR
	PHIL1100	Critical Thinking	3	CR
	ARAB2032	Arabic Language Skills2	3	CR
	MASS2112	News in Mass Media	3	MJR
	Total			15

continued on following page

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Table 5. Continued

	Code	Course Title	Credits	Course Category
Semester 3	COMP2010	Advanced Computer Skills	2	CR
	....	College Elective	3	CE
	...	University Elective	2	UE
	BCOM2911	Business Communication	3	MNR
	MASS2010	Theories of Communication	3	MJR
	MASS2113	News Reporting& Editing	2	MJR
	Total			15
Semester 4	ARAB2123	Functional Grammar	3	MJR
	ECON3222	Intermediate Macroeconomics	3	MNR
	MASS2020	Mass Media in Oman	2	MJR
	MASS2630	Communication Campaigns	3	MJR
	MASS2101	Journalism Interviews	3	MJR
	Total			14
Semester 5	MASS3010	Principles in Mass Media Research	3	MJR
	MASS3032	Media Translation	3	MJR
	MASS3111	Photojournalism	3	MJR
	...	University Elective	2	UE
	ECON3212	Intermediate Microeconomics	3	MNR
	Total			14
Semester 6	...	University Elective	2	UE
	SOCY1001	Oman Contemporary Society	1	UR
	BCOM3921	Public Speaking for Business	3	MNR
	....	Major Elective	3	MJE
	....	Minor Elective	3	MNE
	MASS3112	Investigative Reporting	3	MJR
	Total			15
Summer Semester	MASS 3050	Field Training	3	MJR
	Total			3
Semester 7	MASS4020	Mass Media Laws& Ethics	3	MJR
	ECON4231	Economic Development	3	MNR
	....	Minor Elective	3	MNE
	....	Major Elective	3	MJE
	MASS4113	Press Design and Layout	3	MJR
	Total			15
Semester 8	BCOM4931	Technical Writing for Business	3	MNR
	PRLW4181	Business Law	3	MNR
	MASS4050	Graduation Project	3	MJR
	MASS4111	Specialized Journalism	3	MJR
	MASS4116	Online Journalism	3	MJR
	Total			15

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Table 6. List of major electives (MJE)

No.	Course Title	Credits Number
1	Mass Media in the Gulf States (MASS 4030)	3
2	Arabic Press (MASS 4112)	3
3	International Communication (MASS 2610)	3
4	Press Technology (MASS 3101)	3
5	New Media (MASS 4025)	3
6	Propaganda and Public Opinion (MASS2311)	3

Student should select two courses from this list (6 credits).

Table 7. List of minor electives (MNE)

No.	Course Title	Credits Number
1	Introduction to Econometrics (ECON3261)	3
2	Economics of Oil and Natural Resources (ECON3251)	3
3	Islamic Economics (ECON4235)	3
4	Contemporary Issues in Economics (ECON4282)	3
5	Economics of the Gulf Cooperation Countries (ECON4234)	3
6	Special Topics in Economics (ECON4284)	3

Student should select two courses from this list (6 credits).

4. The courses in the proposed program are available and currently offered by the Mass Communication Department and by different departments in the College of Economic and Political Sciences. There will be no new or extra courses to be established, instead utilizing the available courses in the university and the two colleges. Academically, some components could be added to the descriptions of the available courses to suit the new degree.
5. The course of Field Training in semester 6 will take place in economic and business sections in media outlets and economic and financial institutions both governmental and private inside and outside the country.
6. The proposed program and its degree plan should create the opportunity for experts from areas of economic sciences, business, financial, journalism, and mass communication in general to meet and lecture the students and train them.
7. As far as the researcher's best of knowledge, there is no academic program of this kind in the Arab universities, so the proposal could be adopted and implemented by any interested universities in the region.

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CONCLUSION

Universities in the Arab World are recalled today to establish more interdisciplinary programs which link deferent areas of knowledge. By doing this only, these universities will be able to offer a high quality education which enhance the graduates with skills enabling them providing better solutions and fulfilling the job market needs. Ideas and initiatives are available and experienced before, they only need to be localized before adaptation. The focus of this chapter was on economic journalism, as interdisciplinary area. The approach and structure which implemented in the proposed program could be used to initiate similar programs in “Science Journalism”, “Sport Journalism”, “Health Journalism”, etc.

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KEY TERMS AND DEFINITIONS

Academic Program: A degree program offered by higher education institutions such as institutes, colleges, and universities.

Economic Journalism: Type of specialized journalism dealing with deferent aspects and topics of economic, business, finance, etc.

Interdisciplinary: Area of knowledge consisted of two or more disciplines.

Major: A broader area of specialization in any discipline which receive more attention and served by more courses in any degree plan.

Media Education: Full range of qualification programs about journalism and mass communication and for people who are going to work in these areas.

Minor: A narrowed area of specialization in any discipline. From an academic point of view, less courses are used to serve any minors.

Specialized Journalism: printed and electronic mass media serving specific content and audience.

SQU: A leading national university in the Sultanate of Oman inaugurated in September 1986.

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APPEND

Table 8. Journalism and mass media programs in the USA

No.	University Name	Email	No.	University Name	Email
1	Abilene Christian University	http://www.acu.edu/academics/cas/	85	Stanford University	http://communication.stanford.edu
2	Adams State College	http://artsandletters.adams.edu/comm	86	State University of West Georgia	http://www.westga.edu/~masscom
3	Adelphi University	http://academics.adelphi.edu/artsci/	87	Syracuse University	http://newhouse.syr.edu
4	American University	http://www.soc.american.edu/	88	Temple University	http://www.temple.edu/sct
5	Andrews University	http://www.andrews.edu/COMM	89	Texas A&M University	http://journalism.tamu.edu
6	Angelo State University	http://www.angelo.edu/dept/cdj	90	Texas A&M University-Commerce	http://www7.tamu-commerce.edu/mmct
7	Arizona State University	http://cronkite.asu.edu	91	Texas Christian University	http://www.communication.tcu.edu
8	Arkansas State University	http://comm.astate.edu	92	Texas State University - San Marcos	http://www.masscomm.txstate.edu
9	Auburn University	http://www.auburn.edu/academic/liberal_arts/cmjn	93	Texas Tech University - Lubbock	http://www.depts.ttu.edu/mcom
10	Ball State University	http://www.bsua.edu/cim	94	Troy State University	http://jschool.troy.edu
11	Baylor University	http://www.baylor.edu/journalism	95	University of Alabama - Tuscaloosa	http://www.ccom.ua.edu
12	Bluffton University	http://www.bluffton.edu/com	96	University of Alaska Anchorage	http://jpc.uaa.alaska.edu
13	Boston University	http://www.bu.edu/com	97	University of Alaska Fairbanks	http://www.uaf.edu/journa
14	Bowling Green State University	http://www.bgsu.edu/departments/journalism	98	University of Arizona	http://journalism.arizona.edu
15	Brigham Young University	http://cfac.byu.edu/com	99	University of Arkansas - Fayetteville	http://www.uark.edu/depts/jourinfo/public_html
16	Butler University	http://www.butler.edu/journalism	100	University of Arkansas - Little Rock	http://www.uarl.edu/smc
17	California Polytechnic State University - San Luis Obispo	http://cla.calpoly.edu/jou	101	University of California - Berkeley	http://journalism.berkeley.edu
18	California State University - Chico	http://www.csuchico.edu/jour	102	University of Central Florida	http://www.cas.ucf.edu/communication
19	California State University - Fullerton	http://communications.fullerton.edu	103	University of Colorado - Boulder	http://www.colorado.edu/journalism
20	California State University - Los Angeles	http://web.calstatela.edu/academic/comstud	104	University of Connecticut	http://www.journalism.uconn.edu
21	California State University – Northridge	http://jour.csun.edu	105	University of Denver	http://soc.du.edu
22	Central Michigan University	http://journalism.cmich.edu	106	University of Florida	http://www.jou.ufl.edu
23	Central Missouri State University	http://www.cmsu.edu/x7023.xml	107	University of Georgia	http://www.grady.uga.edu
24	Central Washington University	http://www.cwu.edu/~comm	108	University of Hawaii - Manoa	http://www2.hawaii.edu/~jour
25	Colorado State University	http://www.colostate.edu/depts/tj	109	University of Houston	http://www.class.uh.edu/comm
26	Columbia University	http://www.jrn.columbia.edu	110	University of Idaho	http://www.class.uidaho.edu/jamm

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Table 8. Continued

No.	University Name	Email	No.	University Name	Email
27	Drake University	http://www.drake.edu/journalism	111	University of Illinois - Urbana-Champaign	http://www.comm.uiuc.edu
28	East Carolina University	http://www.ecu.edu/comm	112	University of Iowa	http://www.uiowa.edu/~journal
29	East Tennessee State University	http://www.etsu.edu/cas/comm	113	University of Kansas	http://www.journalism.ku.edu
30	Eastern Illinois University	http://www.eiu.edu/~journa	114	University of Kentucky	http://www.uky.edu/CommInfoStudies/JAT
31	Emerson College	http://www.emerson.edu/school_of_communication	115	University of La Verne	http://www.ulv.edu/comms
32	Florida A&M University	http://www.sjgc.net	116	University of Louisiana - Lafayette	http://comm.louisiana.edu
33	Florida International University	http://jmc.fiu.edu/sjmc	117	University of Louisiana - Monroe	http://www.ulm.edu/masscomm
34	Fort Valley State University	http://www.fvsu.edu/coase/mass_comm.asp	118	University of Maine	http://www.cmj.umaine.edu
35	Georgia Southern University	http://class.georgiasouthern.edu/commarts	119	University of Maryland	http://www.journalism.umd.edu
36	Grambling State University	http://www.gram.edu/Colleges_Schools/Liberal%20Arts/Mass%20Comm	120	University of Massachusetts - Amherst	http://www.umass.edu/journal/UMAJournalism
37	Hampton University	http://www.hamptonu.edu/shsje	121	University of Memphis	http://www.people.memphis.edu/~ccfa
38	Hofstra University	http://www.hofstra.edu/Academics/SOC	122	University of Miami	http://www.miami.edu/com
39	Howard University	http://www.howard.edu/schoolcommunications	123	University of Minnesota - Twincities	http://sjmc.umn.edu
40	Idaho State University	http://www.isu.edu/departments/masscomm	124	University of Mississippi	http://www.olemiss.edu/depts/journalism
41	Indiana University	http://www.journalism.indiana.edu	125	University of Missouri - Columbia	http://www.journalism.missouri.edu
42	Indiana University - Purdue University Indianapolis	http://journalism.iupui.edu	126	University of Missouri - St. Louis	http://www.umsl.edu/divisions/artscience/communication
43	Iona College	http://www.iona.edu/academic/arts	127	University of Montana	http://www.umt.edu/journalism
44	Iowa State University	http://www.jlmc.iastate.edu	128	University of Nebraska - Lincoln	http://journalism.unl.edu
45	Jackson State University	http://ccaix.jsu.edu/~jsucomm	129	University of Nevada, Reno	http://www.unr.edu/journalism
46	Johnson C. Smith University	http://www.jcsu.edu/academics/artsandsciences/communication.htm	130	University of New Mexico	http://www.unm.edu/~cjdept
47	Kansas State University	http://jmc.ksu.edu	131	University of North Carolina - Chapel Hill	http://www.jomc.unc.edu
48	Kent State University	http://www.jmc.kent.edu	132	University of North Texas	http://www.jour.unt.edu
49	Lamar University	http://dept.lamar.edu/cofac	133	University of Northern Colorado	http://www.unco.edu/jmc
50	Lehigh University	http://www.lehigh.edu/~injrl	134	University of Oklahoma	http://jmc.ou.edu
51	Louisiana State University	http://www.manship.lsu.edu	135	University of Oregon	http://jcomm.uoregon.edu
52	Loyola College in Maryland	http://www.loyola.edu/communication	136	University of Richmond	http://journalism.richmond.edu
53	Marquette University	http://www.marquette.edu/comm	137	University of South Alabama	http://comm.southalabama.edu
54	Marshall University	http://www.marshall.edu/sojm	138	University of South Carolina - Columbia	http://www.jour.sc.edu
55	Michigan State University	http://www.jrn.msu.edu	139	University of South Dakota	http://www.usd.edu/cmj

continued on following page

Economic Journalists' Qualifications in the Arab World

Table 8. Continued

No.	University Name	Email	No.	University Name	Email
56	Middle Tennessee State University	http://www.mtsu.edu/~masscomm	140	University of South Florida	http://www.cas.usf.edu/mass_com
57	Mississippi State University	http://www.msstate.edu/dept/communication	141	University of Southern California	http://ascweb.usc.edu/home.php
58	Murray State University	http://www.murraystate.edu/journalism	142	University of Southern Mississippi	http://www.usm.edu/mc
59	New College of California	http://www.newcollege.edu/media_studies/index.html	143	University of Tennessee-Chattanooga	http://www.utc.edu/Academic/Communication
60	New Mexico State University	http://www.nmsu.edu/~journali	144	University of Tennessee-Knoxville	http://excellent.com.utk.edu
61	New York University	http://journalism.nyu.edu	145	University of Tennessee-Martin	http://www.utm.edu/departments/comm
62	Nicholls State University	http://www.nicholls.edu/maco	146	University of Texas - Arlington	http://www.uta.edu/communication
63	Norfolk State University	http://www.nsu.edu/major	147	University of Texas - Austin	http://journalism.utexas.edu
64	Northeastern University	http://www.journalism.neu.edu	148	University of Toledo	http://communication.utoledo.edu
65	Northern Arizona University	http://www.comm.nau.edu	149	University of Utah	http://www.hum.utah.edu/communication
66	Northwestern State University	http://www.nsula.edu/journalism	150	University of Washington	http://www.com.washington.edu
67	Northwestern University	http://www.medill.northwestern.edu	151	University of Wisconsin - Eau Claire	http://www.uwec.edu/COMMJOUR
68	Oakwood College	http://www.oakwood.edu/communication	152	University of Wisconsin - Madison	http://www.journalism.wisc.edu
69	Ohio State University, The	http://www.jcomm.ohio-state.edu	153	University of Wisconsin - Milwaukee	http://www.uwm.edu/Dept/JMC
70	Ohio University	http://www.scrippsjschool.org	154	University of Wisconsin - Oshkosh	http://www.uwosh.edu/journalism
71	Oklahoma State University - Stillwater	http://journalism.okstate.edu	155	University of Wisconsin - River Falls	http://www.uwrf.edu/journalism
73	Pennsylvania State University	http://www.psu.edu/dept/comm	156	University of Wisconsin - Whitewater	http://academics.uww.edu/CAC/Communication
74	Regent University	http://www.regent.edu/acad/schcom	157	University of Wyoming	http://uwadmweb.uwyo.edu/cmjr
75	Rowan University	http://www.rowan.edu/colleges/communication	158	Utah State University	http://www.usu.edu/communic
76	Rutgers University	http://www.scils.rutgers.edu	159	Virginia Commonwealth University	http://www.has.vcu.edu/mac
77	Saint Ambrose University	http://web.sau.edu/communicatio	160	Washington & Lee University	http://journalism.wlu.edu
78	Sam Houston State University	http://www.shsu.edu/~com_www	161	Washington State University	http://134.121.235.77
79	San Francisco State University	http://www.journalism.sfsu.edu	162	Wayne State University	http://www.comm.wayne.edu
80	San Jose State University	http://www.jmc.sjsu.edu/index.html	163	West Virginia University	http://journalism.wvu.edu
81	Savannah State University	http://www.savstate.edu/class/MC/index.html	164	Western Kentucky University	http://www.wku.edu/Journalism
82	South Dakota State University	http://www3.sdstate.edu/Academics/CollegeOfArtsAndScience/JournalismandMassCommunication/Index.cfm	165	Western Washington University	http://www.ac.wvu.edu/~journa
83	Southern Illinois University - Carbondale	http://mcma.siu.edu	166	Winthrop University	http://www.winthrop.edu/masscomm
84	St. Cloud State University	http://www.stcloudstate.edu/masscommunication	167		

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