Perspectives of Information Systems

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For Anneli, Simo, and Petri

Preface

Information system science, defined broadly, is highly interdisciplinary because it can be seen as the effective analysis, design, delivery, use, and impact of information technology in organizations and society. Many basic as well as advanced books on information systems and their development apply approaches and theories from such disciplines as technology, management science, economics, mathematics, psychology, sociology, and philosophy. Such new branches of information system science as mobile information systems, multimedia information systems, telematic commerce, and cooperative work support systems have incorporated theories from such disciplines as organization science, education sciences, communication science, and musicology.

Objectives and Uses of This Book

This book focuses on various issues in information systems and their development, as well as on the advanced utilization of new information technology. The fields and issues that are analyzed in this book have not been discussed in the same context in the current scientific literature, although they are becoming more important in information systems development. This book includes both theoretical foundations and practical approaches for each topic, and therefore it is of relevance both to scientists of information systems and to practitioners in information systems development, introduction, and use. Large companies and software houses will also find this book useful in its discussion of methods for evaluating information technologies, systems, methodologies, and tools. Our colleagues have expressed a need for this kind of book.

We offer new perspectives on key topics in information systems research. These topics and research results are especially useful today because of the rapidly changing nature of information systems and information technology. Methodologies and metamodels for information system development (ISD) and their evaluation, contingency factors and uncertainty in decision making in ISD, development of holistic ISD methodologies, selection of ISD methods and tools, intel-

ligent executive information systems, mobile information systems, exception handling in information systems, and quality assurance and dynamic performance evaluation of information systems are topics that are not often discussed in the literature but are today considered essential in this field. We emphasize the basic approach of information systems scientists, that is the needs of the end-users and the organization as the starting point of information system development and introduction. Contingency, user-participation and evaluation are also considered of importance throughout the text.

Thus, one of the outstanding features of this book is its mixture of subjects under one framework of thinking about information system science. The fundamental ideas of this conceptual framework have resulted in many features of two multinational ESPRIT (European Strategic Programme for Research and Development in Information Technology) projects in the European Union: OSSAD (Office Support Systems Analysis and Design) and HECTOR (Harmonized European Concepts and Tools for Organizational Information Systems).

The editor and main author has participated in the development of each chapter. The book will be useful both in practice and as part of the academic information system (IS) curricula at universities. This material has been successfully used in the advanced course on information systems development at the University of Jyväskylä in Finland, where the editor teaches.

Organization and Contents

Although the basic framework of our thinking can be found in the first two parts of the book and subsequent parts are based on these approaches, definitions, and models, we designed the book to allow the reader to jump around between parts and chapters. Each chapter is self-contained and does not necessarily require having read the previous chapters.

The book is divided into seven parts. Parts I and II provide the conceptual framework. In Chapter 1, we define the conceptual components of an information system. These components, together with the principles of systems-theoretical control structure and linguistic abstraction, are employed in constructing a hierarchical multilevel universal framework for information activities in an organization. The framework lays the foundation for the analysis, modeling, and evaluation of information systems and their relevance for information activities in an organization.

Chapter 2 compares three reference frameworks for information systems and discusses their development. The analysis and comparison scheme is derived from a definition of the concepts of ISD methodology and metamethodology. This detailed scheme is used to determine the strengths and weaknesses of the reference frameworks, but it can also be used in the same way as the frameworks themselves, that is, as a basis for comparing ISD methodologies.

Contingency factors and management of uncertainty in decision making in the introduction of information technology are analyzed and discussed in Chapter 3.

It is of great importance for the decision maker to know the preconditions and the overall favorable atmosphere that should prevail for effective and successful information technology decision making in an organization.

Part III discusses ISD methodologies, methods and tools. The OSSAD methodology was constructed to guide the analysis and design of office organizations and office support systems (Chapter 4). It offers tools, procedures, and practices for finding balanced solutions to social and technical problems in office environments in order to realize acceptable, effective and efficient office support systems in a way that is best suited to their use environment. Its main principles are strong contingency, user participation and modeling. This methodology was created because earlier system design methodologies emphasized technical aspects and paid little attention to the organizational problems in an office environment.

The OSSAD project was supported by researchers from France, Germany, Canada, Italy, and Finland. During its development, it was field-tested in all these countries. This field-test process is illustrated in Chapter 5.

A technical specification model provides a detailed description of information system design products, starting from the results of logical design activities that comprise the cycle of creation, refining and selection of solution versions. Chapter 6 constructs a framework for the technical systems specification process and provides a model for the organizational specification process.

Chapter 7 analyzes the motivations for acquiring a tool to support tasks in information systems development. These research results have been collected from real ISD projects. We explain the tool selection criteria, how the characteristics of tools are measured and emphasized in different circumstances according to different states of ISD contingencies, and how the tool selection process could be improved.

Part IV discusses executive information systems (EISs). Various strategic decision-making problems are collected under the same framework in Chapter 8. We classify them by type and strategic level, and analyze the information requirements for solving them. We also discuss information sources of, and techniques and methods for, acquiring this information. Based on this analysis, we identify the types of strategic decision-making problems that could benefit most from the knowledge-based technology in an EIS.

Key issues in the selection and introduction of executive information systems are the following: Can EISs match our managerial needs and support analytical decision making in an organization? How widely can they be introduced at the management level? Are they easy to learn, easy to use, and easily customizable? Do they utilize the most modern information technology, including graphics? Will they work in our computer network? To facilitate finding elegant solutions to the selection problems, we construct and apply in Chapter 9 an evaluation framework that guides the selection of EIS products to match management needs in the organizational contingencies.

Chapter 10 analyzes current practices in the field of management information systems and decision support systems. To improve these systems in supporting executives in decision making, we propose the integration of decision support

capability into EIS, together with expert systems and knowledge-based systems technology. A conceptual framework for an intelligent executive support system is presented.

Part V discusses mobile computing. The concepts of the traveling executive and executives' mobile information system are defined in Chapter 11. We collected data and opinions from personal discussions with forty-nine executives in the United Kingdom, France, Italy, and Finland, and drew conclusions from the nature of their work and their use of information technology. The expectations of the executives were also analyzed, especially concerning the mobile use of information technology services. Many reasons and cultural characteristics were found to explain differences in these four countries.

Exception handling in an information system is the theme of Part VI. Offices are the dynamic heart of organizations. Interactions, exceptions and interruptions are basic characteristics of office information systems. They are often considered problematic in the formulation of procedures for office workers. In Chapter 12 we analyze the characteristics of exceptionality, reasons for exceptions, organizational influence of exceptions, and exception handling principles and practices in information systems.

Part VII analyzes quality assurance and performance evaluation of information systems. Basic concepts are presented in Chapter 13. Organizational, social, economic, and technical criteria for evaluation, and evaluation practices and user participation, are analyzed. In Chapter 14, graphic models are constructed and analyzed to illustrate the dynamic nature of the performance evaluation process and the gap between information system performance and user preferences. The changing emphases and intensities of performance evaluation efforts during the information system life cycle are discussed. We explain how user views and technical staff views influence the set of performance evaluation criteria along the information system life cycle. Finally, the whole process of performance evaluation of information systems is analyzed in Chapter 15 by describing critically one evaluation process in a large company. A generic model of criteria is constructed, and assessment measures are identified.

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