

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).

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.

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

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

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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