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CHAPTER I

EXPLORING THEORY DEVELOPMENT:
LEARNING FROM DIVERSE MASTERS

DIANE H. SONNENWALD

AS KURT LEWIN (1951) ASSERTS, there is nothing more practical than good theory. Yet theory can be seen as threatening and coercive (Simon 1992), especially when presented as the only truth instead of one truth among many (Feyerabend 1993).

The goal of this book is to illuminate the theory development process in order to encourage, inspire, and assist individuals striving to understand theory, develop theory, or teach theory and theory development. Experienced researchers were asked to reflect on their experiences developing theory and to share their reflections, revealing the challenges, successes, failures, excitement, and satisfaction they experienced during the process. The result is fifteen chapters that discuss theory development from a variety of perspectives.

To facilitate exploration of the chapters, a brief introduction to the information sciences is provided. This is followed by discussions regarding types of theory and the theory development process, including stages of the process and resources that inspire and assist during the process and that, in turn, are impacted by new theory. Lastly, the format of the book is described.

THE INFORMATION SCIENCES

Emerging in the first half of the twentieth century as a discipline, the information sciences contribute to our understanding of how people, groups, organizations, and governments create, share, disseminate, manage, search, access, evaluate, use, and protect information, as well as how technologies can facilitate or constrain these activities. Broadly speaking, the information sciences focus on the interplay of people, information, technology, and social structures. The

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impacts of the information sciences have been numerous and diverse. US president Ronald Reagan, addressing the Association for Information Science and Technology (ASIS&T), put these impacts into perspective:

By advancing the gathering, storage, and transfer of information, you've touched the lives of virtually every citizen and led the way to wider opportunity for all of us. That's because our scholarship, domestic prosperity, and competitive stance in the world marketplace depend as never before on our considerable information technologies and on how we use them. Your vital role in our increasingly efficient and wide diffusion of knowledge has been a tribute to you and a real blessing for our Nation. (Reagan 1978, p. 6)

Although the information sciences have had a far-ranging impact and are broad in scope, they are better known for borrowing theory from other disciplines than for introducing new theories. This may be a result of the applied focus in many of the information sciences, and the relatively young age of the field. However, there are notable exceptions, as the chapters in this book demonstrate.

TYPES OF THEORY

Throughout time and across disciplines, different perspectives regarding what constitutes theory have emerged. D'Andrade (1986) proposed that there are three major paradigms, or scientific worldviews, each of which incorporates different ways of seeing and knowing, and produces different types of theory: the physical sciences, the natural sciences, and the semiotic sciences. Theory in the physical sciences (e.g., physics, chemistry, astronomy, and engineering) is general, covering laws that explain and predict phenomena across time. Theory in the natural sciences (e.g., biology, geology, oceanography, economics, and some areas in anthropology and sociology) focuses on explanations and descriptions of complex mechanisms. Theory in the semiotic sciences (e.g., linguistics and some areas of psychology, anthropology, sociology, and communication) focuses on the discovery of imposed order based on meaning rather than natural or physical order.

This categorization helps explain why there are different perspectives on theory across disciplines. However, the information sciences

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span multiple scientific worldviews, and have historical theoretical foundations in each of these. Spanning and incorporating aspects from multiple worldviews is often valuable in addressing complex problems. However, questions regarding what constitutes theory and its purposes remain.

Gregor (2006) proposes five interrelated categories of theories, types 1 through 5, based on her analysis of research in information systems. Type 1 is theory for analyzing. These theories are descriptive and include taxonomies and classification schema that are complete or extendable. They aid in analysis, especially when little is known about a phenomenon. Type 2 is theory for explaining. These theories propose how, when, where, and why a phenomenon occurs. They should be plausible, credible, and consistent in explaining something new or not well understood. Type 3 is theory for predicting, that is, theory that describes what will be, but not why it will be that way. The predictions are typically based on a set of factors and are very useful when prediction has practical importance. They do not explain causal relationships. Type 4 is theory for explaining and predicting. Theories in this category describe a phenomenon, including how, why, when, and where it occurs, and what the outcomes should be when it occurs. These theories are typically referred to as grand, strong, or meta-level theories. Type 5 is theory for design and action. These theories describe how to do something, providing a road map of actions. They propose methodologies and processes.

Gregor's categories can be found across the information sciences and throughout this book, reflecting the broad and diverse nature of the field. Examples of type 1 theory development for information searching and browsing can be found in chapters by Bates and Chang. Bawden, Buckland, and Crew discuss their approach to developing type 2 theories for understanding information, bibliometrics and information retrieval, and literary criticism, respectively. Development of type 3 theory, focusing on research publication systems, is discussed in the chapter by Meadows. Kuhlthau discusses how she developed a type 4 theory—her theory of the information search process. Olson and Olson, Dillon, Carroll, and Nardi discuss their efforts developing and using type 5 theories, focusing on remote scientific collaboration, reading, technology design, and activity theory. Thelwall demonstrates that all five types are found in webometrics.

However, Gregor's categorization may only be a starting point for the information sciences. For example, Järvelin suggests that theory

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regarding interactive information retrieval should be a combination of types 4 and 5, providing explanation, prediction, and technology development. Saracevic and McGann, by contrast, suggest that after years of effort, the quest for a theory of relevance and a theory of text and textualities still continues.

Thus, across the information sciences, we see multiple types of theories emerging, with some topic areas lacking theory. How do such theories emerge or fail to emerge?

THE THEORY DEVELOPMENT PROCESS

Two historic views regarding the theory development process are provided by Polanyi (1974) and Kuhn (1970), respectively. For Polanyi theory development is achieved through objective and subjective means guided by an individual's scientific passion and vision of reality. Kuhn asserted that theories are grounded in shared paradigms and that the development of new theory begins with the awareness of an anomaly that violates the current paradigm. New theory only becomes accepted with difficulty; it must resolve a long-standing recognized problem and preserve a relatively large part of existing knowledge.

To complement these historic views and to provide a contemporary perspective, the authors in this book describe their personal experiences developing and using theory. Each chapter discusses various components of the theory development process. When considered collectively these components can be conceptualized, or categorized, as stages that are influenced by, and help influence, various resources.

THEORY DEVELOPMENT STAGES

Stages in the theory development process are periods of time that involve specific types of activities. Activities described throughout the chapters can be categorized into three stages: elaborating a focus, conducting research, and making an impact (fig. 1.1). In the elaboration of a focus and the conducting of research, resources provide inspiration and assistance. As impacts are made, resources are transformed. The stages and resources provide a framework to synthesize and elucidate the collective wisdom interspersed throughout this book.

ELABORATING A FOCUS Elaborating a focus for theory development is a crucial step. A focus guides subsequent research and helps define the possible impact your theory can make. It allows you to

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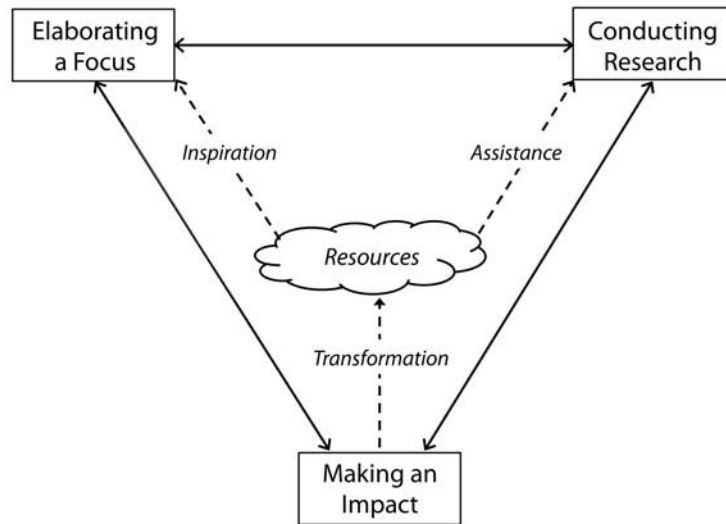


FIGURE 1.1. Stages of the theory development process

more easily relate your work to other work, demonstrate how your work contributes new knowledge, and persuasively convince others regarding the importance of your work.

A focus can be expressed and explained in different ways. Hypotheses, questions, frameworks, models, analogies, and abstract, or high-level, scenarios are tools that can be used to present and explain the focus of your theory development efforts. Justifications for a focus can be expressed using statistical data, quotes from affected individuals, results from prior research, and government policies. Your intuition that a focus is important can be a good starting point, but further evidence is needed not only to procure resources, including the cooperation of study participants, but also to have results published in top-ranked forums. Identifying relevant and persuasive evidence can be challenging, but when well done it can subsequently make the focus appear obvious.

A focus can be iteratively refined and modified throughout the theory development process. Sometimes it is only near the end of the process when we can best express our focus so that it appears definitive, obvious, and important. A focus can also be iteratively extended throughout one's research career (e.g., see the chapters by Kuhlthau, McGann, Meadows, Saracevic, and Olson and Olson).

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CONDUCTING RESEARCH Conducting research typically involves designing a research plan, implementing that plan, and modifying the plan and its implementation when necessary. There are many books, articles, courses, and workshops discussing research designs and methods, and their suitability to different types of research foci. However, research designs and methods are often presented in a formulaic manner with little or no discussion of the next step, that is, theory development, in which interpretation, generalization, and implications of results are elucidated. In the present volume, the authors discuss this next step, moving beyond a discussion of research methods to illuminate the theory development process by providing personal insights.

Designing a research plan can be very challenging, especially when the focus is on phenomena not yet well defined in the literature (Chang, Kuhlthau). Placing meaningful boundary conditions on the phenomenon (Dillon) and developing a model mapping the domain (Järvelin) can help reduce complexity when one is designing a research plan. Other strategies include re-using data in unique ways (Buckland) and employing a cyclical approach, for example, alternating between reading literature, collecting and reading data, and analyzing data (Crew).

In the implementation of a research plan, tasks initially assumed to be straightforward can turn out to be more difficult than first imagined, and plans often require modification (Chang, McGann). For example, coding interview data based on topical content is often just a first step; further analysis is required to identify constructs, influences on constructs, and the meaning or importance of those constructs and influences (Chang). Using additional theoretical constructs, data visualization methods, and comparisons across contexts and time can be helpful when one is analyzing data in order to gain new insights (Crew, Buckland, Meadows).

We learn how to conduct research by conducting research and, as McGann reminds us, learning by doing is learning by failure. Creating theory involves a careful, repetitive cycle of reading data, uncovering its meaning, and refining the representation of its meaning (Crew, Dillon).

In addition to these intellectual challenges, there can also be political, social, and administrative challenges in the conducting of research (McGann). Researchers working in academia and other types of institutions have multiple demands on their time. Perspectives re-

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garding required resources (including time) and expected outcomes can differ across segments of an institution. Researchers must navigate among these differences.

MAKING AN IMPACT In this stage researchers focus on making an impact. Throughout the book authors discuss various types of impact their theoretical work has made. Just as important, authors discuss work they thought would have a significant impact, but did not.

Traditionally the impact of theory is measured by citations to the publication(s) presenting the theory. Disagreements with our theory may emerge explicitly in publications presenting opposing views (Chang, Crew) or implicitly when the number of citations to our theory disappoints (Thelwall).

Other typical measures of publication impact include the reputation (according to national and international rankings) of the journals and conferences where the theory is published, and the reputation of the book publisher when a theory is published in a book. Praise and criticisms found in letters to the editor and book reviews are also common measures of impact.

For multiple reasons, scholars debate the validity of these impact measures. There is a limited amount of citation data collected for some disciplines, and also for publications in languages other than English (Chang). Furthermore, these measures do not capture impact outside academia.

New types of impact and ways to measure them continue to emerge. Examples of alternative types of impact and measures, often referred to as altmetrics, include the amount of income and number of new jobs generated from licensing software, patents, and other intellectual property, inclusion of a theory in government policy, the number of times a paper or software tool has been accessed or downloaded, visits and links to a researcher's web pages or online profile, and programs and articles about a theory published in social and traditional media (and audience reach measurements), as well as prestigious awards given in recognition of theoretical work by scholarly societies, universities, and governments.

TRAVERSING THE STAGES A simplistic, linear perspective on the theory development process involves traversing the three stages one after the other, beginning with elaborating a focus. The conducting-research stage would only begin after a focus has been fully devel-

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oped. Similarly, the results would be used to make an impact after the research has been fully concluded.

However, there is churn and reflection within each stage and fluid movement between stages. A simplistic, linear traversal of stages seldom actually occurs. Instead, the stages are more typically traversed in a nonlinear fashion, as evidenced by the descriptions of theory development in this book. For example, a focus can be reconsidered and refined while one is conducting research; in fact, Thelwall recommends this approach. Impacts can occur before research is completed, and subsequently influence the research process. For example, study participants frequently comment that they learn from the reflection they are asked to do during research interviews, and responses to presentations describing preliminary research results can inspire new interview questions and other changes to the research process.

When you are first learning about and attempting theory development, it can be useful to consider the stages sequentially; however, you should not become discouraged when you discover you cannot traverse them sequentially. The theory development process is a dynamic process that includes the iterative refinement of ideas and plans, as well as multiple executions of tasks.

RESOURCES

Throughout the book authors describe various resources that provide inspiration when they are elaborating a focus or assistance when they are conducting research. Resources can also be transformed by theory. This reciprocal relationship intuitively makes sense; if a resource can inspire and assist our efforts, it is perhaps natural that the resource is, in turn, interested in our results. Resources mentioned by chapter authors are literature, personal experiences, their own research, colleagues, technology, institutions, and societal issues (fig. 1.2). Not every author mentions all of these; rather, the authors discuss resources relevant to their focus. Resources and their potential role in each theory development stage are discussed below.

LITERATURE That literature often plays a role in all stages of theory development is not surprising. When you are elaborating a focus, it is important to read literature deeply in order to develop a clear understanding of its strengths and weaknesses (Bates, Saracevic). A beginning focus or framework can emerge by contrasting and synthe-

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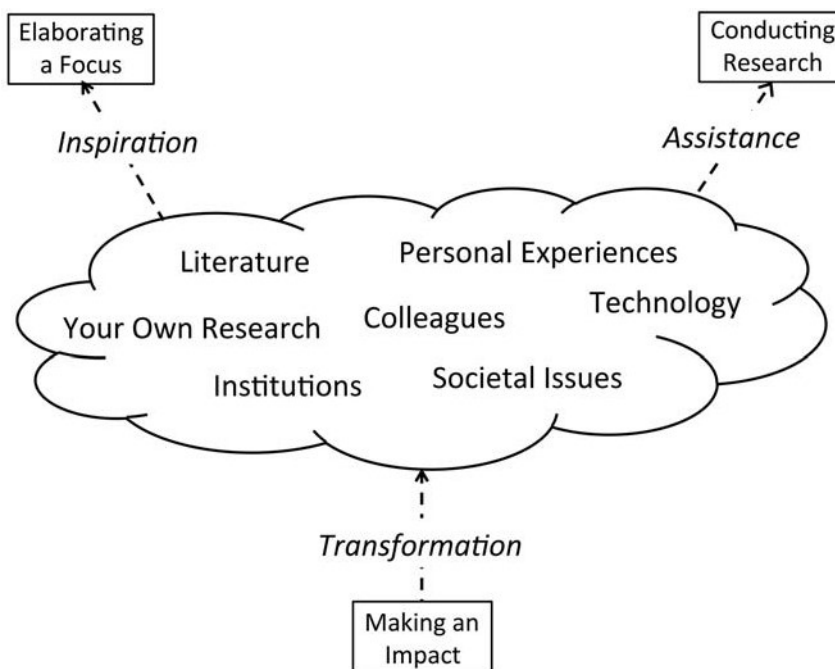


FIGURE 1.2. Theory development resources

sizing literature (Bawden, Chang). Questions and suggestions raised in the literature can inspire new research directions (Meadows), and successful examples of theoretical papers can encourage related work (Thelwall). In addition to current literature, older, historical literature can provide inspiration and insights (Olson and Olson).

Many of the authors (Bates, Chang, Crew, Dillon, Kuhlthau, Nardi, Olson and Olson) comment that literature originating in other disciplines can inspire and inform your focus. However, using this literature brings challenges. Different disciplines often use different terminology for similar concepts, while using similar terms with different meanings. Thus, finding relevant literature emerging from other disciplines and understanding its relationship to your focus may require additional work. One strategy to help identify relevant literature is to employ creative analogies that relate your focus to topics discussed in other disciplines (Chang, Meadows).

Dissatisfaction and disagreement with existing literature can also

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inspire theory development (Dillon). Dissatisfaction may emerge because the literature has omissions or gaps, or because it diverges from personal experiences or observations.

Literature can also help guide us when we are conducting research. It can inform our research design and methods, as well as help us interpret our results. However, it can be challenging to compare results reported in the literature in order to build cumulative knowledge when those results are based on different theories and methods (Bawden). For example, theories based on qualitative research cannot always be easily reconciled with theories based on quantitative research (Meadows). Furthermore, relying too much on literature to provide answers can stifle our creativity and problem-solving abilities. As Boulding (1961) points out, students often operate on the principle of learning the least amount necessary, and this approach should be more frequently recognized as acceptable in order to promote creativity and problem solving.

As discussed previously, a traditional way to make an impact is to present your theory at conferences or to publish in journals and books. The impact possible through these formats continues to be debated; Chang found publishing in a highly ranked peer-review journal had the greatest impact for her work, even though her book was published by a prestigious publisher. Although English is the dominant scholarly language used today, translating your theory into other languages can help make an impact with specific audiences (Chang). Using social media such as blogs, videos, and Twitter to present and discuss your work can also help you reach audiences (Chang).

PERSONAL EXPERIENCES A second resource frequently reported in these chapters is personal experience (Bates, Bawden, Chang, Crew, Dillon, Kuhlthau, Saracevic, Thelwall). That is, experiences and observations that either were not discussed in the literature or did not match discussions in the literature inspired authors.

Observations and work experiences gained in organizations, especially non-academic organizations, can provide insights into problems and phenomena that inspire theory development (Bawden, Kuhlthau, Saracevic). Doctoral degree programs that typically do not require applicants to have recently completed undergraduate and master's degrees can be more welcoming to individuals who have work experience which may inspire theory development. With demands for academics to become more engaged with organizations and societal

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problems outside academia, these prior experiences are increasingly relevant.

Personal challenges can also inspire theory development. Bates notes that her struggles to complete search tasks assigned as homework led to her highly regarded work in information search tactics. Similarly, Thelwall discusses how challenges in getting his work published led to his new theory, information-centered research (ICR). Personal challenges experienced by others may also inspire theory development.

When you are conducting research, personal experiences can help shape how you collect data and interpret data (Bates, Crew, McGann). Embracing this and understanding the advantages and biases personal experiences contribute can strengthen your work.

Developing theory also makes an impact on the developer. It creates new personal experiences that are, ideally, learning opportunities that can help us enhance our existing skills and develop new ones. For example, Nardi reports that mastering and creating a theory makes it easier for us to subsequently master and create additional theories. Invitations to present your theory, join projects, and evaluate other research can also emerge as a result of your theory. These types of activities provide new opportunities to network with others.

YOUR OWN RESEARCH Your own research can be considered a subset of personal experiences, but it merits a separate discussion due to its unique roles in theory development. Both positive and negative results from your ongoing and previous research can inspire a refinement of or an extension to your focus (Chang, Crew). For example, early results from data analysis may help clarify your focus.

Results from your previous research may also be utilized when you are conducting research. For example, Olson and Olson used a database of cases and detailed case studies that they had created with colleagues when developing their theory of remote scientific collaboration. Järvelin uses results from interviews and observations to propose new concepts and relationships in interactive information retrieval. He then investigates the concepts and their relationships through experimentation to develop theory.

As discussed previously, there is often an iterative nature to research, with research and theory development leading to additional research and theory development. That is, your theory may impact

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your subsequent research by serving as a foundation for additional research (Järvelin, Kuhlthau, McGann, Olson and Olson, Saracevic). For example, Kuhlthau has transported her theory, the information search process (ISP), to primary and secondary school education. Chang invites graduate students to work with her to test and extend her theory of browsing in different domains, and suggests that continuing to work with your theory and linking it in real-world applications is one of the most effective ways to make an overall impact.

COLLEAGUES Engagement with colleagues, including professors when you are a student and students when you are a professor, can provide inspiration when you are elaborating a focus (Chang, Kuhlthau, McGann, Nardi, Olson and Olson). Discussing evolving ideas can help clarify them, especially when colleagues listen well and ask constructive questions (Nardi). Engagement with colleagues can occur in a variety of forums, including opportunistic and planned discussions at work, workshops, and conferences.

Colleagues can also provide valuable feedback on our research as we conduct it. For example, feedback can identify what is missing or inconsistent (Crew). Usually feedback from colleagues is given in a constructive manner; however, this is not always the case. It can be challenging, but important, to recognize valuable insights embedded in feedback not presented constructively.

Your theory may also impact colleagues. Colleagues can help disseminate and apply your theory, particularly in new domains (Kuhlthau), use your theory to teach new concepts to students (Dillon, Kuhlthau), and use your theory when interpreting and explaining their research results (Dillon) and developing new theory (Thelwall).

New forms of research output and social media can encourage engagement with colleagues. Examples include blogs, videos, slides, datasets, and digital tools that are shared widely (Chang, Olson and Olson).

TECHNOLOGY Technology can inspire, or motivate, new theory development (Dillon, Meadows, Olson and Olson, Thelwall). Emerging technology can influence behavior and create phenomena we have not previously encountered or considered (McGann). For example, theory in human information behavior and collaboration continues to be impacted by existing and emerging mobile platforms (Olson and Olson). Furthermore, new types of data (e.g., Twitter) may

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extend our ability to investigate human information behavior across geographic distances (Thelwall).

Of course, technology can assist in various ways when you are conducting research, including collecting, managing and analyzing data, creating and exploring visualizations of results, and engaging with colleagues. However, it can be challenging to procure essential technology in settings where such technology has not been previously required (Järvelin).

Technology can also be impacted by theory. This includes theory for the unprecedented that describes how technology can create new practices and services (Carroll); theory that increases our understanding of human information behavior (Bates, Järvelin) and human-computer interaction (Dillon, Nardi) and that informs technology design; and theory creating research methods that lead to new software applications (Thelwall).

INSTITUTIONS Institutions are not frequently discussed in the literature but are noted by authors in this book as a resource (e.g., see McGann, Meadows, Olson and Olson, Saracevic). Decisions made by institutions regarding the establishment and allocation of resources can influence the focus of theory development. For example, McGann discusses how computer equipment assigned to another department at his university and subsequently transferred to his department provided an impetus for digital humanities work and subsequent theory development. Meadows mentions that a research center located at his university influenced his focus. In addition, institutions such as funding agencies, universities, and foundations carefully design and construct calls for proposals to provide inspiration and influence the focus of theory development (Olson and Olson).

Institutions often provide access to various experts who can assist when we conduct research, including experts in literature searching, research design, data management, data analysis, data visualization, and writing for publication. Such experts provide specialized knowledge that can help solve problems that emerge, increasing the validity of our theory. In addition, institutions may facilitate access to study participants (e.g., students or employees), technology, or data (Kuhlthau, McGann, Saracevic).

Theory can also impact institutions. For example, Olson and Olson developed an instrument to help organizations determine if they need additional resources before attempting remote collaboration.

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Theory developed by Bawden, Buckland, and Kuhlthau has led to new and revised library services, and theory developed by Carroll, Dillon, and Nardi has led to new design practices in institutions.

SOCIETAL ISSUES Chapter authors also report that societal issues have informed their focus. For example, the link between illiteracy and poverty inspired Dillon to focus on developing theory about reading. Global technocapitalism inspired Nardi to investigate new ways to design technology. Other resources, such as personal observations and experiences, may also be exemplars of societal issues (Kuhlthau).

When you are conducting research, societal issues can also function as a resource providing assistance or introducing constraints. For example, the American Recovery and Reinvestment Act of 2009 was a government initiative in response to an economic recession that provided increased funding to research. This allowed new research to be undertaken in the United States. In comparison, funding for research was reduced in the Republic of Ireland in response to the recent economic recession, and an important evaluation criterion for much research in Ireland became its potential and actual impact on job creation. This facilitated some types of theory development while constraining others.

The authors in this book did not explicitly claim that their theoretical work has had an impact on societal issues. Yet theories presented in this book have provided new understandings of phenomena, improved practices, informed policies, influenced research directions, and led to new technologies. These types of impact may also affect societal issues in the longer term. Information is an integral component of society, and challenges with respect to sharing, locating, accessing, storing, and understanding information as individuals, organizations, and nations remains central in today's society.

Connections between resources and stages in theory development mentioned by chapter authors are summarized in table 1.1. The stages and resources, and their connections, synthesize and represent the collected wisdom shared by authors throughout this book.

FORMAT OF THE BOOK

The chapters in this book are organized into four parts: behavior of individuals and groups, evaluation, design, and cultural and scientific heritage.

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Table 1.1. Summary of connections between resources and stages in theory development

Type of resource	Examples		
	<i>Inspiration for elaborating a focus</i>	<i>Assistance in conducting research</i>	<i>Transformation through making an impact</i>
Literature	Prior research results, suggestions for new research, cases of successful theory, omissions, or gaps	Information about methods, results from prior research for comparison	New publications in English and other languages, citations within other publications, publication downloads, discussions of publications in social media
Personal experiences	Prior work experiences, personal challenges	Knowledge regarding collection and interpretation of data	Skill development, networking, invitations to make presentations, join projects, and review research
Your own research	Your positive and negative research results	Data for re-use, new concepts	Foundation for new research, transportation of your theory to other disciplines, application of theory to additional contexts
Colleagues	Help in clarifying ideas	Identification of omissions and inconsistencies	Adoption and use of your theory in teaching, research, and practice
Technology	New types of phenomena and data	Tools to support data collection, management, and analysis; tools to interact with colleagues	Methods to design technology, knowledge to inform technology design decisions, scenarios that inspire technology, new research software tools
Institutions	Allocation of resources	Access to experts, study participants, technology	New and revised practices and services
Societal issues	Social problems	Research funding and research evaluation criteria	Job creation, potential longer term impacts

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Part 1 has four chapters. Chapter 2, authored by Marcia J. Bates, discusses skills and practices that help convert creative ideas into meaningful theory. Bates illustrates the value of these skills using examples from her work focusing on online search tactics. She further suggests promising ideas that could be investigated and possibly lead to new theories. In chapter 3, ShanJu Lin Chang reflects on how she developed a theory of browsing originally presented in her PhD dissertation. She shares her insights and lessons learned regarding major challenges she encountered during this process. In chapter 4, Carol Collier Kuhlthau reflects on her journey developing the information search process (ISP) theory. Kuhlthau discusses how she began with a theory from a cognate discipline, and how her theory is now being transported to other cognate disciplines. Chapter 5, authored by Gary M. Olson and Judith S. Olson, discusses how they have drawn on four types of resources to develop their theory on long-distance collaboration, and how their ideas and theory evolved over time.

The four chapters in part 2 discuss theory development related to evaluation. In chapter 6, Michael K. Buckland illustrates how he used visual techniques to develop theories in bibliometrics and information retrieval. Buckland asserts that theory is a way of viewing phenomena, and thus visual techniques can be helpful in theory development. In chapter 7, Kalervo Järvelin presents his personal view on theory development for interactive information retrieval (IIR), which has two stages. The first stage investigates real-life IIR at workplaces to develop a conceptual framework; this framework is tested in the second stage using controlled experiments that include simulation of human behavior. In chapter 8, Tefko Saracevic discusses theoretical aspects of information relevance, including manifestations and models of relevance that have emerged in the information sciences and relevance theories that have emerged in cognate disciplines, describing what a theory of relevance for the information sciences should encompass. Mike Thelwall, in chapter 9, reviews webometric research using Gregor's theory taxonomy and discusses two webometric theories he developed: information-centered research and the theoretical framework for link analysis.

Part 3 focuses on theory development in design. Chapter 10, authored by John M. Carroll, discusses how the information sciences address unprecedented phenomena, creating technology and human interactions that did not exist earlier. He suggests that scenarios are

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useful for developing theories for the unprecedented, and presents several examples. In chapter 11, Bonnie Nardi focuses on the scholar's appropriation of theory and how it can lead to developing new theory. She describes how she came to appropriate activity theory, and how the theory and the journey have influenced her thinking. In chapter 12, Andrew Dillon reflects on his journey developing a theory for design that focuses on reading and information use, and provides a framework for understanding, creating, and evaluating interfaces to support information use.

Part 4 focuses on cultural and scientific heritage theory. In chapter 13, Jerome McGann shares his personal journey pursuing theory and developing the theory of texts and textuality. This journey includes editing Byron's work and developing the Rosetti Archive, an "internetwork." In the next chapter, Hilary S. Crew reflects on her theory development process while writing her PhD dissertation. Her work illuminates the daughter-mother relationships portrayed in young adult fiction. David Bawden discusses his approach to theory development, which employs qualitative conceptual analysis and synthesis to develop theories to understand and explain phenomena. He provides several examples of his approach, including work on the negative information phenomenon and digital literacy. Jack Meadows reflects on navigating different theoretical traditions found across the natural sciences, social sciences, and humanities, all fields he has worked in. He describes how these traditions have influenced his research focusing on scholarly journals.

Each section of the book includes chapters in which authors reflect on theory development from at least two different career time spans or vantage points, and where the authors have substantial educational or work experiences in at least two different continents.

CONCLUSION

This book presents multiple perspectives on theory development in the information sciences written by authors with diverse research expertise, careers, and cultural backgrounds. This diversity helps to broaden our understanding of theory development. It provides evidence that theory development is not limited to a specific type of research expertise, gender, career time span, educational background, place of employment, or cultural context. Each chapter is worthy of careful, multiple readings.

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PART I

BEHAVIOR OF INDIVIDUALS AND GROUPS

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