Preface

INTRODUCTION

This book serves as a critical piece of documentary evidence for automatic identification and location-based services from its inception until today. Automatic identification (auto-ID) is the act of identifying a living or nonliving thing without direct human intervention. Location-based services (LBS) are the ability for an information system to denote the position of a user, based on a device they are carrying, or their position in a given context. Automatic identification technologies and location-based services are both complementary and supplementary technologies. Being able to identify and locate someone on the same device is powerful for different types of requests. But even more powerful is the ability to imply someone's identity by their location. The latter has critical implications for the way law enforcement is conducted, emergency services are deployed, and loved ones are notified of your given circumstances. Indeed this book is about the social implications of technology, and how new emerging innovations are completely changing the rules of engagement.

The great bulk of the research for this book was conducted between 1998 when the first person (a British researcher, Professor Kevin Warwick) was officially chip implanted for the Cyborg 1.0 project, and 2003 with the Jacobs family who were the first family to officially receive the commercial VeriChip implant for an emergency service application. Much has happened since 2003 and this book also attempts to capture the major events since that time, that together, have acted to change the way consumers live, employees work, and companies and governments do business. It therefore follows, that the book could be utilized as a historical source, as a reader on the broad topic of automatic identification and location-based services innovation, but it could also be credited with a futurist perspective, predictive in nature, and multidisciplinary in source and content.

The book was largely written during a time of global geo-political and economic turbulence when the world witnessed a rise in a new kind of terrorism and also large-scale emergencies related to natural disasters. In this time of evident technological advancement, many have questioned, why in such a period of rapid scientific progress are we so incapable of preventing, mitigating, and recovering from catastrophic events. The Hurricane Katrina disaster of 2005 stands as a signpost more than any other event in modern day United States, in the land of the free, where communications and technology

abound, millions of people were left without food and water for days after the hurricane ravaged the Atlantic coastline. Government agencies, whether in the business of strategic intelligence or emergency management or securitization, are seeking new ways to protect their nation's borders. In doing so, they have turned to technology for the answers and realized (even if it has not yet been communicated) that technology is only a partial solution if correctly deployed, and that it is humans working together that ultimately provide the real effective solutions in the long term.

The audience for this book is wide-reaching. In its original form, as a dissertation submitted within the field of Information Technology by Katina Michael, it attempted to demystify the innovation of auto-ID and location-based services, focusing on the firm as the central actor in the process of innovation. Beyond the dissertation, as opportunities arose for Katina to collaborate with husband M.G. Michael, who had a background in the humanities, the focus shifted from a purely technical work, to one that incorporated the socio-ethical component, legal, philosophical, cultural, and religious issues. Here there was an emphasis in informing the general public of the current state of affairs, in providing material that was written in an accessible language, in invigorating debate, and pondering the automatic identification trajectory. Questions of the place of auto-ID and LBS within society, then led to even grander questions related to the role of new technologies within public administration, which then led to the big picture question of the social impact of technology upon citizens and business. This book is about considering where we are headed, why we are headed that way, how fast we will get there, and trying to make sense of what it all could mean. It is in a sense, a one big "what if" scenario which is meant to stir the thinking of the general public, as well as a plea to practitioners to consider the social implications of their research, the development, and its application.

For now, the trajectory we are on seems to be one of aiming to control the masses using technologies we ourselves have created and instituted. The question is whether this is the kind of world we want to live in, filled with smart sensors, smart objects, and real-time analytics. On face value, most perceive competitive advantages in terms of cost savings in business or at least emphasize the convenience factor for the individual or family. Wouldn't it be a great life if I could walk up to my house door and not have to fiddle with keys to gain entry? Or wouldn't it be great if my house knew what temperature I liked the air-conditioning set to, or could just sense my level of discomfort and act appropriately? Or better still, wouldn't it be great if I could just communicate with others just by thinking about them, and never have to lift a handset? All these kinds of potential lifestyle options seem great but what of the continual decline of the individual to live, act, and to make decisions within a discernible physical space? Have we seriously considered the extensive implications that this "new order" of existence might have on our general well being? And these are real consequences (not simply imagined ones) both on the physical and mental levels. Are we knowingly fooling ourselves that such things are the "holy grail" to contentment, to happiness, to the idealized, if not *ideal* life? The oft quoted Latin phrase is certainly not out of place here: *Caveat emptor* (Let the buyer beware).

The consequences of these initiatives will take some time to be felt but already we can predict with some confidence what some of the shortfalls will be. Postmodernist theory might have us believe that the profession of history is in crisis and that its methods are outmoded, but as Richard Evans and others have effectively argued, the discipline can teach us many lessons and provide us with "genuine insights". In the context of technology itself, thinkers in the sociological tradition of Lewis Mumford and Jacques Ellul continue to challenge us to stop for a moment and to critically evaluate the unchecked consequences upon our civilization of an "artificial environment". Whatever happens, whatever road is taken or "not taken", the irreversible consequences of our "technicized" society will be felt by future

generations. This is perhaps a traditional problem that has less to do with technology and more to do with people. Are we continually building new defenses with a "catch me if you can" way of thinking, and "here, try penetrating my latest solutions", or are we genuine about peaceful resolutions which look at the root causes of national security concerns? The question is how much room are we truly leaving ourselves for future modification and change, if we go ahead and implement what we are proposing today? For the record, no one is debunking technology; there are no *neo-Luddites* here. The basic point is to remain the masters over that which we create, and to not allow for the *machine* to dictate the terms and boundaries of our existence.

ORGANIZATION OF THE BOOK

This book is divided into three main sections. Section I provides a background and context for the study. Section II introduces the reader to the technology and representative applications while examining distinct innovation processes. Secion III explores the social implications of auto-ID and LBS technology.

Section I: Background and Context

Chapter I defines automatic identification and location-based services, describes why these technologies are significant and how they are closely allied, and describes the gap this book will fill in the literature. The introduction will also provide an overview of the conceptual framework used for the whole study, the general methodological approach and the multiple sources of evidence used to gather data.

Chapter II presents an overview of relevant literature in the field of innovation studies. The chapter presents theories and frameworks that have been tried and tested against a backdrop of previous qualitative innovation studies. The systems of innovation (SI) framework which has emerged from the contemporary evolutionary economic theory is used in this study to capture both time and context. It is a holistic framework which does not underestimate the study of an innovation from a variety of perspectives including: organizational, institutional, regulatory, technical, social, political, and so forth. This chapter introduces the reader to important innovation concepts including, technological trajectory, selection environment, path dependency, technological guideposts and much more. These basic definitions are used inherently to study the technologies throughout the book, providing a setting for interpretation.

Chapter III takes the reader as far back as antiquity, so they can better appreciate the evolution of the technology and the potential and realized impacts of auto-ID and LBS on today's society. Being able to identify someone or something or to locate someone, something or a physical structure is *not* a new phenomenon. People have always had a need to make correlations between the people they know and the people they do not, between those things that belong to them and those things that do not. In fact, the idea of belonging to a group in a variety of contexts was prevalent in ancient times. However, as places became more urbanized and new inventions changed the way we worked (e.g. the Industrial Revolution) and the way we traveled, moved goods, and communicated (e.g. the invention of the steam train and electricity), automated means of identification and location determination became increasingly important. Understanding the beginnings, how the technologies (even in their manual forms) have been applied in the past, helps to shed light on the present and future possibilities. What has in truth changed since automated methods of identification were introduced? And what of location-based services in their

infancy at present? Have these technologies had revolutionary consequences? What can we learn from history? And why is auto-ID or LBS any different to other information technologies?

Interview 3.1 is conducted with a Holocaust survivor, Mrs. Judy Nachum, who was forced to wear the Yellow Star pointing to the potential for more sophisticated means of auto-ID and LBS to be used to segregate a populace today in the framework of "social sorting". This interview explores some of the issues raised in the preceding chapter, however in more detail. The interview brings to life the potential for technology to be misused by persons in position of power. The interview presents examples of how simple manual identification techniques were first used to identify the Jewish populations during World War II, to gather these people into concentration camps, and then used in the calculated process of dehumanization. The interview is explicit in stating how the Nazis were meticulous record keepers, and how identification numbers granted them the ability to link numerous pieces of information together which was initially paper-based and "off-line". The interview demonstrates that there are clear limits to how present day governments should use computers to record citizen information. It also suggests that while another type of *holocaust* of similar proportions to the persecution of the Jewish people is improbable, that the power of the digital medium to control and to sort, if ever unleashed, would be even more punishing and exacting in pinpointing its desired minority.

Chapter IV is about placing the research study in a background setting. The chapter focuses on issues pertaining to national security for the purposes of border control and counter-terrorism. The dilemma is presented as the trade-off between the collective security of a nation and the right to individual privacy. In this chapter the usefulness of providing strict controls for all citizens via technologies which inherently identify or locate or surveil is questioned, especially when such measures can also be adopted by transnational criminal groups. The speed of deploying new technologies for public administration is also questioned especially given the sweeping legislative changes that were enacted post the September 11, 2001 terrorist attacks.

Section II: Auto-ID and LBS Innovation

Chapter V is dedicated to the rise of bar code innovations particularly in the retail sector. Objects have been identified with labels since herbs and spices were placed in silos for storage. In the 1970s the universal produce code (UPC) revolutionized the checkout at supermarkets and ever since almost every consumable packaged item has been bar coded. The chapter traverses from the first bar code developments in the 20th Century, to modern day two-dimensional bar code advances with biometrics onboard. The limitations of bar code are outlined as are the fundamental issues surrounding its widespread usage. Technically bar code has worked on the principles of symbology, black and white contiguous lines that digitally represent 1s and 0s. In favor of the bar code as an identification technique is that it is relatively cheap, is well established standards-wise, and enjoys worldwide end-user acceptance. The case studies presented in this chapter include the retail and educational sectors indicating how pervasive the technology actually is. Bar code remains the most widespread auto-ID technique in use today, despite its much touted rival, RFID, receiving a great deal of attention and publicity in recent times.

Chapter VI explores the magnetic-stripe card which has not only revolutionized the face of banking but also many other industries, including ticketing and transportation. They were responsible for the move away from cash towards a *cashless* society, a future state where money would become altogether obsolete. Despite magnetic-stripe cards having significant drawbacks, namely that they are subject to counterfeiting, skimming and other criminal practices, the technology is still very popular in a large

number of markets. The technology has also been responsible for the growing physical infrastructure that has supported its inception. ATM machines, global interbank agreements, credit card companies, and standard devices have all lead to the success of magnetic-stripe cards. Today instead of wallets bulging with lose change and bank notes, they are bulging with plastic cards. While many would consider magnetic-stripe card a dying technology, some research has been conducted in the United States in an attempt to make the technique more secure. Admittedly, making magnetic-stripe card "more secure" is an expensive business. This is considered, however, in light of the requirement to update a whole lot of existing infrastructure to meet the technical demands of more robust technologies like smart cards. Similarly to bar codes, magnetic-stripes are here for the long-haul despite better, more secure, technologies being available today.

Chapter VII explores the smart card. In the mid-1980s much was promised about smart card and its pending proliferation but the forecasts missed their mark. Was it an expensive manufacturing process that stifled the card's diffusion, or was it that cardholders were simply not ready for the chip-on-a-card technology? This chapter tells the smart card story from its development in the mid-1970s and traces its use in the medical and telecommunications sectors. Smart cards have had their greatest impact in Europe, although the adoption of the mobile phone has meant that smart cards have become widespread through the use of subscriber identity modules (SIM) for communications. Smart cards have many technical advantages including that they are multiapplication/multifunction capable and have onboard cryptographic abilities and sizeable storage space. Despite the fact that smart card enjoyed a large institutional network that helped the technology receive world-wide coverage and publicity, the network failed to project the smart card into fundamental markets like credit card companies. This is not to say that these companies have abandoned the smart card, on the contrary, many have projected that it will become the preferred technology before too long (e.g. banking industry).

Chapter VIII is about biometric technologies. Biometrics was the first auto-ID technology that displaced the use of cards or ID numbers altogether. It changed the face of identification- a human's physical characteristic, trait or behavior could now identify him/her. In the 1600s, a fingerprint was accepted in place of a signature on title deeds, and criminals had long been fingerprinted right back to the early days of Scotland Yard. But it was not until the 1970s that criminal fingerprints were placed on automatic systems for cross-matching purposes. Biometric technology of the 1980s was both clunky and expensive. Today, biometric technology is easy to install and multi-modal biometrics (the use of more than one physical characteristic) is standard practice in large-scale implementations. The role of government in using biometrics for citizen applications is also discussed in this chapter, as are the use of biometrics for entertainment applications such as fun parks. The use of biometrics, such as DNA, raises a great number of ethical issues which are explored in detail. Contradictions in laws and regulations are studied, as the question of the rightful ownership of a biometric is considered.

Chapter IX is about RFID tag and transponder innovations. Radio-frequency is a capability that was prevalent since before World War II, however as an identification technology in the modern context, RFID has only been trialed and used in niche applications since the late 1990s. Today, RFID has made major inroads into the retail bar code market, initially considered as a replacement technology by its proponents, and then recognized as a complementary technology to bar code. RFID is being heralded as a future supply chain enabler. The push is toward having the ability to identify and locate products at the item level as opposed to the larger pallet level. Emerging standards such as the Electronic Product Code (EPC) are promising an "Internet of Things", allowing ordinary objects to come "alive" using wireless triggers. Animal centric and human-centric RFID tag and transponder applications are also

presented in this chapter. In Europe and many other parts of the world, governments have introduced new regulations and directives in an attempt to contain and eradicate virus outbreaks in livestock. Local councils have also imposed mandatory chip implanting of cats and dogs to limit the number of stray pets and identify ownership. Innovative auto-ID and LBS applications are being used to increase milk production in cow herds, track species that are close to extinction, and for breeding purposes. Commercial applications now exist to tag and track people. In some parts of the world, their entry have meant the establishment of anti-chipping acts, such as in cases throughout the United States. Over time auto-ID technologies have become more invasive, and in some instances technologies are not only worn externally, but implanted into the body. The first human-centric implant experiment was conducted by Professor Kevin Warwick in 1998. RFID implants for humans pose a great number of socio-ethical issues, cultural, religious, and philosophical.

Chapter X analyses the patterns and trends that emerge in Section II in a bid to understand the auto-ID innovation process. Early in Chapter X the complexity of auto-ID is shown by examining the interactions between stakeholders. The auto-ID innovation process is also described and linked to a generic auto-ID product lifecycle. The time between auto-ID inventions also depicts how individual auto-ID technologies have not been invented to make existing techniques obsolete, but have acted as complementary and supplementary technologies. In addition, the frequency of the introduction of major new auto-ID techniques is about a ten year window meaning that the industry is only going to expand over time, probably with developments in the area of nanotechnology next. The auto-ID product lifecycle is also examined and detailed. This lifecycle shows the typical issues that the technologies come up against after their inception and how future technologies could be introduced with a shorter lead time and with greater emphasis on the technology's implications, beyond discussion on plain system design needs. Prevalent trends in the information and communication technology (ICT) sector have shown migration, integration and convergence patterns. Within the auto-ID industry, these patterns are easily identifiable, especially as emerging techniques lend themselves more to not only the function of identification but also the function of location. RFID for instance, can act to identify a thing, in addition to being able to locate it precisely if the corresponding wireless infrastructure is available.

Chapter XI is dedicated to defining geographic information systems (GIS) in the context of location-based services. A GIS is a system of storing information linked to geographic details such as objects (pinpoint locations using an X and Y coordinate), lines (such as roads, and other topographic and human-made features that have a bearing and distance value), and regions (such as administrative, political or council boundaries that can be measured in surface area). The concept of geocoding is integral to a GIS. A telecommunications operator for example could store millions of records of information, including asset data such as their infrastructure's physical lifetime, photos of their telephone exchanges, as well as customer billing data per individual householder. Geocoding allows organizations to conduct exact matching or fuzzy matching on large datasets and to visualize them to differing geographic levels of detail in a GIS. As a presentation tool, a GIS can be used to conduct districting or target marketing via thematic mapping. Today, such LBS applications as *Google Earth* and *Google Street View* have revolutionized the way people conduct navigation activities and also reconnaissance for personal or competitive business reasons. Such new technologies are clashing with cultural ideals and testing the limits of definitions of personal versus public space in the field of privacy law.

Interview 11.1 consists of an interview with Professor Alan Brimicombe of the Centre for Geo-Information Studies at the University of East London. Brimicombe describes the strengths of today's geographic information systems (GISs), as they are used in tandem with other technologies such as

location-based services and data warehouses. He is well known for work in the area of location-based services and geo-information engineering. For Brimicombe the future is not only in the collection of data via satellite imagery or GPS from the tops of cars but in Web crawlers that go out and check spatial databases for information that is already out there waiting to be harvested and used.

Section III: The Social Implications of Auto-ID and LBS Technology

Chapter XII explores the trajectory of an innovation related to which path or course it may follow over time. Having already studied in earlier chapters, where auto-ID and LBS came from, and understanding where it is now, one should be able to gain insight about its future direction and use value. This chapter illuminates the short-term trajectory of auto-ID and LBS without the hysteria and sensationalism that so often plagues predictive studies in the field. It is based on sober analysis of the current research in universities, patents on the United States database, and worldwide commercial ventures. This chapter has a predictive element running right through it and presents a number of mini embedded cases. It begins with wearable technologies (e.g. industrial application), e-wallets (e.g. medical application) and smart clothes (e.g. military application). The merging of a number of disciplines ranging from engineering, computing, and medical is prevalent in this chapter.

Interview 12.1 consists of an interview with Professor Christofer Toumazou, a former telecommunications engineer and now the Chair of the Biomedical Institute at Imperial College, London, who speaks with compelling insight and a globally recognized authority on the current state of development of biomedical devices. Through his extensive record of research he has invented innovative electronic devices ranging from dual mode cellular phones to ultra-low power devices for both medical diagnosis and therapy.

Chapter XIII discusses the socio-ethical implications and the dilemmas surrounding an environment of uberveillance, an emerging age of omnipresent embedded surveillance which is increasingly introducing us to lots of grey areas. These have to do with the fundamental rights of an individual, the powers of commercial enterprises and government agencies, about underlying philosophies, ideologies, religious beliefs, cultures, and inherent freedoms. It has to do with the legal framework, the law, and a consensus approach to juridical action. Technology must be understood within a social context, and not solely as a dumb artifact with no trajectory. Beyond guidelines, standards for product development are needed, as are appropriate regulations supported by governments. Without these vital safeguards society runs the actual risk of being overridden and destroyed by the very things that it has set out to create to make the world "a better and safer place". The debate has little to do with "stopping science" and "progress" and more to do with attempting to curb the potential problems that may arise as a consequence of a "harmful" technique's widespread use. The question is not whether one can prejudge ethics, but more about circumspectly considering the long-term impacts and implications of that which we plan to create and to unleash into the world.

Interview 13.1 provides the perspective of Professor Ian Angell of the Department of Management, Information Systems and Innovation Group at the London School of Economics. Professor Angell is one of the world's most recognized forecasters of the socio-political and business consequences of information and communication technologies. He gives his thought-provoking views on the current state of play between the quest for national security *contra* terrorism and the rights to individual privacy. He emphasizes not only the darker implications of auto-ID but that the whole motivation for mass market citizen auto-ID technologies has essentially to do with economics.

Chapter XIV points to the rise of the *Electrophorus*. It is predicted that the ultimate trajectory of auto-ID and LBS in humans is encapsulated in the emerging concept of "Electrophorus". Far from the notion of "cyborg" meaning part human and part machine, the notion of Electrophorus refers to a bearer of an embedded electric technology. In short, we do hold that embedded technologies for predisposition and healing of illness or for prosthesis is indeed acceptable, but that humans should not too quickly rush into these technologies for "bionic" enhancement or auto-amplification without first carefully examining the potential pitfalls. Questions of applied ethics are raised as the potential to use auto-ID and other advanced nanotechnologies to unite flesh and machine or at least to make the experience between the virtual and physical space indistinguishable. What type of person is the *Electrophorus*, if indeed he/she still belongs to that family called Homo sapiens. At what point is a person who adopts embedded technologies for enhancement, something other than a human being?

Interview 14.1 for the most part investigates the usability context of control with respect to human-centric microchip implants. Professor Kevin Warwick from the University of Reading is generally the first acknowledged "implantee"/"cyborg" who amongst other research endeavors (e.g. robotics) studies the direct interfaces between computer systems and the human nervous system. The interview captures the essence of the proposed Electrophorus concept and in general raises concerns about the potential of the Electrophorus in society. Kevin is best known for his pioneering experiments involving a neuro-surgical implantation into the median nerves of his left arm to link his nervous system directly to a computer to assess the latest technology for use with the disabled. He was successful with the first extra-sensory (ultrasonic) input for a human and with the first purely electronic telegraphic communication experiment between the nervous systems of two humans.

Interview 14.2 predominantly investigates the usability context of convenience with respect to human-centric microchip implants in a straightforward and revealing interview with arguably the world's most recognizable "do-it-yourselfer" RFID implantee, Amal Graafstra of the United States and author of *RFID Toys*. He is the owner of several technology and mobile communications companies and is presently the Director of Information Technology for *OutBack Power Systems*. Amal loves thinking up interesting ways to combine and apply various technologies in his daily life.

Interview 14.3 investigates the usability context of care with respect to auto-ID and location-based services. This is done with in an interview of Mr. Kenneth Lea, a carer of an Alzheimer's sufferer. Mr. Lea considers the possibilities for identifying, tracking and tracing people who have a tendency to wander using location-based services and provides insights from his first hand experience as a carer. Mr. Lea speaks honestly and frankly about the major safety issue related to people suffering with dementia and the possible technological solutions that might aid carers and sufferers. Kenneth feels that the current information and communication technology (ICT) solutions are inadequate to support members of society who require 24x7 care.

Chapter XV describes *uberveillance* and argues that it is a more suitable concept in the context of the auto-ID trajectory than dataveillance given the pervasiveness of the emerging embedded surveillance technologies. Uberveillance is defined as an above and beyond, an exaggerated, an omnipresent 24/7 embedded in the body surveillance. Uberveillance is more than just data-surveillance, it encompasses an ethereal presence, is not measured just by bits and bytes, although almost certainly begins at that basic level of detail. Computers, however, are not omniscient, although they might be "always on" and accessible at "any time." And that is one of the problems which we explore. Uberveillance is more than just ubiquity. It has a motive, a purpose, an agenda; is governed by someone/ something; and does not just exist due to evolutionary forces of nature. It is not simply about being able to determine whether

someone owes the tax office money by using data-matching techniques, to mine their personal data. Uberveillance has the potential to control the masses. In its ultimate form, it is *Big Brother* on the inside looking out from the microchipped human working in concert with existing wholesale surveillance and auto-ID infrastructure.. In this mode, there can be no place to hide, everything is recorded and society is impartially dissected between the haves and have-nots. Also pervasive computing within the context of eHealth raises some complex questions about the value and use of uberveillance within a given application, but it remains that any type of intrusive surveillance within the body must be considered with caution regardless.

Chapter XVI is the conclusion to *Innovative Auto-ID and LBS applications: from Bar Codes to Chip Implants* which was chiefly about exposing the reader to a synthesized account of literature on the topic and raising awareness of the many possibilities in the field. Some readers would have been surprised to learn that RFID implants and advanced location-based service (A-LBS) applications are now realities, and indeed commercial realities with a number of companies already listed on stock exchanges across the world. These technologies - and many others about to make their mark, such as nanotechnology - are beginning to permeate global cultures, initiating changes that will become irreversible before too long. It is one thing to use technology to help grant someone sight, hearing, speech, and mobility, a different thing to willingly invite technology into the body as a fashion statement, or to extend basic human function beyond natural measure, or in the hope of becoming an immortal. *Re-designing* the human species before we know much more could inevitably lead us down a path of extinction electronic viruses will have the potential to cause virtual pandemics which no security patch will be able to fix. One need only consider what happens to animals when the ecosystem within which they reside is disrupted ... "mutations", "recombination" and "hybrids" will not only describe different types of inventions, but different forms of "somewhat" human existence. While these technologies are often purported to be enabling technologies- in the sense of progress, improvement and wonder- in actual fact they will herald a loss of control of our own autonomy and be subject to abuse. Beyond what technology promises or hopes to achieve, the basic premise remains that the end-user should be in control of their world and not a third party or system extension. If we think that a future vision of people and machines being fused is far-fetched, we need only look at the evidence provided in this book and in others to understand that we are at the brink of another revolution, this time a *hyper*-revolution. How we respond, both individually and collectively to these super changes which we are only now getting a good glimpse, will go a long to determining the eschatology of our planet.

CONCLUSION

When the research project was first established while the primary author was working at Nortel Networks in 1996, the possibility of microchip implants in humans seemed remote if not impossible. Even though Nortel were original part-sponsors of the Cyborg 1.0 experiment, the vast majority of employees in the company still had little if any idea of the potential possibilities to implant humans. When discussing the research project with peers (mostly engineers), the primary author was often lightheartedly mocked for taking on such a "far-fetched" and futuristic type project. "C'mon Katina, microchips in humans, that's the stuff of the *Six Million Dollar Man*." Of course Nortel supported the Warwick initiative as members of British Telecom also touted it groundbreaking for its sheer potential to change how people could communicate with one another in deference to the use of physical telephone handsets. Many academics

today, deemed experts in the field of mobile commerce, are still too commonly unaware or misinformed to the current microchipping of humans. This not only highlights the importance of predictive studies in the high-tech field and also the rapid change of pace technology is instilling in our everyday lives, but that investigation based on cutting edge research is paramount. Most of this cutting edge research is not found in refereed journal papers or in large volumes dedicated to special topics- these simply take too long to get through the publication process. We find the future is here in sci-fi, popular media, through newspaper articles, the World Wide Web (WWW), and small snippets of university and commercial media releases. The use of popular media is not without caution however- all *claims* need to be substantiated and exaggerations tempered with the appropriate evidence. It is from within such a context that the reader of this book should expect to learn about auto-ID innovation and LBS, through a mixture of academic and non-academic sources, used together to shed light on a topic that has the propensity to change just about everything.