Preface

Computer-based developments over the last four decades have facilitated managers with numerous collaborative tools to support operational, tactical, and/or strategic level of enquiries within the environment of an organization. In relation to managing decisions, the use of collaborative decision and management support systems has evolved over the years through developments in computational science including databases, data warehouses, data mining, data visualization, intelligent agents, artificial intelligence, and neural networks. One of the purposes of these technologies is to provide managers as decision makers with a holistic view of the situation under enquiry.

Managers in commercial and other organizational environments often find the effective and efficient utilization of Information and Communication Technology (ICT) resources quite a challenging decision-making process, but frequently a very supportive mechanism for sustaining and creating a competitive advantage.

Recent studies in relation to networking and resource integration have resulted in the new concept of Grid technology, a term originally coined by Ian Foster in 1995. Grid technology has been described as the infrastructure and set of protocols that enable the sharing, integration and collaborative use of networked computer-based distributed heterogeneous resources (hardware, applications, data and instrumentation) between the multiple organizations that own those resources.

During the last five years, scientists have almost exclusively used Grid technology for their own research and development purposes. Lately, the focus is shifting to more interdisciplinary application domains that are closer to everyday life, such as medical, business and engineering applications. Hence, the Grid concept as a paradigm has an increased focus on the interconnection of resources both within and across various and differing collaborative organizations. This book will ensure that Grid technology shall be of the fullest interest to decision makers seeking collaborative decision management and support by advancing effective virtual organizations.

WHAT IS A VIRTUAL ORGANIZATION?

In the last few years, the Internet has revolutionized the way we work and do business. In both commerce and academia, this has led to market globalization, which in turn has led us to experience an enormous increase in competitiveness between organizations.

In response, a number of organizations have vanished, others have started to collaborate, and some have chosen to shrink by offering more specialist services. In most instances, collaboration is the key for those surviving organizations (service providers), as they realize that a customer (service consumer)

is mostly looking for the front-end of a completed package that is either a final product or service. As a note here, collaboration refers to the back-end process (from a consumer point of view) in which more than one organization share their competencies and work together towards the achievement of a mutual goal; that is to say, the final product or service. The growing trend of collaboration between organizations is also due to the fact that organizations are realizing that their goals are more demanding; they involve higher level complexity tasks and their resource capabilities may be inevitably limited in an environment of continuously rising standards and challenges. On the other hand, it is reasonable to think that there is a greater possibility of a more complete final product to be encountered, and earlier, if its development approach incorporates the input from more than the sum of the development parts.

Current ICTs are capable of supporting collaborative activities in cyberspace. These cyber-enabled collaborations involve the emergence of multiple organizations that function as one unit through the use of their shared competencies and resources for the purpose of one or more identified goals. It is important to note that a single organization collaborating in cyberspace may have as many unit functions – within the same or a different cluster of collaborative organizations – as the number of their identified goals. This cluster of collaborative organizations functioning as a unit towards an identified goal lasts for the lifetime of the identified goal. The fact that such collaboration is happening in cyberspace and that it has a transient life labels it as a virtual organization.

Thus, the enabling features (access to aggregated, distributed heterogeneous data, combined and parallel computational power, storage and instrumentation) offered by Grid technology have the potential to push the boundaries of and strengthen the aforementioned collaborations via a more informed (access to a greater horizon) and timely (quicker, on demand) collaborative support and therefore, provide more opportunities for advancing virtual organizations (VO).

With regard to collaborative decision-making, a VO utilizing Grid technology aims to facilitate managers with the ability to analyze and utilize data and instrumentation drawn from multiple pools encompassing registered distributed and heterogeneous (re)sources in a far more convenient and collaborative manner. It is anticipated that Grid technology will facilitate informed decision making – by enabling timely access to a larger number and range of resources – in a way that managers and their teams will be able to carry out parallel and/or combined tasks of increased complexity far more quickly through one or many interconnected, separable or inseparable collaborative VOs. Using Grid technology, a VO is also equipped with the combined competencies offered by the organizations involved. Competencies also refer to the distinct expertise and understanding each organization owns for the particular domain they serve.

In the context of this book, a VO utilizing Grid technology refers to the one which incorporates the combination of all those qualities (resource and competencies) as a whole, which each individual organization brings into the partnership. The quality of seeking results from a multi-perspective point-of-view, enabling a multidisciplinary, interdisciplinary and trans-disciplinary approach offers a greater chance for a far more informed, timely and complete end result to be encountered.

THE PURPOSE OF THE BOOK

The book aims to build a network of excellence in effectively and efficiently managing ICT-related resources using Grid technology. Its mission is to introduce both technical and non-technical details of Grid technology and its implications to the VOs involved, demonstrating its feasible and applicable arrangement within business and other organizational IT infrastructures.

It thereafter deepens its focus by highlighting strengths, weaknesses, opportunities, and threats when Grid technology is deployed – in a collaborative manner – within a commercial or other organizational setting. This is achieved by: presenting current and past implementations based on stabilized standards, as well as conceptualizing applicable practical opportunities. Contributions pay particular attention to presenting topics that are diverse in scale and complexity, as well as written by and for a technical and non-technical audience to suit different reading styles.

Specifically, the goal of the book is to educate readers by demonstrating how Grid technology has and could be applied to serve as the vehicle to maximize decision management and support across organizations in a far more effective and efficient virtual collaborative setting. The book prompts further development for best practices in identifying opportunities and provides future direction for innovative and applicable adoption of Grid technology in the area.

WHO SHOULD READ THE BOOK?

The content of the book reflects the interests of a broad audience as it offers state-of-the-art information and references for work undertaken to the challenging area of utilizing Grid technology for maximizing collaborative decision management and support. The book provides a rich source for both technical and organizational practices with regard to adopting Grid technology to advance effective virtual organizations.

The projected audience ranges from those currently engaged in to those interested in joining interdisciplinary and trans-disciplinary collaborative work utilizing ICT.

In brief, this book will be of highest value to a specialist audience including industry leaders, consultants, managers, practitioners, researchers, academics, and advanced undergraduate and postgraduate students working in the area of Grid technology. It will also be of high value to those wishing to embark in joining partnerships for producing collaborative interdisciplinary work utilizing Grid technology as the method to understand their domains in a far more complete way. Non-specialist audiences include postgraduate students, researchers, and academics from non-computing disciplines such as information systems, social science, business, and management.

ORGANIZATION OF THE BOOK

Fourteen self-contained chapters, each authored by experts in the area, are included in this book. The book is organized into three sections according to the thematic topic of the chapter. Thus, it is quite possible that a paper in one section may also address issues covered in other sections. However, the three sections reflect most of the topics sought in the initial call for chapters.

Section I, "*Grid Technology for Collaborative Decision Management and Support*" includes six chapters. This section introduces concepts and principles of Grid technology such as distributed computation and resource-sharing using Web services, middleware, and applications. These cover state-of-the-art methods and techniques for collaborative decision management and support across various organizational settings. In addition, some chapters present scenarios and approaches on how these methods and techniques could be further improved. As such, they underpin future development and implementation of relevant services.

Section II, "*Social Aspects in Grid Environments*" includes three chapters. This section elaborates the social aspect of sharing knowledge with, and entrusting other organizations, in a Grid environment. The content of this section is particularly valuable to those whose concerns keep them from participating in a virtual organization partnership using Grid technology. It pays particular attention to issues related to the understanding of socio-technical aspects of trust and control between virtual teams and organizations.

Section III, "*Grid Services for Advancing Virtual Organizations*" includes five chapters. This section goes beyond and builds upon current theory and practice, providing visionary directions on how Grid technology could be used in the future to the benefit of various organizational settings. It discusses the wide implications of Grid technology as to advance virtual organizations. As such, it provides latest thinking, practices, and conceptual models in utilizing Grid technology prompting further development for best practices in the real-world by identifying opportunities to support innovative and applicable services as to advance virtual organizations.

A brief introduction to each of the chapters follows.

In **Chapter I**, *Building Service-Oriented Grid Applications*, by Enjie Liu, Xia Zhao, and Gordon J. Clapworthy, presents a case study of a Web services design and implementation to allow medical data in differing formats to be stored in a standardized form and to expose algorithms from existing applications that manipulate these data sets as online service objects.

Chapter II, *Sustainable and Interoperable E-Infrastructures for Research and Business*, by Giuseppe Andronico, Rpbertp Barbera, Marco Fargetta, Emidio Giorgio, Salvatore Marco Pappalardo, and Dego Scardaci, discusses the approaches on how a company can alleviate the risks when it adopts a technology before standardization. Their approaches allow existing Grid infrastructures to evolve, by including newer middleware, and consequently preserve the investment made in the infrastructure.

In **Chapter III**, *Scenarios of Next Generation Grid Applications in Collaborative Environments: A Business-Technical Analysis*, Vassiliki Andronikou, Dimosthenis Kyriazis, Magdalini Kardara, Dimitrios Halkos, and Theodora Varvarigou, focus on two emerging Next Generation Grid (NGG) applications, which serve complex collaborations. These have shown rapid growth over the past decades and include the supply chain management and the Cargo Transportation Logistics competitive and highly dynamic markets.

In **Chapter IV**, *Semantics-Based Process Support for Grid Applications*, Gayathri Nadarajan, Areti Manataki, and Yun-Heh Chen-Burger consider business process frameworks that utilize semantics-based business process modeling (BPM) technologies. They illustrate their multidisciplinary approach by applying them to three different fields: Supply Chain Management, Business Intelligence and Knowledge Management, and Intelligent Video Analysis.

In **Chapter V**, *Placement and Scheduling over Grid Warehouses*, Rogério Luís de Carvalho Costa and Pedro Furtado consider a multi-site, Grid-aware data warehouse, which is a large distributed repository sharing a schema and data concerning scientific or business domains.

In **Chapter VI**, *Leveraging Simulation Practice in Industry through use of Desktop Grid Middleware*, Navonil Mustafee and Simon J.E. Taylor focus on the collaborative use of middleware for desktop Grid computing, like BOINC and Condor. The chapter discusses the integration of commercial simulation software together with free-to-download Grid middleware so as to offer competitive advantage to organizations that opt for this technology.

In **Chapter VII**, *Trust, Virtual Teams and Grid Technology*, Genoveffa (Jeni) Giambona, Nicholas L.J. Silburn, and David W. Birchall discuss what impact trust – a key element in favoring cooperation

among team members – has on the performance of virtual teams. The chapter explores the opportunity to build trust through the sharing of common resources and the enabling of rich communications.

In **Chapter VIII**, *The Socio-Technical Virtual Organisation*, Rob Smith and Rob Wilson discuss the problem in which several collaborating organizations act as though they are part of a single conventional organization. They present two factual scenarios from the chemical and health industries to illustrate the types of problem such systems are susceptible to and the utility of a socio-technical approach in overcoming them.

In **Chapter IX**, *Modeling Trust-Control Dynamics for Grid-Based Communities: A Shared Psychological Ownership Perspective*, Marina Burakova-Lorgnier discusses the need for, and proposes some thoughts on, modeling trust–control dynamics for communities that use Grid technology. The chapter proposes a trust framework that brings these together by taking into account both social and technological approaches to trust.

Chapter X, *Small World Architecture for Building Effective Virtual Organisations*, by Lu Liu and Nick Antonopoulos discusses the similarity between social networks and Grids, and that concepts in social science can be adopted for the design of New Generation Grid systems. The chapter presents an architecture which enables VOs working in a more collaborative manner to support decision makers.

In **Chapter XI**, *Runtime Service Discovery for Grid Applications*, James Dooley, Andrea Zisman, and George Spanoudakis describe a framework to support runtime service discovery for Grid applications based on service discovery queries in both push and pull modes of query execution. The framework supports six different types of trigger conditions that may prompt service replacement during runtime of Grid business application, and evaluates the relevance of a set of candidate services against service discovery queries.

In **Chapter XII**, *Model Architecture for a User Tailored Data Push Service in Data Grids*, Nik Bessis presents a model architecture and its implementation which allows clients within a data Grid environment to be kept automatically informed of the latest and relevant changes about data entered/committed in single or multiple autonomous distributed datasets. The chapter argues that an OGSA-DAI push architecture will enlarge the decision-making space, which in turn will increase the opportunities for a more informed decision to be encountered.

Chapter XIII, *Using Grid Technology for Maximizing Collaborative Emergency Response Decision Making*, by Eleana Asimakopoulou, Chimay J. Anumba, and Dino Bouchlaghem, discusses the major limitations with the ICT currently in use when a natural disaster occurs. The chapter then describes a Grid-aware emergency response model as the practice to maximize potential and make the best of functionality offered by current ICT to support intelligence in emergency response decision-making.

In **Chapter XIV**, *Unified Data Access/Query over Integrated Data-Views for Decision Making in Geographic Information Systems*, Ahmet Sayar, Geoffrey C. Fox, and Marlon E. Pierce focus on decision-making using Geographical Information Services (GIS), which increasingly rely on analyses of distributed heterogeneous spatial data in map-based formats. The chapter presents distributed service architecture for managing the production of knowledge from distributed collections of observations and simulation data through integrated data-views.

I hope you find this book an inspirational read.

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