Foreword

I am delighted to write the foreword to this book: *Risk Assessment and Management in Pervasive Computing: Operational, Legal, Ethical, and Financial Perspectives.*

This is a very timely book as pervasive computing will increasingly impact almost all aspects of our lives. Intelligence and connectivity are already being incorporated into devices, appliances, homes, work-places, and most of the products we use and environments we live in. This will enable remote connectivity and control over everyday products such as home appliances, as well as more efficient and environmentally-sensitive use of resources.

The book examines the implications of pervasive computing from operational, legal, and ethical perspectives so that current and future e-business managers can make informed decisions about where, when, and how to use this technology. It contains the views and opinions of leading experts and practitioners from across a range of relevant disciplines directly and indirectly connected to pervasive computing.

The scope and content of this book provide industry and government with the essential ingredients for planning, implementing, and managing pervasive computing, as well for as ensuring the anticipated benefits are realised. The book begins with a conceptual framework covering the foundations of pervasive computing and smart environments from theoretical perspectives. It introduces ambient and grid computing which, with pervasive computing, will provide the infrastructure for convenient services at any time and any place.

The infrastructure for pervasive computing, including network technologies, routing, and security is presented. Technology covered includes a wide range of mobile and ubiquitous systems and devices, security solutions, and routing methods.

A framework for the computational mobile grid is proposed in which the mobile computational devices themselves will form a grid to provide general and specific computational services to the applications and the users of the mobile devices.

Mobile-learning is the first application discussed. This covers the implications and challenges for educators, practitioners, and researchers, as well as the possible applications for pervasive m-learning and detailed examples.

A chapter on ubiquitous computing for microbial forensics and bioterrorism discusses the importance and abilities of micro-organisms as agents for use in biosensors. It introduces the discipline of microbial forensics and issues related to biological microelectromechanical systems and surveillance systems. It also identifies the potential of ubiquitous computing technology in developing integrated small devices, which could detect bioterrorism agents, and detect microbial pollution in foodstuffs and other commodities.

A case study of learning management systems as pervasive technologies in an Australian university is presented. This illustrates the ways in which a range of social and institutional influences, operating internally and externally to an organization, can affect managerial decision-making.

The resulting changes in business models is discussed, including emerging business strategies, opportunities, community thinking, emerging markets, and the impacts of the evolution in Web technologies.

A set of critical success factors is offered for implementing e-business technologies in small and medium size enterprises. Suggestions are offered about how the legal and regulatory framework might focus on the improvement of internal monitoring of risks and vulnerabilities; greater information sharing about risks and responses.

The chapter on biometrical identification discusses the benefits, risks, and approaches. It also explores the role legislators can play in smooth adoption of biometrical technologies with special reference to the Finnish context. Pervasive computing in the aviation industry, as it contributes to passenger profiling, is explored. The identification of vulnerabilities assists in developing advice on requirements for legislative change related to aviation. It is important to have an ethical perspective when considering the design and implementation of complex, integrated, and multiple systems. Ethical issues discussed include codes of professional conduct and standards. Knowledge

The book addresses the implications of knowledge sharing, the importance of knowledge acquired in its historical context, social aspects, and trust in an era of pervasive computing. It considers the issues of the changing attitudes of people, interpersonal aspect of knowledge sharing, rewarding knowledge workers, knowledge management, and values in pervasive computing environment.

It will be essential to address the need for gaining skills for full participation in the digital economy including for women. The book discusses different approaches to acquiring meta competencies including evidence-based learning models, gender-sensitive approaches to business learning, life long learning, and collaborative uses of technology that underpin content and e-business learning designs.

The book discusses culture, nature of culture, the dimensions of culture, and its interdependence with technology. It introduces the concept of culture-centric design; basic principles and requirements of cultural approach and discusses technology in the framework of culture. The discussion tries to depict the importance of cultural understanding of societies as well cultural factors necessary in order to develop culture-specific devices for information exchange. The book concludes with a discussion of computer games and video games in the context of child development, and explores negative and positive impacts on learning, behaviour, and growth.

Pervasive computing is a new phase of technology evolution which will enable telecare, telehealth, and smart buildings. We already have some environments such as aircraft and sophisticated vehicles where computer technology controls almost all functions. In my field, assistive technology and smart homes for the frail elderly, chronic illness sufferers, and people with disabilities, pervasive computing will allow people to extend their productive and active lives as well as to remain independent, safe, and cared for in their own homes. Intelligent pantries and refrigerators will know their contents and be able to send orders for restocking. Pervasive computing, geospatial positioning, and collision-avoidance will allow the frail elderly to drive their cars safely despite deteriorating vision.

Smart homes and workplace buildings equipped with intelligent controls will know our patterns of resource use. They will know when to prepare for peak loads and can while reducing energy use at other times. For example, our hot water, lighting, cooling and heating systems will know and prepare for times of greatest demand, and can reduce to lower levels at other times.

Older people will be better able to choose to remain in their own homes and delay or avoid moving to institutional care. Their homes will monitor movement. Visitors will know regular patterns of activity and provide reminders such as adhering to medication regimes in providing access to care.

We can lock all doors to our cars, enable the theft alarm, and switch off the lights with one press of a remote button. There are cars now that do not require a key; the car will sense the card held in the driver's wallet, purse, or pocket. With pervasive computing we can expect to control our homes and buildings in a similar way. Blinds and shutters will adjust automatically to the movement of the sun, allowing heating in winter and shade for cooling in summer. Buildings will know the people in each room, thus increasing or decreasing heating, cooling and lighting alongside the opening of windows and the controling of window shades; all appropriate to the needs and seasonal conditions.

Smart homes enabled by pervasive computing will know a great deal about their occupants and patterns of behaviour. When we bring our shopping home from the supermarket, our pantry and refrigerator will register the items that are placed inside them. These appliances may know how long items have been there and might suggest innovative recipes to use based on their knowledge of our home food-stocks coupled with our preferences. When using medications we could be reminded of the time to take the next dose. The intelligent medication cabinet would know that a pill bottle had not been moved since the last time for a dose. If we picked up the wrong medication container an alarm might sound to alert us of the error. If we forget where we left our bottle of pills the house might be able to locate it.

The house would monitor the arrival and departure of people, ensuring that frail elderly are both safe and receiving the appropriate care with other services. When away from our homes we could continue to be connected to its intelligent controls through our mobile phones or other portable devices. There is a plethora of devices under development that will monitor activities. If for example an older person had a fall, the house sensors could alert carers. The technology would monitor events such as gait and stumbles and could similarly provide information about the risk of a fall. Sensors could detect not only falls, but also if patterns of behaviour were out-side of normal patterns, like going to the bathroom, or of using devices such as refrigerators and cook-tops. This might indicate whether a frail elderly person was using, or not using, those devices and consequently whether they were eating adequately.

The house could monitor our level of activity and prompt us for an exercise or stretching regime. Reminders of activities of daily living are essential for people with dementia and taxing for carers will be assisted by the technology. Computing technology will never tire of providing reminders. In pervasive computing in home and community settings for people with disabilities, there will need to be sensitivity in its application. Protocols and standards need to ensure that issues of privacy and safety are balanced and that the technology is an aid and not a substitute for human contact. The technology will facilitate social networking and provide access to communities of interest and online interactions.

The application of intelligent building environmental controls is already moving from the laboratory into industry. For example, Queensland Health in Australia has already installed intelligent controls into several of its hospitals. These buildings can be controlled remotely and have built-in intelligence to monitor and control resource usage. The hospital can know what time activities, such as operating procedures, start and ensure that hot water and environmental controls are appropriately prepared. At quiet times, the systems can power down, for example by using only minimum lighting as required for safety. These systems have already delivered massive energy savings.

I have the roles of Secretary of Aged Care Informatics Australia (a Special Interest Group of the Health Informatics Society of Australia, the Foundation Director of CAAIR [Collaboration for Ageing & Aged-care Informatics Research], Convener of the Queensland Smart Home Initiative, and a specialist researcher into assistive technology and smart homes for independent living and home care). I have firsthand experience with care providers, industry, and government who are seeking professional guidance on the implementation of pervasive computing. I believe that these people will benefit from reading this book, for its extensive analysis of requirements and its report on the state-of-the-art.

The book merges the academic rigour and the practical knowledge of the authors to assist organizations in gaining benefits from both perspectives. It offers the learnings derived from the implementations, and the extensive academic research and consulting assignments.

This book cuts through much of the hype and panache associated with marketing of pervasive computing technologies. It provides a thorough examination of business contexts and provides a framework for requirements analysis, along with examples to assist with analysis and specification. I am pleased to be able to recommend this book to readers, be they those looking for substantive material on strategy, or those looking to understand an important aspect of pervasive computing. I wish you the very best success with the implementation and realisation of the many benefits of this technology.

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