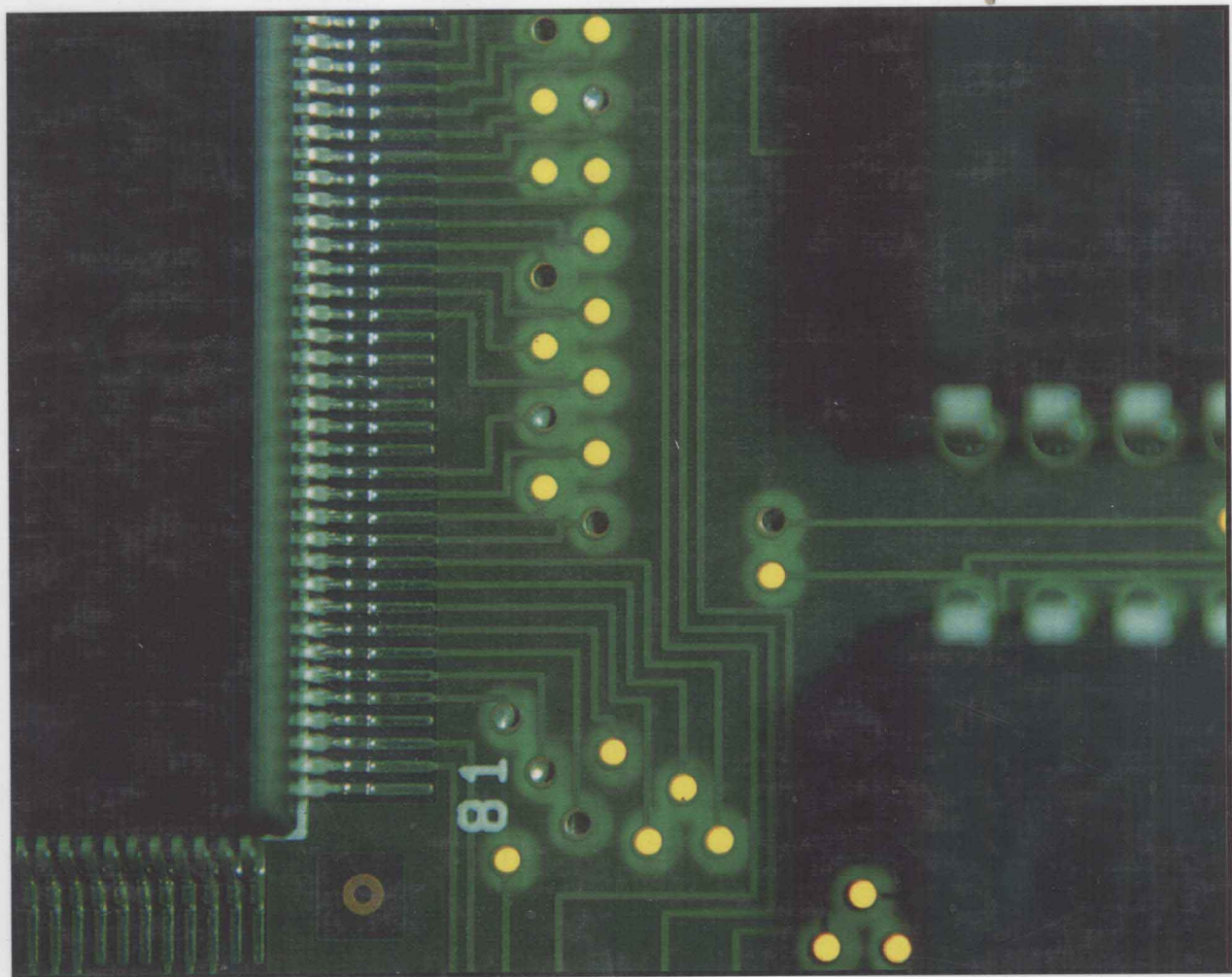


Emerging Systems Approaches in Information Technologies

CONCEPTS, THEORIES, AND APPLICATIONS



DAVID PARADICE

Emerging Systems Approaches in Information Technologies: Concepts, Theories, and Applications

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Information Science
REFERENCE

INFORMATION SCIENCE REFERENCE

Hershey • New York

Director of Editorial Content: Kristin Klinger
Senior Managing Editor: Jamie Snavelly
Assistant Managing Editor: Michael Brehm
Publishing Assistant: Sean Woznicki
Typesetter: Michael Brehm, Michael Killian
Cover Design: Lisa Tosheff
Printed at: Yurchak Printing Inc.

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: <http://www.igi-global.com/reference>

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Library of Congress Cataloging-in-Publication Data

Emerging systems approaches in information technologies concepts : theories
and applications / David Paradice, editor.
p. cm.

Includes bibliographical references and index.

Summary: "This book presents findings utilizing the incorporation of the
systems approach into fields such as systems engineering, computer science,
and software engineering"--Provided by publisher.

ISBN 978-1-60566-976-2 (hardcover) -- ISBN 978-1-60566-977-9 (ebook) 1.
Information technology. 2. Systems engineering. 3. Software engineering. I.
Paradice, David B.
T58.5.E523 2010
620.001'171--dc22

2009032053

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this book is new, previously-unpublished material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

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Preface

ABSTRACT

The papers published in the first volume of the *International Journal of Information Technology and the Systems Approach* (IJITSA) and a special issue of *Information Resource Management Journal* (IRMJ) reveals that most of the papers describing research that is grounded in a systems approach are theoretical and conceptual. The papers are typically grounded in a constructionist epistemology. This outcome is influenced somewhat by the need to publish area-specific position papers in a new journal to establish the types of research sought by the editorial review boards. However, the analysis also identifies the opportunity for objectivist, empirical work and shows that a wide range of possible research purposes may be explored with ample opportunity to make significant contributions.

INTRODUCTION

Organizations have been facing increasingly turbulent environments for over half of a century. Fifty years ago the post-world-war era ushered in the foundation of the modern business world as nations around the globe rebuilt their economies. Forty years ago organizations operated in a world of turbulent social change marked by the emergence of new consumer markets and a host of technological innovations. Thirty years ago the global economy as we now know it began to take shape with oil producing countries influencing the energy markets that allow organizations to operate. Twenty years ago the political super power landscape changed, small computing devices became common, and the seeds of a mobile, computing-based population were sown. Ten years ago global commerce moved boldly into a digital environment.

Today, we witness the global interconnectedness of the world's manufacturing, banking, and commerce systems. Fluctuations in the price of the fuel required to bring goods to market impact the cost of goods. The prices of these goods impact the ability of consumers to purchase them. As spending slows, organizations adjust by cutting back on production or services, slowing the growth of the economy. Jobs become scarce and wages start to lag the cost of living. Consumers borrow more or purchase on credit to maintain a standard of living; organizations borrow to finance operations in anticipation of greater markets later. As debt increases, credit lines grow tighter. Eventually, defaults occur and a cascade of failures ripples through the system producing ever larger impacts. In today's world, the system is truly global. Now more than ever, we realize that only through truly systemic thinking do we have any chance of managing the complexity of the world around us to any successful result, regardless of how we define success.

The systems approach is an approach that maintains a holistic view of a problem while supporting a focused investigation on one or several aspects of the problem. It is a robust approach; one that can support multi-disciplinary and / or inter-disciplinary methods. It is an integrative approach.

Over the past year, Manuel Mora of Autonomous University of Aguascalientes (Mexico) has sought to provide outlets for research that was grounded in a systems approach. The *International Journal of Information Systems and the Systems Approach* (IJITSA) is an international, refereed journal supporting publication of papers that address the foundations, challenges, opportunities, problems, trends, and solutions encountered by both scholars and practitioners in the field of information systems as they are perceived from the perspective of the systems approach. IJITSA emphasizes a systemic worldview of managerial, organizational and engineering interaction, which is often reflected or implemented in modern complex information systems and information technologies. Articles published in IJITSA focus on information systems and often also include tenets of software engineering, systems engineering, complexity and philosophy. Applied and theoretical research papers are welcome.

Similarly, Professor Mora organized a special issue of *Information Resources Management Journal* (IRMJ) on the systems approach. The IRMJ is a refereed, international journal providing wide coverage of issues in information systems field. It is especially receptive of applied research. This book summarizes the work in these volumes to offer interested persons in both the research and practitioner areas access to the high-quality research in information systems and related disciplines that is grounded in a systems approach.

IJITSA'S GOALS AND MISSION

The *International Journal of Information Technologies and Systems Approach* (IJITSA) is a refereed, international journal on applied and theoretical research, aimed at providing coverage of the foundations, challenges, opportunities, problems, trends, and solutions encountered by both scholars and practitioners in the field of information systems when applying the systems approach to important issues. IJITSA was created to disseminate and to promote discussion of high quality research results on information systems. A long run goal of IJITSA is to facilitate the application of the systems approach to the systems field, thus obtaining a better understanding of the complexity inherent in the field. The current publication rate is two issues per year.

The articles published in IJITSA are organized into several subareas and a particular paper's home area is determined by the paper's primary orientation. These subareas are information systems, software engineering, systems engineering, complex systems, and philosophy of systems. However, IJITSA emphasizes a systemic worldview of modern complex information systems and information technologies. Therefore, the interaction of managerial, organizational and engineering facets that characterize complex situations is particularly emphasized in IJITSA.

A "systems approach" can have different meaning to different researchers, probably depending on their training and philosophy. The editors of IJITSA therefore focus on the rigor of submitted papers in applying a systems approach (broadly defined) to theoretical, empirical, modeling, engineering or behavioral studies in order to explore, describe, explain, predict, design, control, evaluate, interpret, intervene and/or develop organizational systems where information systems are the primary objects of study.

A FRAMEWORK FOR ANALYSIS & ASSESSMENT

This book provides an opportunity to assess the start that has been made in publishing research in the systems approach area. To that end, each paper published in the first volume of IJITSA and the IRMJ special issue was categorized on several dimensions. The dimensions were defined in prospectus for the journal's creation. They also appear in the descriptive information available online. Table 1 lists the papers.

The first evaluation of each paper was with respect to the overall basis of the paper. The overall basis of the paper was identified as either theoretical or empirical. There are, of course, many ways that a paper may be theoretical or empirical. Theoretical research papers may be further divided into several categories. Theoretical position papers are papers that study the whole discipline or a vast topic within the discipline, with a long-term and strategic perspective. These papers analyze the contributions, achievements and challenges of the topic, and may use theoretical or empirical arguments. Theoretical literature review papers are papers that report the state of the art of a topic. Formal theoretical papers are papers that report the development and/or utilization of a theoretical construct, framework, model, architecture or methodology. Finally, theoretical modeling papers are papers that report the development of a model. The model may be evaluated using simulation.

Empirical research papers may be engineering-oriented or behaviorally-oriented. Engineering papers are papers that report the design and/or building of a model or system, which is evaluated in an empirical manner. The empirical test may be an analysis of data to determine the fit of a model to reality or a pilot test evaluation of a system. Behaviorally-oriented papers are papers that report survey-based, case study or action research studies, where the behavior of human beings is the main focus of the system. These studies may occur in a laboratory or in a more ethnographic form in organizational settings.

The second evaluation of each paper was with respect to the epistemology of the paper. The epistemology of the paper indicates the philosophical underpinnings of the work. The categories considered are objectivism, constructionism, and critical inquiry. Crotty (1998) provides an excellent treatment of epistemologies and theoretical perspectives, upon which we draw. Research from an objectivism epistemology is rooted in the notion that truth and meaning reside in the objects of study, independently of any consciousness. It is typified by positivist and post-positivist studies. Constructionism, on the other hand, is the view that knowledge and reality is contingent upon human practices, being constructed from interaction between humans and the world they study. We currently combine both socially-constructed reality and individually-constructed reality (i.e., subjectivist research) under the constructionism umbrella. Research rooted in critical inquiry is research that challenges conventions. For the purposes of IJITSA, critical inquiry need not be pursued from an advocacy or emancipatory perspective, as is often the case in other social science research (although such a stance is not precluded by any means). Regardless of the epistemological approach taken, the philosophy is expected to be integrated or discussed from the perspective of the systems approach with the long-term aim of obtaining a unified view of theory of systems and the object of study.

The third evaluation of each paper was with respect to the systemic research methodology or approach employed. Conceptual papers apply a systems approach theory to bring order to a set of related concepts. Formal mathematical papers apply mathematical rigor to the analysis. Papers that employ systems simulation may use discrete, multi-agent or hybrid modeling. Papers that study feedbacks and information flows to gain a better understanding of the system over time typically draw on methods of systems dynamics modeling. Soft systems methodologies form the basis of another category of papers. These papers typically examine difficult problems with many opposing, and often conflicting, points of view. Action research papers recognize the influence the researcher may have on the system when s/he is

Table 1. Papers published using a systems approach

Paper	Title	Authors
1	Toward an Interdisciplinary Engineering and Management of Complex IT-Intensive Organizational Systems: A Systems View	M. Mora, O. Gelman, M. Frank, D. Paradice, F. Cervantes, G. Forgionne
2	Do We Mean Information Systems of Systems of Information	F. Stowell
3	On the Study of Complexity in Information Systems	J. Courtney, Y. Merali, D. Paradice, E. Wynn
4	Importance of Systems Engineering in the Development of Information Systems	M. Kljajić, J. Farr
5	Towards A Wider Application of the Systems Approach in Information Systems and Software Engineering	D. Petkov, D. Edgar-Nevill, R. Madachy, R. O'Connor
6	Pluralism, Realism, and Truth: The Keys to Knowledge and Information Systems Research	J. Mingers
7	Information-As-System in Information Systems: A Systems Thinking Perspective	T. Nguyen, H. Vo
8	An Analysis of the Imbursement of Currency in a Debt-Based Money-Information System	G. Swanson
9	A Complex Adaptive Systems-Based Enterprise Knowledge Sharing Model	C. Small, A. Sage
10	A Conceptual Descriptive-Comparative Study of Models and Processes in SE, SwE, and IT Disciplines Using the Theory of Systems	M. Mora, O. Gelman, R. O'Connor, F. Alvarez, J. Macías-Lúcvano
11	Integrating the Fragmented Pieces of IS Research Paradigms and Frameworks: A Systems Approach	M. Mora, O. Gelman, G. Forgionne, D. Petkov, J. Cano
12	System-of-Systems Cost Estimation: Analysis of Lead System Integrator Engineering Activities	J. Lanc, B. Boehm
13	Could the Work System Method Embrace Systems Concepts More Fully?	S. Alter
14	Information and Knowledge Perspectives in Systems Engineering and Management for Innovation and Productivity through Enterprise Resource Planning	S. Stephenson, A. Sage
15	A Critical Systems View of Power-Ethics Interactions in Information Systems Evaluation	J. Córdoba
16	Information Technology Industry Dynamics: Impact of Disruptive Innovation Strategy	N. Georgantzas, E. Katsamakas
17	Using a Systems Thinking Perspective to Construct and Apply an Evaluation Approach of Technology-Based Information Systems	H. Kefi
18	The Distribution of a Management Control System in an Organization	A. Reyes
19	Making a Case for Critical Realism: Examining the Implementation of Automated Performance Management Systems	P. Dobson, J. Myles, P. Jackson

engaged in the research of the system. Critical systems research combines a traditional systems approach with participatory methods so that the complex issues being examined may be reconciled from different viewpoints as the problem examination process unfolds. Finally, a study may be multi-disciplinary or inter-disciplinary. However, it can be argued that almost every paper published in these issues is multi-disciplinary or inter-disciplinary, so that category was not considered in the analysis below.

The fourth evaluation of each paper was with respect to its purpose. This was often the most difficult category to assess, because most studies of complex phenomena cannot be categorized on a single purpose. However, a wide range of possible purposes exists and it is beneficial for our purposes here to place each paper in one primary category to start. Scholastic papers are papers that organize, disperse, fragment and ignore theoretical knowledge to achieve a better understanding of the phenomenon of interest. Exploratory papers generate potentially useful insights for new situations. For the purposes of this effort, descriptive papers identify sets of variables and their measurement scales that best describes the profile of the information systems field. Predictive papers find plausible relations between variables. The relationships may be non-linear and include feedback. There may also be multiple predictors and multiple effects described. Explanatory papers describe cause and effect relationships, which may also be multiple in nature. Design and control papers design and possibly evaluate conceptual or physical artifacts used to control information systems, either as a whole or in part. Evaluative papers evaluate system actions such as politics, programs, or projects, among others, in an information systems context. Instrumental papers develop and validate a conceptual or physical instrument to measure a construct that is argued to be useful in better understanding information systems. Interpretation papers develop and test (or simply apply) a model in a complex event or situation. Often, there is conflict in these situations due to the different perspectives taken. Interpretation papers seek to achieve a mutual understanding and interpretation of the event or situation. Interventionist papers design, implement and verify human actions taken to ameliorate a problematic situation related to an information systems context. Developmental papers design, build and evaluate a physical artifact to exhibit the proof of a new information systems concept, either in whole or in part. Methodological papers propose a new methodological research process based on the systems approach. These papers rely on logical argumentation or proofs of the method's applicability.

Most of the papers examined can be argued to achieve multiple purposes. In spite of this realization, most of the papers were placed in only one category, which was selected based on my perception of the primary goal or achievement of the paper. However, other readers and the authors of the papers may rightfully disagree with my assessment, but my goal is to provide a "big picture" view of our current situation. I encourage future researchers to fill in the (in some case, missing) details with future work.

IJITSA also publishes interviews of internationally known information systems scholars who have published research in the areas covered by IJITSA. These interviews were not included in the analysis which follows.

ANALYSIS OF THE PUBLISHED PAPERS

Table 2 contains the results of the effort to analyze the papers on the categories described above. The horizontal lines in the table separate the issues of publication. The first row contains data for the papers published in IJITSA volume one, issue one. The second row contains data for the papers published in IJITSA volume 1, issue two. The third row contains data for the papers published in IRMJ volume twenty, number 1.

When considering the basis of the papers, the analysis reflects an overwhelming bias toward theoretical work. The first papers in IJITSA were intended to outline the positions of the senior editorial review board members in order to provide guidance to potential researchers who are interested in pursuing work in one of the subareas (information systems, software engineering, system engineering, complex systems, or philosophical issues) of the journal. Given the complexity that can be inherent in a systems approach to any issue, it is not surprising that a majority of the papers do not incorporate empirical arguments.

However, a few papers do include empirical analysis. Paper number 4 (“Importance of Systems Engineering in the Development of Information Systems”) uses data to confirm some of the approach described in the paper, so it was given both a theoretical and an empirical rating. Paper 16 (“Information Technology Industry Dynamics: Impact of Disruptive Innovation Strategy”) tested a system dynamics model using simulation. Paper 17 (“Using a Systems Thinking Perspective to Construct and Apply an Evaluation Approach of Technology-Based Information Systems”) tested a model of information systems / information technology using a systems thinking perspective with empirical data from interviews and questionnaires. Notably, this paper also confronts the positivist versus constructivist / interpretivist research dilemma directly, settling on the systems approach as a pragmatic manner for achieving a purposeful result. This paper was also given both a theoretical and an empirical rating.

With respect to epistemology, and given the bias toward a theoretical basis for the papers published, it also should not be surprising that a constructionism epistemology is used in most of the papers. Paper 16 (“Information Technology Industry Dynamics: Impact of Disruptive Innovation Strategy”) was classified as a paper based on an objectivism epistemology because it reflects a fairly standard post-positivist approach to research.

Several papers were classified as based on a critical inquiry epistemology. Paper 1 (“Toward an Interdisciplinary Engineering and Management of Complex IT-Intensive Organizational Systems: A Systems View”), paper 15 (“A Critical Systems View of Power-Ethics Interactions in Information Systems Evaluation”), and paper 19 (“Making a Case for Critical Realism: Examining the Implementation of Automated Performance Management Systems”) were placed in this category. As noted above, in this analysis the focus on the critical inquiry characteristic of challenging the status quo took precedence over the existence of an advocacy or emancipatory goal.

Paper 1 (“Toward an Interdisciplinary Engineering and Management of Complex IT-Intensive Organizational Systems: A Systems View”), the position paper for the journal, challenges readers to consider the benefits and advantages of using interdisciplinary concepts “to improve and reposition the information systems discipline to accommodate the emergence of” complex information technology intensive organizational systems. Paper 15 (“A Critical Systems View of Power-Ethics Interactions in Information Systems Evaluation”) uses the ideas of critical systems thinking and Foucault’s work on power and ethics to examine information systems evaluation processes. Paper 19 (“Making a Case for Critical Realism: Examining the Implementation of Automated Performance Management Systems”) proposes that “critical realism be adopted as the underlying research philosophy” in the evaluation of enterprise systems.

Within the methodology section of Table 2, most of the papers were placed in the conceptual methodology category. This is consistent with the nature of the position papers that were published. Many of these papers are intended to demonstrate how an application of systems approach theory can bring order to the primary topic of the paper. For example, in paper 5 (“Towards a Wider Application of the Systems Approach in Information Systems and Software Engineering”) the authors propose “directions for future research and practical work” that result from applying systems thinking to the fields of information systems and software engineering.

Paper 8 (“An Analysis of the Imbursement of Currency in a Debt-Based Money-Information System”) is the only paper that was placed in the formal mathematical method category. The paper takes an analytical approach to examine money-information exchanges. It also takes an internal perspective to examine certain aspects of social cybernetics.

Paper 9 (“A Complex Adaptive Systems-Based Enterprise Knowledge Sharing Model”) uses systems simulation to test a complex adaptive systems-based enterprise knowledge sharing model. The research found that the methodology can provide knowledge management executives with a better understand-

ing of knowledge sharing behavior and influences. As noted above, paper 16 (“Information Technology Industry Dynamics: Impact of Disruptive Innovation Strategy”) is a paper that also uses simulation to test a model. However, the primary focus of this paper was determined to be the systems dynamics aspect, so it was placed in the systems dynamics methodology category. It was the only paper placed in the systems dynamics category.

Paper 17 (“Using a Systems Thinking Perspective to Construct and Apply an Evaluation Approach of Technology-Based Information Systems”) is a soft systems methodology paper. Soft systems methodology is combined with complexity modeling to build an evaluation approach of a data warehouse. As noted earlier, the systems approach adopted in this work was selected for the pragmatic fashion that it would support a purposeful outcome.

The final paper considered in the methodology section of the grid is paper 15 (“A Critical Systems View of Power-Ethics Interactions in Information Systems Evaluation”), which was mentioned earlier as a paper using a critical inquiry epistemology. The paper takes the position that information systems evaluation does not provide enough guidance to practitioners on how to act in relation to power as an issue that affects any action for improvement.

Moving next to the Purpose section of Table 2, we see that eight of the nineteen papers are classified as having a scholastic purpose. Papers 1 (“towards an Interdisciplinary Engineering and Management of Complex IT-Intensive Organizational Systems: A Systems View”), 3 (“On the Study of Complexity in Information Systems”), and 6 (“Pluralism, Realism, and Truth: The Keys to Knowledge in Information Systems Research”) are all editorial position papers in the first issue. Paper 10 (“A Conceptual Descriptive-Comparative Study of Models and Standards of Processes in SE, SwE, and IT Disciplines Using the Theory of Systems”) analyzes three fields in a single comparison paper with the objective of reducing the complexity inherent in business process schemes.

Three of the Information Resources Management Journal papers are scholastic papers. Paper 11 (“Integrating the Fragmented Pieces of IS Research Paradigms and Frameworks: A Systems Approach”) applies the systems approach to information system research paradigms and frameworks. Paper 18 (“The Distribution of a Management Control System in an Organization”) builds upon the Cybersin method to align systems and organizational structure. Paper 19 (“Making the Case for Critical Realism: Examining the Implementation of Automated Performance Management Systems”) leverages a philosophical stance, so it is considered scholastic on that merit. (Papers 18 and 19 are also methodological papers, discussed below.)

Paper 7 (“Information-As-System in Information Systems: A Systems Thinking Perspective”) has been categorized as an exploratory paper. It examines information as a system in its own right, thus proposing a new way of conceptualizing information.

The descriptive papers in this analysis are paper 4 (“The Role of Systems Engineering in the Development of Information Systems”) and paper 8 (“An Analysis of the Imbursement of Currency in a Debt-Based Money-Information System”). These papers contain models that describe relationships identified by the authors. Paper 8 is also categorized as an explanatory paper. Through the use of analytical descriptions typically found in economic analysis, the author describes money-information exchanges and derives implications for the design of information systems.

Only two papers were categorized as design and control papers. Paper 12 (“System-of-Systems Cost Estimation: Analysis of Lead Systems Integrator Engineering Activities”) examines the activities of architecture development and integration in order to answer questions related to time and effort needed to achieve desired results in systems implementations. Paper 14 (“Information and Knowledge Perspectives in Systems Engineering and Management for Innovation and Productivity through Enterprise Resource

Planning”) focuses on enhancing innovation, productivity, and knowledge management through a better understanding of network effects and path dependencies in enterprises.

The only evaluative paper is paper 17 (“Using a Systems Thinking Perspective to Construct and Apply and Evaluation Approach of Technology-Based Information Systems”). As mentioned earlier, this paper uses a soft systems approach to build an evaluative mechanism of a data warehouse implementation.

The final category containing entries in Table 2 is the methodological purpose category. Five papers are listed there. Paper 9 (“A Complex Adaptive Systems-Based Enterprise Knowledge Sharing Model”) and paper 16 (“Information Technology Industry Dynamics: Impact of Disruptive Innovation Strategy”) use simulation. Paper 15 (“A Critical Systems View of Power-Ethics Interactions in Information Systems Evaluation”) and paper 19 (“Making a Case for Critical Realism: Examining the Implementation of Automated Performance Management Systems”) rely on a critical thinking methodology. As noted above, paper 18 (“The Distribution of a Management Control System in an Organization”) builds upon the Cybersin method.

OPPORTUNITIES FOR FUTURE RESEARCH

The analysis indicates there are many, many opportunities for publishing new work grounded in the systems approach. Epistemologically, objectivism is almost nonexistent as a knowledge perspective in this analysis. Given that outcome, it is not surprising that only three of the nineteen papers published in these issues were empirical papers. Researchers may be reluctant to pursue empirical work in systems areas, due to a perceived increase in the complexity of modeling systems as compared to modeling components of systems (i.e., subsystems). Indeed, a major criticism of non-systems research is that it is necessarily reductionist and loses much of the richness that a more complete systems-oriented description more naturally captures. However, structural equation modeling has much to offer in the analysis of systems and researchers are encouraged to investigate the appropriate application of that type of approach where possible. In cases where structural equation modeling is not appropriate, researchers should explore the use of multivariate analyses. In some cases, nonparametric approaches may be applicable to describe differences in distributions of outcomes that do not meet the assumptions of parametric analysis methods.

On the other hand, the use of critical inquiry-like epistemology is very encouraging. Critical inquiry is a defining characteristic of scientific approaches (Popper 2000). Through critical inquiry we can surface assumptions in the descriptions and models of problem situations to better understand the nature of the complexity inherent in them. Critical inquiry is often pursued from an advocacy perspective with a goal that change will occur in the system (typically, a social / political system). As information systems researchers, we may be able to improve the application of the systems approach through a more aggressive advocacy!

All of the methodological categories except the conceptual category are in need of development. The rigor of formal mathematical approaches should be pursued where possible, including when it can only be applied to a portion of a system being analyzed. In such a case, a mixed-method approach (Creswell 2003) can be utilized to present an analysis that is richer than one which is based only on a qualitative approach or only on an empirical approach. Systems simulation, systems dynamics, and the use of the soft systems methodology can be leveraged to add to the body of work in these categories. This volume contains excellent examples of critical inquiry, which can be used to inform a critical systems methodology approach in research.

The absence of action research methods-based papers in this analysis is a call for researchers to get out of their offices and into the world. Information systems issues are inherently socio-technical issues, especially when aspects of decision making come into play. The role of systems in complex decision making environments such as public policy making, healthcare, financial fund administration, enterprise management and many other areas depends on understanding how the human element comes into play. Action research must be executed carefully, as the researcher cannot avoid being part of the system under investigation. However, guidelines exist for minimizing the researcher's influence on the study results so there is no need to hesitate on methodological grounds.

An increase in action research papers could lead to an increase in papers with an interventionist purpose. Research involving the design and implementation of systems that also incorporate an analysis of human actions taken to mitigate a problematic situation would fall into the interventionist category.

Actually, there is great opportunity for papers in all of the purposeful categories used in this analysis. As might be expected given a lack of empirically-based papers, predictive papers that find plausible relations between variables have not been published. Instrumental papers that develop and validate an instrument to measure a construct are also lacking. Interpretation papers that develop and test (or simply apply) a model in a complex event or situation are also needed.

Systems design, development, implementation, and assessment were core activities in the early years of information systems research. Developmental papers that describe these activities related to the design, implementation, and testing of an artifact to prove systems approach to an information systems concept, either in whole or in part, certainly would be welcomed.

CONCLUSION

As noted at the outset, this analysis paints a picture using a broad brush. The papers considered here are truly too complex to be accurately described on the discrete dimensions that exist in our categories. Yet, I believe we have established a few reasonable characterizations of the work that has been published. Much of it is theoretical and conceptual in nature. The underlying epistemology is constructionist, a term that is used in this work to include subjective perspectives that are either individually or socially constructed. The primary purposes of the work are to educate readers as to what could be studied, evaluate a few approaches, and outline several potential methodologies. There is a small but undeniable collection of papers that reflect a critical inquiry approach. I feel this is a valuable contribution and I hope to see more papers develop along that line of inquiry.

There are many opportunities for researchers to fill in gaps in our existing publication scheme. A greater use of objectivist epistemology (as typically underlies positivist and post-positivist approaches) will be likely to bring more empirically-based papers into the community. Action research is needed and increasing that approach can drive academically rigorous research into the world of relevant application, a need that is often identified inside and outside of academe.

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