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Management Information Systems for Enterprise Applications

Business Issues, Research and Solutions



Adamantios Koumpis



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Management Information Systems for Enterprise Applications:

Business Issues, Research and Solutions

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To Callisto, again, and a hopefully bright future

Preface

STUDY OF MANAGEMENT INFORMATION SYSTEMS TO HELP INVENTING THE FUTURE IN SERVICE INNOVATION

Fossils (from Latin *fossilis*, literally, “obtained by digging”) are the preserved remains, impression, or traces of animals or plants of the past.

The basic idea in this book is to “dig-up,” expose, and utilize past conceptions, theories, ideas, and uses of Management Information Systems, which have been “fossilized,” yet retain a useful structure and utility, and will observe and analyze current trends in Management Information Systems, in order to provide an integrative framework of concepts, methodologies, and infrastructures for an emerging service-based world that will be based on existing and forthcoming advanced technologies, such as the Semantic Web, the Web of Services, ubiquitous computing, and the Internet of Things.

The book takes an interdisciplinary approach to consider the importance of Management Information Systems worldwide, analyze the challenges for individuals, organisations, and the society, examine transcendental elements and novel conceptualizations from areas related to service provision, and investigate patterns of service systems.

Based on the concept of service as a knowledge-based process for the co-creation of value in everyday practices through interaction in service ecosystems, the book aims to provide the scientific foundations for research in Information and Communications Technologies that will produce innovations in the design, development and operation of Management Information Systems.

The target audience of this book is clearly defined: students and researchers / professionals from academia and industry. A lot of books aim at reaching this rather comprehensive goal and fail, but here, it works out surprisingly.

TARGETED BREAKTHROUGH AND RELEVANCE TOWARDS A LONG-TERM VISION FOR MANAGEMENT INFORMATION SYSTEMS

Over the past two decades, the service economy, which includes the service sector activities, as well as service activities performed in the agricultural, the extractive, and the manufacturing sectors, has become the largest part of most industrialized nations’ economies according to key economic indices, such as contribution to GDP and employment.

In parallel, the concept of ‘service’ has been developed in different disciplines, such as in computer science and software engineering, operations research, business strategy, and marketing, as a key theoretical construct or a strong metaphor that affects drastically recent research initiatives.

This book takes a radical approach to provide the conceptual and methodological foundations that reflect interdisciplinary concerns regarding research in Management Information Systems. It is about cross-fertilizing disciplines to expand the common knowledge base, generate ideas, create methodologies, develop toolsets, and evaluate practices in order to investigate and invent the future of services. In this respect, the book aims to investigate the future of Management Information Systems by means of analyzing a variety of MIS and service-related concepts in a wide range of disciplines, including computer science, software engineering, operations research, management of Information Systems, economics, management theory, marketing, business strategy, cognitive sciences, anthropology, humanities, and the arts; transcendental elements in services, as well as novel concepts and knowledge from related areas, are also part of the items discussed in the book.

Concepts and Objectives for the Reader

The conceptual basis of the book includes the following: Management Information Systems concern all sorts of activities performed by providers for the benefit of the customer and is considered as the archetype of all transactions. A Management Information System, same as with a generic service, is defined by the roles of the provider and the customer and in terms of the benefit delivered to the customer / consumer.

Providers and consumers can be individuals, communities, organizations, or technological artifacts. Interaction within a Management Information System is approached as a value co-creation process between the provider and the customer, which renders both of them “value creating service systems.”

The following are strong aspects of the present book:

- *It provides a stage for the cross-fertilization of new ideas in Management Information System research to expand the intellectual boundaries in MIS interactions and search for alternative paradigms*, by blending scientific knowledge and business requirements with input from humanities and arts related with service provision and by considering transcendental elements of people’s personal and working lives and organisational practices.
- *It provides a conceptualisation for a “world of services” and for the future of the Management Information System*. It is not difficult to predict a future with global MIS service infrastructures (some of which already exist), multilingual MIS services that understand natural language, or MIS services that can supply customised service delivery and make any of their customers or consumers happy. On the other hand, potential exploitation of such Management Information System demands caution: a world of MIS-based services is open to collapses of service economies, due to potential *service terrorism* (e.g. provision of bogus services to damage the reputation of service providers or service systems) or *service anarchy* (e.g. jamming the e-commerce sites with huge number of simultaneous connections); also, it leaves room for the emergence of multifarious novel socio-technical phenomena, such as *MIS service activism* (e.g. for the co-creation of value in virtual communities), *MIS service democracies* (e.g. which, when unorganised, cause ineffectiveness and discouragement for providers, perhaps by ignoring all past performance and giving all service providers the same exposure to customers) or, at the other extreme, *MIS service tyrannies*, (e.g. causing without ration the total hierarchic control of the exposure of service providers by a few nodes).

- *It provides a universal framework for the study of Management Information System as collaborative knowledge creation and advancement systems.* Management services are considered a knowledge-based process for the co-creation of value through the interaction of various / multiple organizational service (sub-)systems. Such systems are normative structures that facilitate the collaborative knowledge creation and advancement (i.e. improvement of existing knowledge) between the provider and the customer. Hence, the value of a Management Information System interaction can be considered as equal to the knowledge it creates collaboratively, regardless whether this knowledge remains with the customer or with the provider (or it is shared with another entity or the society).
- *It drives service research from the consumer's point of view.* Up to date research is dominated by provider-oriented approaches that focus on production and delivery issues, such as productivity, efficiency, and competitive advantage, but overlook the customer's perspective (especially when the customer is an individual or consumer). Such approaches lead inevitably to gaps in the perception of service from providers and customers. The present book moves one step forward and tries to close these gaps, by providing a universal framework for understanding Management Information System interactions and their respective value.
- *It provides an ecosystem approach on Management Information System interactions.* Customers and providers interchange roles constantly, being one time producers and some other time receivers of services from a plethora of different Management Information Systems. Since service interactions mean to provide some benefit to the customer in order to resolve problems or meet particular needs, the complexity of customer problems or everyday practices should determine the complexity of such Management Information System interactions.

The specific objectives of the book refer to the following:

- *To broaden the concept of Management Information System itself and show its infinitive potential in the field of ICT* by truly excavating, examining, and embracing a multitude of disciplines and moulding their particularities into practices and methodologies for creating ICT-enabled services.
- *To provide an integrative framework for understanding Management Information Systems and the related interactions* that organically incorporates concepts and influences from a variety of disciplines to enable service innovation with ICT. It includes methodologies and practices for the development of Management Information Systems and analysis of positive and negative ways for MIS exploitation.
- *To analyze MIS interactions and provide a taxonomy of value co-creation patterns*, according to the role of the participants and their positive or negative (deliberately or not) contribution in the creation of value, the type of interaction, and the inputs and methods/ tools used for the creation of value.
- *To suggest innovative service-based MIS models for the co-creation of value in digital service interactions* that take into consideration the requirements of both the provider and the customer in real-life situation.
- *To provide a conceptualisation of a Service-based Web as a next phase in the evolution of Management Information Systems.* The Service-based Web refers to people, communities, and organisations that enter into service interactions on the Web in order to perform their everyday practices or resolve problems. It moves beyond the manipulation of data and the distribution of

information to enable knowledge-based processes for Management Information System interactions, service compositions, and value co-creation. The Web of Services is the technological underlay for the execution of such processes.

- *To evaluate the potential of existing and forthcoming MIS technologies, combine different conceptualizations of Management Information Systems and devise new methodologies and tool concepts for the actualization of a Service-based Web.* Existing methodologies and technologies, such as Service Oriented Architectures (SOA) and Web Services, enable transactions between Information Systems and can be approached as the necessary technical infrastructure of such a Service-based Web, but not as capable to support the intellectual aspects and the pragmatic needs of complicated services or highly nested interactions, such as those faced nowadays in most environments. The Semantic Web can significantly support the intelligence in understanding and satisfying the real life needs. New methodologies and technologies are required for the capturing and manipulation of knowledge that is used or created in service processes, such as ontologies that describe the different means that can satisfy a need or the new options that derive from past decisions and SLAs that are based on the concept of the benefit and value that is co-created with the customer. Besides, new interactive tools are required for the picturing, configuration, integration, coordination, and use of services.
- *To provide a roadmap for research on Management Information Systems.* The lack of a central paradigm for Management Information Systems makes research in this area a difficult and risky scientific task. Researchers may tackle problems while being unsure of the wider picture, or tackle problems without being sure that they have the tools at hand to solve them. A roadmap would help guide research efforts and prevent the wheel from being re-invented.

Expected Impact for the Academic, Research, and Professional Reader

The book aspires to promote research that will provide the fundamental structures for a paradigm shift in the design, development, and operation of Management Information Systems. The deep understanding of the potential of Management Information Systems could lead to an avalanche of innovative, constructive, and exciting projects in the field. The wider impact of the book relates with the following:

- It will contribute in the establishment of a paradigm for the development of new generations of Management Information Systems.
- It will boost and extend the opportunities for Management Information Systems innovation with respect to the development of new types of services, the application of alternative processes of service provision and the interaction with the customer at the front-end for the co-creation of value.
- It will nurture genuine innovation that aims at the creation of value, rather than the improvement and efficiency of Management Information Systems.
- It will foster fresh approaches on the analysis of Management Information Systems systems that emphasize the role of the customer, as well as culture-related aspects such as the social interaction and the co-creation of value.

ORGANISATION OF THE BOOK

The contents of the book are organised in twelve chapters. We consciously and deliberately chose to follow an applications-oriented approach in the presentation of the material so that more flexible practices may be adopted by the readers, following their usually highly differentiated needs and reading styles.

More specifically:

Chapter 1 deals with some essentials of Management Information Systems. Here the author elaborates on a not exhaustive list of key issues that are relevant and connected with the notion of a Management Information System. This chapter includes also a very interesting examination of a business case dealing with the introduction of a MIS to support independent filmmakers.

Chapter 2 presents a business case for use of a Management Information System in the domain of archaeology aiming to specifically unify existing practices and models to assist archaeological excavations from all practical perspectives: reduce time, minimise costs, improve personnel recruiting and assignments, et cetera. The chapter closes with an investigation for new research ventures in the wider area of cultural heritage preservation. This chapter includes also an appendix where the Ancient Greek Theatre Electronic Documentation Project is presented in more detail.

Chapter 3 presents some grounding theories for building robust corporate management Information Systems. This goes through a theoretical analysis of what is nowadays encountered within modern organisations and which relates with multiple reality decision-making. The chapter also discusses theoretical and practical aspects related with the Management Information System contexts and the Management Information System interactions of the corporate decision-making.

Chapter 4 focuses on something that has unfortunately drawn little attention in the past, but is expected to concentrate more and more interest in the years to follow, namely mission-specific Management Information Systems and the underlying Management Information System infrastructures. The chapter examines two example cases related with the building of a conceptual framework for the study of research ecosystems and the measuring of government innovation within the countries of the European Union.

Chapter 5 deals with an ambitious Management Information System goal: the creation of Open Source Supply Chains. Here we start with some basics and background for the Open (Source) Supply Chains, discuss relevant architectures and modelling work, proceed to an analysis of real-world business cases and the related application scenarios, and present an Open Source Reference Model.

Chapter 6 deals with the realisation of business transactions on the globalised networked economy; technology and business challenges for accounting information systems are discussed, and an environmental accounting infrastructure is presented.

Chapter 7 deals with another exciting area: how can people make use of emerging social networking infrastructures to support educational content creation and usage? This chapter presents the case of myCourse, its architecture, and application.

Chapter 8 deals with Management Information System infrastructures and how they can be organised to better support business process and operations outsourcing. The author examines the outsourcing potential for development in the area of Management Information Systems, and continues by presenting a truly innovative platform that has been developed, the PANDA platform, which makes use of a sophisticated mechanism to deal with reputation matters within multi-vendor establishments.

Chapter 9 is dedicated to the examination of a case study related with the efficient management of waste. It is commonplace that industrial activities have created serious ecological problems, and even though there are different philosophies and approaches to resolving these problems, it is necessary to organize business activities along ecologically sound principles. Building of W-MIS, i.e. Waste Management Information Systems, is a key issue because every business activity produces some waste, either hazardous or polluting to the environment.

Chapter 10 deals with Management Information Systems situated in a futuristic context namely this of a service factory of the future. The vision of such a service factory is to become a major driver for the large-scale exploitation of multi-agent information processing technologies for e.g. the manufacturing sector in a service-oriented view and explore the potential of the production as a service approach as both an enabler and a catalyst towards the realisation of intelligent and environmentally conscious factories. In the chapter the Service Factory concept is presented and its potential business impact is analysed. The chapter includes two appendices related with the real world validation of the concept with members of the industrial community.

Chapter 11 presents new questions with respect to the research in Management Information Systems. The book continues with an assessment of the SERVICE FACTORY concept presented in the previous chapter, and presents the results of a series of workshops held on this topic.

The final chapter, 12, presents some scenes from the future in terms of elaborating on the reflections from the Service Factory workshops presented in the previous chapter. The focus here is on five application scenarios and trying to shed light on a variety of methodological, organisational, human-related factors, and business aspects. The selected areas of these include: (1) problem solving in complex product development projects, (2) collaborative authoring, publishing and delivery of multimedia content, (3) individual learning and corporate content management in industry, (4) knowledge sharing and management in professional virtual communities, and lastly, (5) augmented reality and experiential systems for use in remote and rural areas.

HOW TO USE THIS BOOK: GUIDE TO HELP THE READER

- A. In contrast to many books that first give a few real world management Information System data sets to elaborate the data and problem definition and then elaborate on what kind of method is best, depending on which practice is used, this book seems to follow an unorthodox approach: it starts with some aphorisms or observations regarding Management Information Systems and mixes together chapters that describe a practical business case with a chapter that deals with theoretical issues. This way, readers will have a better understanding of theory with enough background on practice.
- B. Readers should not expect to spend more time examining the special characteristics of enterprise applications or addressing the consequences of actions; these are not part of this book and the reason is simple and straightforward: these vary highly from one case to another and also fail to take into account the most important factors: not all enterprises are the same, not all managers perceive the reality and transform it into actions and decisions in the same way, and finally not all contexts are the same. Making Management Information Systems appear like an exact science field would be a failure from the author's side and also a handicap for the reader to help him or her transferring the described methodologies, technologies, and strategies into his or her application fields.

- C. This book is not a cookbook. And being a hobby cook, the author has many different cookbooks that don't look the same. And a cookbook does not need to be a catalogue of recipes. So the real gain after reading this book is to supply the reader with all those methodologies and techniques to enable them to address successfully similar analysis cases and demands in their particular business or professional environments. Don't expect this book to offer recipes and solutions ready-for-use "on how things should be done"; the aim here is to analyse cases and try find the missing links between theory and practice: how can some practice help devise a theory and how can a theory shed light and inspire a totally new approach for a practical problem.

Though the area of Management Information Systems attracted historically many publications from the early 80s (their majority mainly for use as textbooks and for teaching purposes); this area is rapidly gaining strong popularity lately, especially due to the emergence of several new forms of computing that change the ideas and attitudes towards more conventional or traditional forms of computing like MIS systems. The purpose of this book is to discuss Management Information Systems. To do so, the author demonstrates how a time-sharing computing system of the 80's or a batch system of the 70's still offer the paradigm of how Management Information Systems should be. But why not take a more radical perspective? Could a company for instance build its MIS totally based on Facebook? Could a company build its MIS on Twitter? Why not? How should such an MIS operate? Which would be the appropriate way to conceptualise on enterprise processes? Or applications? How could an MIS be accessed solely by mobile (smart) phones?

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This first chapter deals with some essentials of Management Information Systems. The main concern here is, from the corporate perspective, on a broader interpretation over time, and it may be necessary to know before proceeding to the purchase of a new MIS how the actual implementation and uptake of the new system will look like. The chapter also elaborates on a non-exhaustive list of key issues that are relevant and connected with the notion of a Management Information System. The author also makes a quite interesting examination of a business case dealing with the introduction of an MIS to support independent film makers.

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This chapter presents a business case for use of a Management Information System in the domain of archaeology, aiming to specifically unify existing practices and models to assist archaeological excavations from all practical perspectives: reduce time, minimise costs, improve personnel recruiting and assignments, et cetera. The work goes through experiences gained from the planning and implementation of an ambitious research venture aimed at developing a visually enhanced, unified access to data, information, processes, and the related content of archaeological excavations in situ. Such content is distributed among various excavations all over the world, thematically related, providing access to archaeology visitors, students, and archaeologists (practitioners, professionals, academicians, and researchers).

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What kind of software tool would people ideally like to use in order to facilitate a collaborative decision-making process in order to arrive at the best decision, in the shortest possible amount of time, with the strongest support by as many members of the group as possible, while also enabling new members of the group to easily understand why a certain decision was made one way and not another, even after several months or even years later? This chapter presents some grounding theories for building robust corporate management Information Systems. The chapter presents a theoretical analysis of what can be encountered nowadays within modern organisations, which relates with multiple reality decision-making. The author also discusses theoretical and practical aspects related with the Management Information System contexts and the Management Information System interactions of corporate decision-making.

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This chapter focuses on something that has unfortunately drawn little attention in the past, but is expected to garner more and more interest in the years to follow, namely mission-specific Management Information Systems and the underlying Management Information System infrastructures. Managerial/organizational information needs and the role of Management Information Systems in business organizations have been studied from one side only: formalizing the functions and defining typologies of operations. This (wrong) approach still dominates the field despite the fact that such type of MIS covers only less than 5 or 10 per cent of the interactions and communications amongst the employees and the management of a commercial business or an organization. This chapter examines two example cases related with the building of a conceptual framework for the study of research ecosystems and the measuring of government innovation within the countries of the European Union.

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This chapter deals with an ambitious Management Information System goal: the creation of open source supply chains. It starts with some basics and background for the open (source) supply chains, discusses relevant architectures and modelling work, proceeds to an analysis of real-world business cases and the related application scenarios, and presents an open source reference model. In current e-commerce frameworks, the issue of dynamic supply chain establishment and supply chain life cycle management is still misrepresented and not addressed adequately. Registration, advertisement, and change management for complex products and services heavily relies on proprietary application programming interfaces and protocols as well as emerging and partially competing (pseudo)standards.

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This chapter deals with the realisation of business transactions on the globalised networked economy; technology and business challenges for accounting Information Systems are discussed, and the chapter presents an environmental accounting infrastructure. Accounting services will definitely constitute the future of our global economies – as they always have in all levels, but now, the difference is that this dominance of accounting services shall be evident and apparent in all levels of the society and the economy. This means that the emergence of the accounting service science as an independent branch of the accounting discipline that will be taught, studied, researched, and examined, shall take place. For sure, this is not a novelty; management (and traditional) accounting experienced, at some point of their lifetime, their transformation from a profession into a science.

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This chapter deals with another exciting area: how is it possible to make use of emerging social networking infrastructures to support educational content creation and usage? This chapter presents the case of myCourse, its architecture, and its application. The myCourse Framework (consisting of the myCourse platform, the associated servicee, and business models, as well as relevant tools and technologies) aims to help learners create highly individualised (Web) services to meet their needs, whether for meeting educational, business, or self-development purposes. It also enables dynamically integrate people's