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# Humancentric Applications of Precise Location Based Services

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# Humancentric Applications of Precise Location Based Services


## Abstract

Mobile technologies, which allow users to move around while maintaining the ability to access a network and its services, now claim a significant degree of attention in both industry and academia. In this vision, one particular attribute gains critical importance: location. The ability to pinpoint a mobile user's location creates a new class of applications and services. These location based services (LBS) exploit the known location of a user to provide services dependent on their geographic context and personalised needs. However, as newer positioning technologies are introduced into the market with a greater level of location accuracy, and existing technologies are integrated to overcome limitations, issues pertaining to the use and potential misuse of location information rise to the fore. In addition to this, perhaps because LBS are so new, there has been limited investigation into exactly what effects the widespread use of these technologies may have. This thesis aims to rectify a gap in current knowledge by presenting a plausible scenario that describes how humancentric applications of LBS could change the world of tomorrow, based on the current state of development. It also makes several original contributions in an analysis of legal, ethical, social and technological issues that arise from the scenario.



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# Humancentric Applications

# of

# Precise Location Based Services

**Laura Perusco**

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# Chapter 1: Introduction

*'The future is always beginning now.'*

Mark Strand[1]

## 1.1 Introduction

We live in an era of mobility. Mobile technologies, which allow users to move around while maintaining the ability to access a network and its services, now claim a significant degree of attention in both industry and academia.[2] In this vision, one particular attribute gains critical importance: location. The ability to pinpoint a mobile user's location creates a new class of applications and services.[3] These location based services (LBS) exploit the known location of a user to provide services dependent on their geographic context[4] and personalised needs. This area has potentially wide-ranging implications for society. In fact, LBS have been described as being "without a doubt one of the most exciting developments to emerge from the mobile telecommunications sector."[5] However, as newer positioning technologies are introduced into the market with a greater level of location accuracy, and existing technologies are integrated to overcome limitations, issues pertaining to the use and potential misuse of location information rise to the fore. In addition to this, perhaps because LBS are so new,[6] there has been limited investigation into exactly what effects the widespread use of these technologies may have. This thesis aims to rectify a gap in current knowledge by presenting a plausible scenario that describes how humancentric applications of LBS could change the world of tomorrow, based on the current state of development. It also makes several original contributions in an analysis of legal, ethical, social and technological issues that arise from the scenario.

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[1] ThinkExist.com Quotations, *Future Quotes* <http://en.thinkexist.com/quotations/future/3.html> [Accessed October 5, 2005].
[2] George M. Giaglis, Panos Kourouthanassis and Argirios Tsamakos, 'Towards a Classification Framework for Mobile Location Services' in Brian E. Mennecke and Troy Strader (eds), *Mobile Commerce: Technology, Theory and Applications* (2003) 67, 68.
[3] Ibid.
[4] Kirk Mitchell and Mark Whitmore, 'Location Based Services: Locating the Money' in Brian E. Mennecke and Troy Strader (eds), *Mobile Commerce: Technology, Theory and Applications* (2003) 51, 53.
[5] Ibid, 65.
[6] Giaglis, Kourouthanassis and Tsamakos, above n 2, 68.

## 1.2 Background

### *1.2.1 Location Based Services*

The term LBS covers a variety of applications, but all have at least one thing in common: they all rely on knowledge of a user's location to provide tailored services or information by means of a wireless device (such as a mobile phone or PDA). Personalisation may be based on other things in addition to location, like user profiles and the surrounding context.[7] However, the way in which this information is actually determined varies, as does the required level of accuracy. This thesis is concerned with precise LBS, defined here as those applications that require a high degree of accuracy according to Giaglis, Kourouthanassis and Tsamakos's existing taxonomy.[8] There are currently a number of enabling technologies that can support precise LBS initiatives. Table 1 gives a brief description and highlights the precision of six enabling technologies and approaches to location determination.

**Table 1: Enabling technologies for precise LBS**

| Technology | Description | Precision |
|---|---|---|
| Global Positioning System (GPS) | A worldwide satellite-based navigation system that can calculate position in three dimensions (latitude, longitude and altitude).[9] | <= 10m |
| Assisted-GPS (A-GPS) | An improvement on GPS where a mobile network or third party service provider directs the mobile device to look for particular satellites. It also performs positioning calculations that the mobile device may not have enough processing power to perform itself by collecting additional data from the device.[10] | 1m – 10m |
| Time-based methods | Various methods of determining location that depend on the time delay of an electromagnetic signal, which have the potential to be quite accurate.[11] | 50m – 150m |

[7] Hubert Ka Yau Leung, Ioana Burcea and Hans-Arno Jacobsen, 'Modeling Location-based Services with Subject Spaces', *Proceedings of the 2003 conference of the Centre for Advanced Studies on Collaborative Research* (Oct 2003) 171.
[8] Giaglis, Kourouthanassis and Tsamakos, above n 2, 72.
[9] Vasileios Zeimpekis, George M. Giaglis and George Lekakos, 'A Taxonomy of Indoor and Outdoor Positioning Techniques for Mobile Location Services', *ACM SIGecom Exchanges* (Dec 2002) Vol. 3, Iss. 4, 19, 21.
[10] Ibid.
[11] Ibid, 22-23.

| | | |
|---|---|---|
| Bluetooth | A short-range radiofrequency specification with very high location accuracy due to the short link range.[12] | 10cm – 10m |
| Radiofrequency identification (RFID) | In conjunction with wireless systems, allows for contactless reading of RF-enabled tags. Like Bluetooth, the short operating range means that accuracy can be extremely high.[13] | 1cm – 1m |
| WiFi | Small active radio tags can be located within the coverage area of an 802.11 network.[14] | 1m – 10m |

The technologies that this thesis is focused on are GPS, A-GPS and RFID (the term "GPS" is used to refer to both GPS and A-GPS). Other authors, including Varshney[15] and Masters and Michael,[16] have put forward the notion of a hierarchical positioning system (HPS) and an integrated network. This thesis assumes the ability to pinpoint the location of an end user by applying a combinative approach. It then follows that this work is concerned with applications that require a high degree of precision with respect to humans, including navigation,[17] point-of-need information delivery[18] and people tracking.[19]

#### *1.2.2 Previous Research*

There are many existing works that have some bearing on LBS – some notable ones are Rao and Minakakis's 'Evolution of Mobile Location-based Services';[20] Mennecke and Strader's *Mobile Commerce: Technology, Theory and Applications*,[21] a collection of papers about mobile commerce; and Karimi and Hammad's *Telegeoinformatics:*

[12] Giaglis, Kourouthanassis and Tsamakos, above n 2, 75.
[13] Ibid, 76.
[14] Ekahau, *T201 Wi-Fi Tag* <http://www.ekahau.com/?id=4410> [Accessed Sep. 26, 2005].
[15] Upkar Varshney, 'Location management for mobile commerce applications in wireless Internet environment', *ACM Transactions on Internet Technology* (Aug 2003) Vol. 3, Iss. 3, 236.
[16] Amelia Masters and Katina Michael, 'Humancentric Applications of RFID Implants: The Usability Contexts of Control, Convenience and Care', *The Second International Workshop on Mobile Commerce and Services* (July 2005) 32.
[17] Bharat Rao and Louis Minakakis, 'Evolution of Mobile Location-based Services', *Communications of the ACM* (Dec 2003) Vol. 46, Iss. 17, 61, 64.
[18] Ibid.
[19] Zeimpekis, Giaglis and Lekakos, above n 9, 27.
[20] Rao and Minakakis, above n 17, 61.
[21] Brian E. Mennecke and Troy Strader (eds), *Mobile Commerce: Technology, Theory and Applications* (2003).

*Location-Based Computing and Services*,[22] a compilation of papers relating to LBS. Although these works are often focused on aspects of enabling technologies, they also offer insights into commercial applications of LBS. This thesis will draw on some of the papers contained in the works mentioned above. However, while a few describe possible future applications of LBS, none offers a cogent vision of what effects LBS will have on society in the future.

An article by Michael and Michael about the human electrophorus[23] does make some salient points about possible future applications of RFID and GPS. Although the focus of the article is on human implantation of auto-ID devices, it is relevant to consideration of the ethical implications of any technology that enables the tracking and monitoring of people. For this reason it is a useful source for discussing the social and ethical issues involved in the widespread use of LBS.

Other articles are also important to the thesis in this respect. Weckert's article[24] on trust and surveillance, for example, is a good source that discusses the impacts of surveillance on human relationships. As personal tracking is one of the major applications of LBS, Weckert's work is invaluable to this thesis.

Williams et al[25] have also produced articles that have a great deal of significance here. Their work with children and mobile technologies has generated some interesting information about children's reactions to being tracked with LBS devices. Though the results of their studies are can really only be applied to certain age groups, the articles are

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[22] Hassan A. Karimi and Amin Hammad (eds), *Telegeoinformatics: Location-Based Computing and Services* (2004).
[23] Katina Michael and M.G. Michael, 'Microchipping People: The Rise of the Electrophorus', *Quadrant* (Mar 2005) Vol. 49, Iss. 3, 22.
[24] John Weckert, 'Trust and Monitoring in the Workplace', *IEEE International Symposium on Technology and Society* (2000) 245.
[25] Morris Williams, Owain Jones and Constance Fleuriot, 'Wearable Computing and the Geographies of Urban Childhood – Working with Children to Explore the Potential of New Technology', *Proceeding of the 2003 conference on Interaction design and children* (Jul 2003) 111 and Morris Williams et al, 'Children and Emerging Wireless Technologies: Investigating the Potential for Spatial Practice', *Proceeding of the SIGCHI conference on Human factors in computing systems* (Apr 2005) 819.

valuable in that they look at the social factors behind the use of LBS rather than just technical aspects of the technology.

Perhaps the most notable existing article for this thesis is 'Geoslavery' by Dobson and Fisher.[26] Reasoning that vendors give plenty of positive coverage to LBS, the authors look at various negative uses. More importantly, the article examines the social and ethical issues that arise from the use of LBS. This is a highly significant source and is discussed in much greater detail in chapter two.

There are few scenarios pertaining to future applications LBS, but some do exist. One of the more noteworthy is MIT's *Project Oxygen*.[27] The downfall of this scenario is that it presents a blatantly utopian vision of how LBS will improve life – hardly surprising, considering that Oxygen's sponsors include technology giants such as Hewlett-Packard and Nokia.[28] Regardless, *Project Oxygen* is useful for demonstrating the need for a more realistic view.

#### *1.2.3 The Gap in the Literature*

Despite the fact that LBS represent an important new application area,[29] there has as yet been little formal, independent consideration of how precise LBS as a whole may affect our world. There currently exists no cogent scenario of a possible future society where humancentric applications of LBS have become part of our everyday lives. There is also no comprehensive discussion of the potential implications associated with the widespread use of LBS. There are certainly issues that could become serious concerns, but this topic has garnered little attention in research so far compared to technical and commercial aspects of LBS. This thesis aims to fill this gap in current knowledge, creating a plausible

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[26] Jerome E. Dobson and Peter F. Fisher, 'Geoslavery', *IEEE Technology and Society Magazine* (Spring 2003) Vol. 22, Iss. 1, 47.
[27] MIT Laboratory for Computer Science and MIT Artificial Intelligence Laboratory, *MIT Project Oxygen* (May 2002).
[28] MIT, 'Sponsors', *MIT Project Oxygen* <http://oxygen.lcs.mit.edu/Sponsors.html> [Accessed March 21, 2005].
[29] Mitchell and Whitmore, above n 4, 65.

scenario that is able to demonstrate the possible future effects of precise LBS to a layperson in the subject. The work also presents an analysis of the legal, ethical, social and technological issues that arise from the scenario.

## 1.3 Research Objectives

1. To identify and describe the current state of development of precise LBS.
2. To present a way in which the possible future of LBS can be explored.
3. To identify and describe, using a narrative structure, a plausible future scenario based on research completed in order to fulfil objectives 1 and 2.
4. To analyse and discuss the legal, social, ethical and technological issues drawn from the scenario.

Figure 1 depicts the relationship between the stated research objectives and the structure of the thesis.

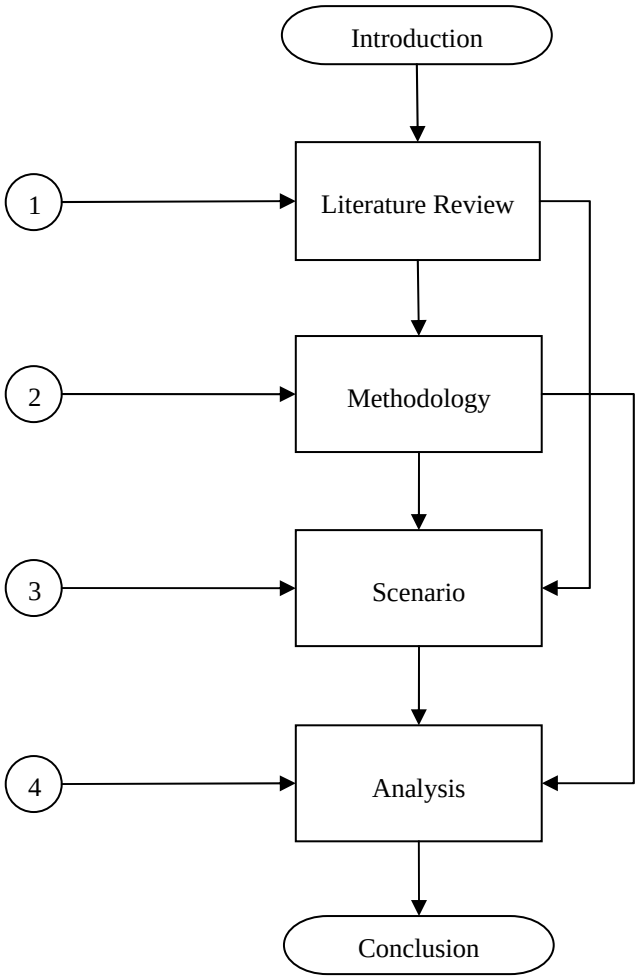


**Figure 1: Relationship of research objectives to thesis chapters**

## 1.4 Research Design / Methodology

### *1.4.1 Data Collection*

The data for the scenario generation is drawn in part from the literature review, and partly from wider-ranging additional research. For this reason, the data collection method is a qualitative content analysis of existing research and articles on applications of precise LBS. Works that consider the social and ethical issues associated with LBS are also examined. The content analysis serves as a guided tour of the existing literature and is descriptive in nature. Such an approach was chosen because of the complexity of the

research question: it demands a qualitative methodology rather than a quantitative one, as this allows the nuances of the topic to be explored.[30]

Existing work is drawn from journal articles, patents, books, websites and even some theses. Because the area of LBS is relatively new, books that are used are largely collections of conference papers and the like. Also, it is noted that online sources are often not reliable. However, these were mostly used to obtain peripheral data for the scenario where peer-reviewed information is not so important, and every effort was made to consult official organisational websites.

### *1.4.2 The Scenario*

One of the central achievements of the thesis is a narrative-based scenario constructed using a scenario planning methodology. It draws on the research conducted in the first part of the work in order to describe a plausible vision of how precise LBS may affect our lives in the future. The scenario is fully footnoted and referenced.

There is no single, authoritative definition of what a scenario is. The definition used in this paper is "[a]n internally consistent view of what the future might turn out to be."[31] The idea is to make the issues involved in LBS applications accessible to a layperson in the subject.

The scenario was created via scenario planning, which is the actual process of developing a scenario or set of scenarios. It is a methodology aimed at exploring a line or lines of development and the possible consequences.[32] This thesis uses the first three steps of TAIDA[33] as the method to give structure to the process of scenario planning.

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[30] Katina Michael, *The Technological Trajectory of the Automatic Identification Industry*, PhD thesis, University of Wollongong (2003), 50.
[31] Mats Lindgren and Hans Bandhold, *Scenario Planning: The link between future and strategy* (2003) 21.
[32] Ibid, 168.
[33] Ibid, 38.

#### *1.4.3 Data Analysis*

The actual data analysis uses deconstruction to draw out the legal, social, ethical and technological implications resulting from the scenario. This approach is considered the most appropriate way of extracting the underlying issues and allowing them to become the focus of analysis.

## 1.5 Justification

The Roman philosopher Seneca said: "[t]here is no favourable wind for the man who knows not where he is going."[34] It is often said that the changes LBS bring about will be dramatic, with some even going so far as to say that "this technological revolution will directly or indirectly affect in a significant way practically every person in the industrialised world."[35] Precise LBS are expected to create a paradigm shift in the way we live.[36]

With this in mind, there is certainly merit in exploring the potential effects of LBS before they occur. "[T]oday's process of transition allows us to perceive what we are losing and what we are gaining; this perception will become impossible the moment we fully embrace and feel fully at home in the new technologies."[37] It is also important for analysis of possible future implications to keep pace with technological development. As Michael and Michael highlight:

> Most alarming is the rate of change in technological capabilities without a commensurate and involved response from an informed community on what these changes actually "mean" in real and applied terms, not only for the present but also for the future.[38]

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[34] Michel Godet, 'The Art of Scenarios and Strategic Planning: Tools and Pitfalls', *Technological Forecasting and Social Change*, (Sep 2000) Vol. 65, Iss. 1, 3.
[35] Mennecke and Strader, above n 21, vii.
[36] Stanton Zeff, 'A New Spin on Location Services', *Telecommunications Americas* (Sep 2004) Vol. 38, Iss. 10, 36.
[37] Slavoj Žižek, 'Cyberspace, or the Unbearable Closure of Being' in Janet Bergstrom (ed), *Endless Night: Cinema and Psychoanalysis, Parallel Histories* (1999) 92, 101-102.
[38] Michael and Michael, above n 23, 33.

Another vital consideration is that information about issues involved with LBS should be available to a wide audience, because LBS are already commercially available as consumer technologies and are being used today for various applications. Anyone who cares about the potential implications of such technologies should be able to access information about them. This is why the scenario presented in chapter four is such a significant and unique part of this thesis. No one has previously developed a future scenario for LBS that is well-considered, grounded in current technological capabilities, fully referenced, and accessible to a wide audience.

## 1.6 Limitations

The qualitative methodology used in this thesis does not claim to give a completely accurate prediction, but rather a plausible scenario depicting how LBS *might* affect society in the future. There are no concrete predictions or forecasts like "*x* percent of people will be using *y* LBS by year *z*". However, at the same time, a quantitative methodology would not draw out the potential issues from possible future uses of LBS.

As for the scenario itself, TAIDA is just one possible framework for scenario planning – there are others that may produce different results. Also, only one scenario is presented here, but countless others could conceivably exist.

## 1.7 Outline of the Thesis

Chapter two reviews the existing literature in the area of LBS, highlighting important works and exposing a gap in the knowledge. Chapter three outlines and describes the three methodologies used to complete the various parts of the thesis. In chapter four, a future scenario is presented based on the preceding work. Following this, in chapter five, is an analysis of the legal, ethical, social and technological implications drawn from the scenario. Chapter five also contains two of the major accomplishments of this work: the LBS privacy-security dichotomy, and an LBS issues framework. Finally, the thesis concludes with chapter six, where the principal findings, major implications, and recommendations of this work are reviewed.

# Chapter 2: Literature Review

*'The greatest part of a writer's time is spent in reading, in order to write: a man will turn over half a library to make one book.'*

Samuel Johnson[39]

## 2.1 Introduction

This chapter discusses and analyses relevant literature in the area of precise LBS, as well as looking at some service offerings that exist today. It clarifies the gap in current knowledge that this thesis aims to fill. The first part of the review focuses on enabling technologies and protocols. This is to show that LBS are technically feasible and that applications which are not currently feasible may be so in the near future, with the intention of providing an overview that is not mired in technical detail. The next section looks at articles pertaining to the commercial viability of LBS. LBS will never become commonplace if there is no market for them, so the purpose here is to prove that this is not the case – LBS are likely to become pervasive. Next, some examples of existing LBS applications are highlighted, including patents that may not yet be commercial products or services. This is to give some idea of what types of LBS applications are currently available in order to further demonstrate the market potential of such services. To facilitate analysis, service offerings and patents are placed in one of three categories depending on their main function: tagging, tracking, or tracing. These categories are explained further below. Finally, this chapter looks at existing work considering the future implications of LBS, as well as identifying scenarios that have been developed about LBS. This underlines the lack of a cohesive, plausible scenario that adequately covers the potential legal, social and ethical issues associated with the widespread use of LBS. It also shows that where scenarios have been developed, there is rarely a related discussion of the issues involved. The nature of the analysis means that throughout this chapter literature is reviewed topically.

[39] Elizabeth Knowles (ed), 'Johnson, Samuel', *The Oxford Dictionary of Quotations* (2004).

## 2.2 Enabling Technologies

As stated in chapter one, a combinative approach is the most appropriate for precise LBS. This section discusses the enabling technologies of GPS and RFID in more detail to show that the development of LBS is supported by a working technological foundation. The discussion is deliberately focused on the technologies' relation to LBS rather than on technical aspects.

### *2.2.1 GPS and RFID*

Krikelis says that location sensors to enable LBS "should work inside and outside buildings, ideally anywhere on earth. The information they provide should include orientation and position, with the desired accuracy."[40] Unfortunately, there is no single technology existing today that fulfils all these requirements. For now ubiquitous LBS will have to depend on a combination of different products. Chapter one identified GPS and RFID as being two of the most appropriate technologies for precise LBS. GPS can be very accurate (10 metres or better),[41] however, due to the construction materials used in buildings GPS does not work indoors or in highly built-up areas. In such places RFID (or a similar short-range technology like WiFi) is suited as a replacement positioning technology: scanners can be mounted on walls and in doorways, and positioning is extremely accurate (between a few centimetres and one metre).[42]

Further to using RFID for indoor positioning, Martin suggests combining the advantages of the technology with the "containment control" of infrared (IR) transmissions to more accurately locate RFID tags.[43] In his WatchIt system, rooms and hallways are fitted with infrared transmitters, each of which emits a unique code. A person wears a tag that contains both an infrared receiver and an RF transmitter. As they move from room to

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[40] Argy Krikelis, 'Location-dependent multimedia computing', *IEEE Concurrency* (Apr-Jun 1999) Vol. 7, Iss. 2, 13, 14.
[41] Zeimpekis, Giaglis and Lekakos, above n 9, 21.
[42] Giaglis, Kourouthanassis and Tsamakos, above n 2, 76.
[43] Brian W. Martin, 'WatchIt: A Fully Supervised Identification, Location and Tracking System', *Proceedings of the IEEE International Carnahan Conference on Security Technology* (Oct 1995) 306.

room, their tag receives the location code of the nearest IR transmitter and combines it with its own unique identification code, transmitting both to local area RF receivers which then relay the codes to a central monitor.[44]

The main point here is that no one technology perfectly fulfils all the needs of ubiquitous LBS. However, this does not preclude LBS from becoming widespread. Until a single technology can provide accurate location information both indoors and outdoors, precise LBS will probably rely on a combination of technologies such as GPS (for outdoors) and RFID or WiFi (for indoors and for highly built-up areas).

#### *2.2.2 Standards*

For LBS to be effective, there will need to be standards for their operation. Lopez emphasises the need for LBS to be interoperable and automatic. He states that customers want to be able to focus on informed decision making, which means that LBS should take care of integrating and filtering information from a variety of sources according to the customer's preferences.[45] This will require common standards for LBS.

As a subset of mobile commerce (m-commerce), LBS are partially enabled by m-commerce protocols as they may use Internet technologies for service delivery. Lei et al identify the two most popular protocols as Wireless Application Protocol (WAP), an open, global specification; and i-mode, a proprietary standard developed by NTT DoCoMo.[46] Of these, Lei et al. are of the opinion that i-mode will play a more dominant role in m-commerce applications and support this with a comparison of the two protocols.[47]

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[44] Ibid, 308.
[45] Xavier R. Lopez, 'Location-Based Services' in Hassan A. Karimi and Amin Hammad (eds), *Telegeoinformatics: Location-Based Computing and Services* (2004) 171, 173-4.
[46] P.W. Lei et al, 'Opportunities and Limitations in M-Commerce' in Nan Si Shi (ed), *Wireless Communications and Mobile Commerce* (2004) 80, 86-89.
[47] Ibid, 90.

LBS will also need a common operating platform on which to run. An existing specification discussed by Lopez[48] that could possibly become a standard is the Open Location Services (OpenLS) interface specification developed by the OpenGIS Consortium.[49] Table 2 identifies the types of LBS that the platform can support.

**Table 2: Types of LBS supported by the OpenLS specification[50]**

Please see print copy for Table 2

Some protocols for LBS already exist. It is simply a matter of which one will become the de facto standard.

## 2.3 Market Potential

With regard to LBS becoming commonplace, Samuelsson and Dholakia have some salient points to make about the market potential of mobile business (m-business) services like LBS. They illustrate several LBS concepts that "will become available to

[48] Lopez, above n 45, 180.
[49] OpenGIS Consortium, *OpenGIS Location Services (OpenLS): Core Services* (Jan 2004) available at <http://www.opengeospatial.org/specs/?page=specs> [Accessed April 11, 2005].
[50] Adapted from Lopez, above n 45, 180.

business and consumer users in the years ahead".[51] These examples include an electronic payment application and an advertising-type application that uses customer location data. Samuelsson and Dholakia say that although it may take some time for sustainable business models and the like to evolve, eventually m-business "will become as pervasive as e-business has become today."[52] Their article confirms that LBS will be an integral part of our future world. This opinion is supported by Raisinghani[53] and Lei et al.,[54] who agree that it is only a matter of time before LBS become part of the way we live.

## 2.4 Existing Precise LBS

Precise LBS are still emerging as an application area but there are some pioneering service offerings that exist today. Some of these are discussed below, with each example being placed in one of three categories according to the main functionality – tagging, tracking, or tracing. The dissection of LBS functionality in this way is an original concept. The three elements have been collectively termed the *Three Ts of LBS*. In this taxonomy, tagging is a single, individual locate of an LBS device. It could be used, for example, for point-of-need advertisement delivery to a mobile device. Tracking is the connection between two or more tags and thus allows activities to be monitored in some capacity. Tracing is end-to-end routing or monitoring and could be for a single trip, a day, a month, or even the entire life of the device. These components are represented in Figure 2.

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[51] Mats Samuelsson and Nikhilesh Dholakia, 'Assessing the Market Potential of Network-Enabled 3G M-Business Services' in Nan Si Shi (ed), *Wireless Communications and Mobile Commerce* (2004) 23, 34.
[52] Ibid, 25.
[53] Mahesh S. Raisinghani, 'Mobile E-Commerce and the Wireless Worldwide Web: Strategic Perspectives on the Internet's Emerging Model' in Nan Si Shi (ed), *Wireless Communications and Mobile Commerce* (2004) 49, 66.
[54] Lei et al, above n 46, 80.

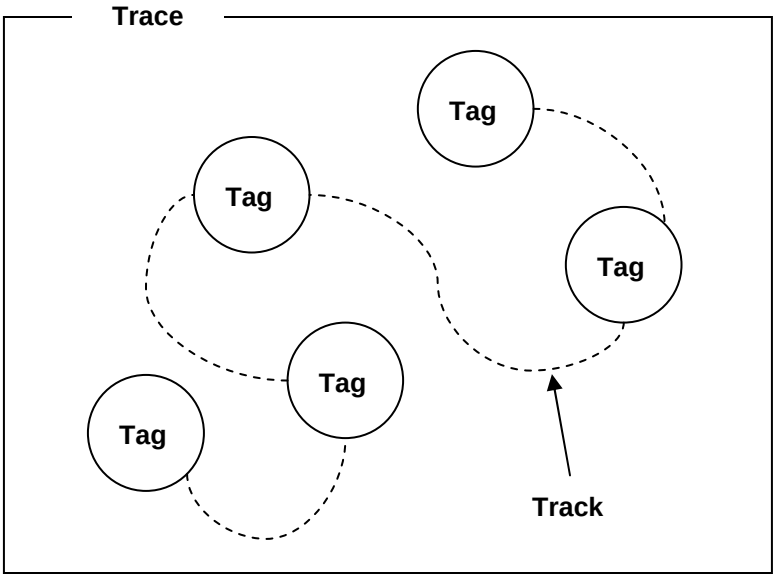


**Figure 2: Tagging, tracking and tracing**

These different types of locates can be used to classify LBS applications into tagging, tracking and tracing categories. Here, tagging includes all applications where the major objective is some form of information delivery or the like. The name is derived from the "tagging" of a location (i.e. the definition and storage of a coordinate point or bounded area) in order to provide information or a service when a user approaches, enters or exits that location. The tracking category contains LBS that are focused on locating and monitoring others. Finally, tracing covers examples of LBS where the main purpose is to provide navigational information, allowing the user to trace a route on a map (in this sense, tracing is equivalent to routing). It also includes applications where the main objective is some other kind of end-to-end tracing.

### *2.4.1 Tagging*

There are few existing services in the area of tagging LBS, probably due to the need to resolve logistical issues. However, there is existing research about such applications. With regard to technical problems, their resolution may not be far off. Munson and Gupta describe their prototype for a general-purpose notification service that will have three

crucial capabilities: to precisely locate subscribers, to precisely define notification areas, and to promptly detect when a subscriber enters a notification area.[55] While it must be noted that the authors' definition of "precise" is broader than the one used in this thesis, their work demonstrates that tagging LBS will be technically feasible. They even state that the system "can also be extended to use the precise location ability in the automobile navigation systems now becoming popular."[56] This would enable the system to be classified as precise within the terms of this thesis.

If technological issues can be resolved, there will be no shortage of applications in this area. Lucent Technologies has already patented a system that uses wireless telecommunications in combination with knowledge of the user's location in order to automatically perform desired functions.[57] The user's location is compared to that of a remote location such as the person's home or office. As the user approaches the stored location, the network may use this information to initiate particular actions,[58] such as automatically opening the garage door when the user gets within a certain distance of home.

In another patent by the same company, the system relies on the user's proximity to a fixed point to deliver tailored information rather than to perform actions.[59] The user's location is compared to the stored coordinates of a remote location. Based on the user's current location and instructions/preferences stored about the wireless device, tailored information is delivered to the user.[60] One application of this might be the user receiving personalised flight information as they approach the airport.

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[55] Jonathan P. Munson and Vineet K. Gupta, 'Location-Based Notification as a General-Purpose Service', *Proceedings of the 2nd International Conference on Mobile Commerce* (Sep 2002) 40, 41.
[56] Ibid.
[57] Robert Ellis Richton, 'Method and apparatus for a wireless telecommunication system that provides location-based action services', Lucent Technologies Inc., patent 6,400,956 (4 June 2002).
[58] Ibid.
[59] Ibid.
[60] Robert Ellis Richton, 'Method and apparatus for wireless telecommunications system that provides location-based information delivery to a wireless mobile unit', Lucent Technologies Inc., patent 6,650,902 (18 Nov 2003).

There is also an existing patent for a system that alerts the user to the imminent arrival of a vehicle.[61] In this case, the definition of a vehicle includes a person on foot. The system depends on activation points, which are fixed,[62] and could be RFID sensors. Other patented inventions enable the user to save information about a location. One, assigned to Motorola, allows the user to mark a location and attach additional information to it, like text or images.[63] The real novelty of this invention lies in the ability to edit and share the location and the attached information, even showing the location on a map.[64]

#### *2.4.2 Tracking*

OnStar is a United States-based company that bills itself as offering "invaluable safety and security services created to help protect you and your family while on the road."[65] The system they provide equips vehicles with a GPS device, allowing them to be located by company employees. Customers can request various LBS at the touch of a button, including driving directions, roadside assistance and emergency services.

It is not just vehicles that can be tracked, but also individuals on foot. For example, Locationet owns a patent that describes a system enabling a mobile user to locate another mobile user.[66] Each mobile device transmits its location to a service provider, which maintains a database of all subscribers. A user can send a message or announcement to others that is stamped with the sender's location. In addition, one user may request the location of another user, with the location of the requested user being shown on a map relative to the position of the requester.[67]

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[61] M. Kelly Jones, 'Notification systems and methods with user-definable notifications based upon vehicle proximities', ArrivalStar, Inc., patent 6,804,606 (12 Oct 2004).
[62] Ibid.
[63] James Blake Bullock and Axel Fuchs, 'System and method for storing and using information associated with geographic locations of interest to a mobile user', Motorola, Inc., patent 6,810,323 (26 Oct 2004).
[64] Ibid.
[65] OnStar, *Explore OnStar* <http://www.onstar.com/us_english/jsp/explore/index.jsp> [Accessed April 14, 2005].
[66] Kulbir S. Sandhu et al, 'Method and system for a plurality of mobile units to locate one another', At Road, Inc., patent 6,867,733 (15 Mar 2005).
[67] Ibid.

There are also human tracking systems that actually exist as commercially available services. The Wherify Personal Locator is a watch-like device that uses a combination of GPS and network triangulation to track the wearer,[68] and is aimed at parents who want to monitor their children. When a report is requested, the watch device transmits its location to Wherify's servers. The parent can then log on to Wherify's secure website to see their child's location displayed on a street map, or even on an aerial photograph.[69] The Personal Locator also comes in the form of a GPS-enabled mobile phone.[70]

The applications of such tracking systems are certainly not limited to concerned parents keeping tabs on their children. LBS are also being used in Britain,[71] the U.S.[72] and even Australia[73] to monitor convicted criminals. For example, the NSW State Government has announced that the Parole Board will now be able to order convicted sex offenders to wear GPS tracking devices and carry locator units the size of a large mobile phone.[74] An alarm is triggered if the offender attempts to remove the device they wear.[75]

#### *2.4.3 Tracing*

There are many companies that offer routing-type tracing services. One of these is Pharos,[76] which delivers tracing LBS based on GPS and Windows mobile devices such as personal digital assistants (PDAs). As well as displaying a map of the user's location, Pharos's system provides multiple-stop routing and directions. It even shows real-time

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[68] Katina Michael, 'Location-based services – a vehicle for IT&T convergence', *Proceedings of the Fourth International Conference on e-Engineering and Digital Enterprise Technology* (Sep 2004) 467, 470.
[69] Travel by GPS, *Using GPS for People Tracking* <http://www.travelbygps.com/articles/tracking.php> [Accessed April 14, 2005].
[70] Wherify Wireless, *Products* <http://www.wherify.com/html/solutions.asp?pageId=50> [Accessed October 6, 2005].
[71] Dobson and Fisher, above n 26, 49.
[72] Reuters, 'Sex offenders to be tracked with GPS', *The Sydney Morning Herald* (October 5, 2005) <http://www.smh.com.au/news/world/sex-offenders-to-be-tracked-with-gps/2005/10/05/1128191750031.html> [Accessed October 5, 2005].
[73] Jonathan Pearlman, 'Sex offenders forced to wear tracking devices', *The Sydney Morning Herald* (26/5/05) <http://www.smh.com.au/news/National/Sex-offenders-forced-to-wear-tracking-devices/2005/05/26/1116950801070.html> [Accessed May 26, 2005].
[74] Ibid.
[75] ABC, 'NSW to use GPS to track sex offenders', *ABC News Online* (26/5/05) <http://www.abc.net.au/news/newsitems/200505/s1378025.htm> [Accessed May 26, 2005].
[76] Pharos, *Pharos GPS* <http://www.pharosgps.com> [Accessed April 15, 2005].

traffic data for metropolitan areas and takes this into account when planning a route for the user.[77]

Until recently there have been no tracing services that work with mobile phone handsets rather than requiring a larger device such as a PDA, but this has now changed. Lopez[78] describes J-Navi, an existing LBS that uses a graphics-enabled handset to display the results of location-based queries on a colour map. It works with the i-mode protocol described above. J-Navi is "the world's first operational graphical map delivery to mobile phones."[79] Applications such as this one show that LBS are already entering the mainstream in places like Japan.

Apart from routing applications, the tracing category covers LBS where the aim is some other kind of end-to-end monitoring. For example, tracing LBS have been put forward as a way of mapping human virus outbreaks such as SARS from their beginning to end.[80]

## 2.5 The Future of LBS and its Societal Implications

### *2.5.1 Consideration of Social and Ethical Issues*

Despite existing applications and the research saying that LBS will rapidly become pervasive, there has been little consideration of what implications this will have for society. O'Connor and Godar suggest that the reason for this is that LBS are still in their infancy.[81] However, there is merit in examining how LBS will change our world, and discussing the effects they may have on our everyday lives.

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[77] Pharos, *Smart Navigator* <http://www.pharosgps.com/products/services/smartnavigator.htm> [Accessed April 14, 2005].
[78] Lopez, above n 45.
[79] Ibid, 186.
[80] Katina Michael and Amelia Masters, 'Realized Applications of Positioning Technologies in Defense Intelligence' in Darryl Essam and Hussein A. Abbass (eds), *Applications of Information Systems to Homeland Security and Defense* (2005) 164, 184.
[81] Patricia J. O'Connor and Susan H. Godar, 'We Know Where You Are: The Ethics of LBS Advertising' in Brian E. Mennecke and Troy J. Strader (eds), *Mobile Commerce: Technology, Theory and Applications* (2003) 245, 246.

There are a number of concerns that arise when individuals, business and government have the ability to precisely determine a person's location. Raisinghani says that LBS brings with it certain "issues that still need to be addressed and have been downplayed by current technology developers."[82] The major issue is privacy. All three of the application areas described above – tagging, tracking, and tracing – rely on determining the user's location. Therefore, even LBS that are focused on tracing and tagging have some element of tracking.

Michael and Michael's article about the human electrophorus[83] makes some salient points about possible future applications of the LBS enabling technologies of RFID and GPS. Although the focus of the article is on human implantation of auto-ID devices, it has an important bearing on the ethical implications of any technology that allows the tracking and monitoring of people. It also serves as a measured argument for caution rather than blind acceptance of technology-push – the authors' main message is one of prudence. Attention is drawn to the fact that technological development often proceeds at a pace that outstrips analysis of where such development is leading.[84] The authors highlight the need for consideration of the possible future implications of any technology,[85] and this includes LBS.

Similarly, an article by Weckert about trust and workplace surveillance[86] does not discuss LBS specifically, but it does mention electronic surveillance and has some bearing on the potential implications of the widespread use of LBS. Weckert cites Perolle as saying that "surveillance is practiced where trust is low, and … this surveillance [in] itself creates a low-trust workplace".[87]

This has important ramifications for LBS in the context of workplace monitoring. LBS allow employers to expand surveillance to employee's activities outside the office. The

[82] Raisinghani, above n 53, 61.
[83] Michael and Michael, above n 23.
[84] Ibid, 31.
[85] Ibid, 33.
[86] Weckert, above n 24.
[87] Ibid, 245.

danger of this increased employee monitoring is that it would probably erode trust in the workplace even more, perhaps even extending this erosion to other contexts.[88] A well-functioning and happy community largely depends on a high level of trust, because trust is integrated with notions of self-respect and respect for others.[89] What happens to trust in the community when there is little trust at work, where many people spend a majority of their time?

Another important paper directly related to monitoring and the possible social implications of LBS is that by Williams, Jones and Fleuriot,[90] who investigate the potential impact of mobile wearable technologies on children. It is pointed out that the increased dangers of city living in modern times have largely curtailed children's freedom in urban areas, and the article is focused on how such new technologies might be applied to allow children to make more use of urban spaces. Their paper is based on a research workshop they carried out with 10 schoolchildren between the ages of 11 and 12.[91] Though this is a small sample group, it was appropriate to the aims of the workshop.

Focus sessions were conducted with the children to determine their views of the new technologies. Both the researchers and the participants concentrated on the LBS potential of the technologies they were investigating. Some of the children's comments from the article are as follows:

> [T]he map is good because then people can see where you are …
>
> [Y]our parents might want to have it to check you are safe.
>
> [Researcher] Would you like that?
>
> Yes, because then you would be able to go out more …
>
> [Researcher] What would they use it for?
>
> They'd use it to check up on you.[92]

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[88] Ibid, 250.
[89] Ibid, 245.
[90] Morris Williams, Owain Jones and Constance Fleuriot, 'Wearable Computing and the Geographies of Urban Childhood – Working with Children to Explore the Potential of New Technology', *Proceeding of the 2003 conference on Interaction design and children* (Jul 2003) 111.
[91] Ibid, 113.
[92] Ibid, 116.

A highly similar study was conducted very recently by the same researchers. In this study, they worked with 36 children aged between 9 and 10.[93] The attitudes of these children were much the same as those in the first study. One child said:

> [I]t could be like a new way of keeping up with your children. You could have like a tracking device on it and you could load it in to a PC … so like your parents could track their children to make sure they don't go anywhere.[94]

These two studies are rare in that they focus on the possible societal implications of LBS technologies. They also go some way toward showing that children, at least of this age, would probably accept and perhaps even welcome the possibility of tracking LBS. The studies do have some failings in that they are not really large enough to properly gauge the reaction of the majority of children in the general populace, and the results obviously cannot be extrapolated to other age groups. The authors do provide an excellent discussion of the societal implications arising from the studies. However, these are limited by the studies' focus on children's use of urban space.

The article 'Geoslavery' by Dobson and Fisher[95] is also highly relevant to this thesis topic. The authors (both "long-term insiders of the GIS community")[96] describe several ways in which LBS could be used to subjugate individuals and exert real-time control. They say that three technologies – GPS, GIS and miniature radio transmitters – can be combined to enable an electronic form of geoslavery (the coercive monitoring and exertion of control over the physical location of a human being).[97] A GPS receiver tracks a person's location and the radio transmitter sends the information to a monitor, who uses a GIS to relate the person's movements to streets and buildings.[98]

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[93] Morris Williams et al, 'Children and Emerging Wireless Technologies: Investigating the Potential for Spatial Practice', *Proceeding of the SIGCHI conference on Human factors in computing systems* (Apr 2005) 819.
[94] Ibid, 825.
[95] Dobson and Fisher, above n 26.
[96] Ibid, 51.
[97] Ibid, 47-8.
[98] Ibid, 49.

Dobson and Fisher identify four different types of spatial constraints: prescribing a path that must be followed, allowing free reign except for off-limits areas, limiting movement to specific places at specific times, and barring intersections between a person's path and that of another person or persons.[99] All of these could be aspects of geoslavery.

A major point that the authors make is the danger of LBS inaccuracies implicating people unfairly, with potentially extreme results. They give the example of so-called honour killings in some cultures where a male family member may kill a female who has 'disgraced' the family, such as by visiting a man alone or even by seeing a movie without permission.[100] In this case, a woman could be murdered simply for standing in the wrong place. A slight inaccuracy in reported location could mean the difference between appearing to be inside or outside a man's house.

The article is definitely biased toward presenting a negative view of potential LBS applications, but as the authors point out: "benefits get more than their due from commercial advertising, while hazards are ignored by vendors and, all too often, by public officials as well."[101] The authors are right. LBS technology vendors and service providers give more than enough attention to the positive aspects of LBS. It is fair for Dobson and Fisher to present a different perspective in order to redress the balance. They do remind the reader that it is not technology itself that is either good or evil, but the uses to which human beings put it. They also support their claims (elevating them above fanciful ideas) by showing that enabling technology for geoslavery already exists.

In fact, not only does the technology exist, it is already being used in several countries for some of the purposes that Dobson and Fisher postulate. Fortunately, this has not occurred entirely without public debate. For example, the NSW State Government states that the use of LBS for paroled sex offenders is supposed to be "an extra protection for potential victims and … one way of making parole conditions more effective", but there are others

[99] Ibid.
[100] Ibid, 50.
[101] Ibid, 47.

voicing fear that it will lead to parole being granted to more serial sex criminals.[102] Some are concerned about it being a detriment to rehabilitation, stigmatising people who are trying to become productive members of the community again.[103] This sort of debate is reassuring: it shows that society in general is not apathetic to LBS and the possible effects it may have.

It must also be remembered that LBS is not just used to monitor convicted criminals who have voided some of their rights to freedom by breaking the law – innocent individuals may also be monitored and controlled. Parents can use commercially available services (such as those described in the Tracking section above) to monitor their children. In the U.S. at least, the use of LBS surveillance for children would be unlikely to be contested successfully. Parents are given a great deal of control over their offspring because of "the peculiar vulnerability of children; their inability to make critical decisions in an informed, mature manner; and the importance of the parental role in child rearing."[104] The findings of Williams et al in their discussions with children also suggest that many would not particularly mind being monitored via LBS, and may even welcome it. However, we may not know the impacts of the widespread monitoring of children until they actually occur. Perhaps Weckert's ideas about the need for trust in a community would hold true. There is certainly no need to bother with outdated concepts like trust when you can actually see exactly where someone is at any given time.

Even if the monitoring of children is neither socially nor legally problematic, some people may use LBS for other surveillance purposes, such as tracking aging relatives with Alzheimer's to ensure their safety. Batty presents the example of elderly patients in nursing homes, saying that an LBS system could raise an alarm if the "subject" wanders

[102] Pearlman, above n 67.
[103] ABC, above n 69.
[104] Stephen N. Roberts, 'Tracking your children with GPS: do you have the right?', *Wireless Business & Technology* (Dec 2003) Vol. 3, Iss. 12, 20.

outside specific areas.[105] He even goes so far as to suggest monitoring their physical activity levels to make sure they get adequate exercise.[106]

But who decides when a person is sufficiently impaired to warrant making them wear a tracking device? There are no specific laws relating to LBS that could guide such decisions.[107] The real-life uses of LBS for control purposes today highlight the need to develop concrete guidelines for LBS applications. Some thought has occurred in this area, such as Durocher's 'Laws of LBS', inspired by Isaac Asimov's 'Three Laws of Robotics'.[108] Durocher's proposed laws are as follows:

> *First LBS Law:* Location, through its availability or non-availability, must not allow a human being to come to harm.
>
> *Second LBS Law:* The availability of one's location must be in one's complete control, except where such control would conflict with the First Law.
>
> *Third LBS Law:* The providers of location-based services must be allowed to create a profitable business from these services as long as such business does not conflict with the First or Second Law.[109]

Of course, while useful for guiding discussion about the social and ethical issues involved in LBS, any 'laws' such as these are largely useless unless they are backed up by legally enforceable regulations. Even then, they would likely only be applicable during peacetime.[110] Sui suggests that this would particularly be the case in the context of ongoing conflicts like the war on terrorism.[111] This is backed up by a survey conducted by Boondao, Esichaikul and Tripathi where more than two-thirds of the respondents cited safety and security issues as the main reasons for wanting widespread LBS.[112] As such,

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[105] Peter Batty, 'Future Trends & the Spatial Industry, Part Two', *Geospatial Solutions* (Sept 2004) Vol. 14, Iss. 9, 32, 35.
[106] Ibid.
[107] Daniel Sui, 'Are robotics laws applicable to location-based services?', *GEO World* (Sept 2004) Vol. 17, Iss. 9, 22.
[108] m-travel.com, *Webraska CEO proposes 'Laws of LBS'* (June 14, 2002) <http://www.m-travel.com/news/2002/06/webraska_ceo_pr.html> [Accessed May 24, 2005].
[109] Ibid.
[110] Daniel Sui, above n 107, 22.
[111] Ibid.
[112] Roongrasamee Boondao, Vatcharaporn Esichaikul and Nitin Kumar Tripathi, 'A Model of Location Based Services for Crime Control', *Map Asia 2003* <http://www.gisdevelopment.net/technology/lbs/ma03217.htm> [Accessed May 24, 2005].

the main value of these 'laws' lies in provoking thought and debate about the widespread use of LBS rather than actually enforcing compliance.

#### *2.5.2 Scenarios and Related Discussion*

While there have been some scenarios developed about the future of LBS, these tend to be limited in scope and related discussion is lacking. Samuelsson and Dholakia provide a scenario depicting how LBS could enable a mobile office solution,[113] and also give several examples of how LBS could be used in different application areas. These, however, are fairly brief and are certainly not accompanied by any kind of discussion about what societal effects such services may have.

Lin, Yu and Shih[114] have developed more comprehensive and believable scenarios. In this case, however, the focus is more on the technical processes behind what happens in the narratives rather than the broader social, legal and ethical issues associated with the events in the scenarios.

Dobson and Fisher also present different ways in which LBS could be used. However, they focus on uses for geoslavery, such as the following:

> [I]t is quite possible for an abusive husband, for example, to purchase an inexpensive devise [sic] or service that will enable him to follow his wife's every step, monitor her daily travels, report her whereabouts, identify whether she visits a specified friend, and time her stay on any given visit.[115]

Again, the authors' scenarios are brief, presenting small snippets of potential real-life examples of how LBS might be used. The difference is that Dobson and Fisher's scenarios are accompanied by relevant discussion of the social and ethical issues involved.

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[113] Samuelsson and Dholakia, above n 51, 38.
[114] Kwei-Jay Lin, Tao Yu and Chia-Yen Shih, 'The Design of A Personal and Intelligent Pervasive-Commerce System Architecture', *Proceedings of the Second IEEE International Workshop on Mobile Commerce and Services* (2005) 163.
[115] Dobson and Fisher, above n 26, 49.

Another notable LBS-related scenario is MIT's *Project Oxygen*.[116] Oxygen is MIT's vision of a system that is freely available, everywhere, all the time – just like the oxygen in the air we breathe.[117] One of the important themes of Oxygen's technologies is described as "distribution and mobility",[118] where users of the system carry multifunction handheld devices that, among other things, act as GPS receivers.[119] These qualities of the system allow for the support of LBS applications.

Several scenarios are presented based on potential uses of the Oxygen system. One describes the system facilitating a business conference, while another illustrates how it could act as a "guardian angel" to the elderly.[120] Yet another shows various uses of Oxygen on a students' field trip.[121] One thing that all these scenarios have in common is this: they are all utopian depictions of a perfect technology. This is hardly surprising given that Oxygen's sponsors include technology companies such as Acer, Nippon Telegraph and Telephone, Hewlett-Packard and Nokia.[122] MIT has a vested interest in presenting LBS in a positive light.

## 2.6 The Gap in the Literature

Many of the works discussed above are largely academic in nature, especially those considering standards, market potential and social and ethical issues. These are high-quality sources. The patents referenced are also important and are based on solid research and development. Although the websites mentioned are generally commercial and certainly should not be relied upon as the basis of a thesis, they are useful for demonstrating the types of LBS that exist today. The real value of commercial websites, combined with the credibility of both academic papers and patents, is that they offer a

[116] MIT, above n 27.
[117] Ibid, 2.
[118] Ibid, 5.
[119] Ibid, 6.
[120] Ibid, 11.
[121] Ibid, 10.
[122] MIT, above n 28.

convincing foundation for the opinion that LBS will be a pervasive part of our future world.

Given that the use LBS is likely to increase dramatically, it is appropriate that there are at least a few sources that discuss the possible social implications that may arise from these technologies. Sui says that consideration of social issues is especially urgent for LBS because of their potential ubiquity and close coupling with users' personal lives.[123] The studies conducted by Williams et al[124] are pioneering in this respect – they investigate and discuss possible future uses of LBS by children and how they will affect daily life. Other articles that have been mentioned here, particularly Dobson and Fisher's,[125] are also highly concerned with potential social and ethical implications.

What is noticeably lacking in the literature is a scenario that depicts a coherent vision for LBS and is accompanied by a discussion of the issues underpinning it. The scenarios that do exist are generally limited in scope and present a utopian view of how LBS will change our lives. MIT's *Project Oxygen*[126] is especially guilty of this last failing. Although it was the most comprehensive scenario found, it is biased toward presenting only the beneficial aspects of LBS. Like any new technology, LBS are likely to have both positive and negative effects. There is a need for a realistic, cogent scenario depicting how LBS may change the world in the future. There is also a need for a rational discussion of the possible social, legal, ethical and technological implications that may arise.

It is vitally important to consider how the widespread use of LBS may affect society and to provoke debate about where we are headed. With LBS already being used to monitor criminals and children today, it is really only a matter of time before LBS surveillance extends beyond these groups. No laws have been written to deal with the possible uses of

[123] Sui, above n 107, 22.
[124] Williams, Jones and Fleuriot, above n 90 and Williams et al, above n 93.
[125] Dobson and Fisher, above n 26.
[126] MIT, above n 27.

LBS. Surely, on the brink of a future where LBS are ubiquitous, we need to look at plausible destinations of our current path.

## 2.7 Conclusion

Chapter two has shown that enabling technologies like GPS and RFID exist today that make LBS technically feasible, however, there is a need for common standards before LBS can become pervasive. It has also shown that, despite the lack of agreed standards, there are researchers who are of the opinion that LBS will eventually change the way we live. This is supported by the existence of pioneering LBS applications in the three identified areas of tagging, tracking and tracing.

This chapter has pointed out that if it is accepted that it is only a matter of time before LBS become commonplace, there is a need to examine the societal implications that will arise from the widespread use of such services. Some investigation has been conducted in this area. However, there is no existing vision of the future that is balanced, rational and based on the reality of the present day. The rest of this thesis aims to use appropriate methodologies (described in chapter three) to construct a plausible future scenario to fill this gap and to analyse the legal, social, ethical and technological implications arising from the scenario.

# Chapter 3: Methodology

*'I like the dreams of the future better than the history of the past.'*

Thomas Jefferson[127]

## 3.1 Introduction

The preceding chapters have oriented the reader to the research topic by providing an introduction and necessary background information about precise LBS, their supporting technologies, their market potential and some existing applications in the three areas of tagging, tracking, and tracing. Works considering social and ethical issues have also been looked at, as well as some existing scenarios about LBS. This has led to the identification of a gap in current knowledge. There is no cohesive scenario depicting a plausible future where LBS are commonplace. Scenarios that do exist tend to be lacking in related discussion about the social and ethical issues involved. There is a need for consideration of the future of precise LBS and their societal impacts that is accessible to the general public. Of course, this could not be accomplished without underlying methodologies to guide the research and analysis. This chapter describes the various approaches taken to collect data about the possible future of LBS, create a plausible scenario depicting this future, and discuss the implications arising from the scenario.

## 3.2 Research Strategy

The research question that forms the basis of this thesis is, by its very nature, exploratory. The aim is to use the current state of development of LBS, combined with articles by others about the possible effects of these technologies, to create a scenario depicting a possible future where LBS have become commonplace and to discuss potential societal impacts. Because the topic is so novel, it warrants a qualitative strategy that allows the nuances of the subject to be explored.

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[127] ThinkExist.com Quotations, *Future Quotes* <http://en.thinkexist.com/quotations/future/4.html> [Accessed October 5, 2005].

In satisfying the objectives of the thesis, three different approaches are taken. Although the data collection, scenario and analysis complement one another, each serves a different purpose and thus requires a different method.

## 3.3 Research Design

The primary focus for research is a qualitative content analysis of relevant articles about the technical capabilities of LBS and their possible future effects (chapter two and part of chapter four), with a scenario being developed based on this information through scenario planning (chapter four). This is followed by a discussion of the legal, ethical, social and technological implications arising from the scenario (chapter five), drawn out by deconstruction.

Figure 3 shows how the methodologies support the various parts of the thesis.

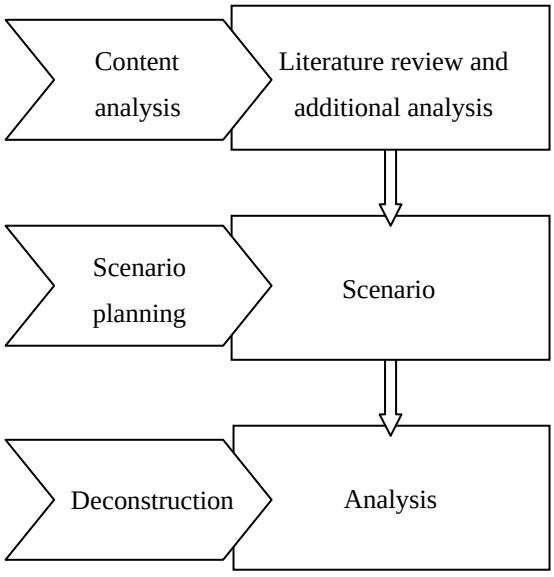


**Figure 3: Relationship of methodologies to thesis chapters**

### *3.3.1 Qualitative Content Analysis Protocol*

The exploratory quality of the research may seem to suggest that a case study approach be taken in data collection, particularly as such an approach has been used in related literature (most notably in Michael's thesis on the future of auto-ID technologies).[128] A case study approach would produce an in-depth understanding of one or two specific applications of LBS. However, this is not the aim of the data collection in this work – the objective is to develop a broad picture of the current state of development and possible effects of widespread use of LBS, so that this information can be used to generate the scenario.

In light of this, the most appropriate method for data collection here is qualitative content analysis. This technique is used in the literature review to identify the current state of development and other researchers' ideas about the future impacts of LBS. Further information was gathered in this way to fill in both central and peripheral details for the scenario. Evidence of this can be seen in the footnotes of chapter four.

### *3.3.2 Unit of Analysis*

The unit of analysis defines how data is gathered during the data collection stage (in the case of this thesis, the results of the data collection stage are presented largely in chapter two, with additional information in the footnotes of chapter four). All data collected has some bearing on the future of precise LBS. However, it is important to have some unit of analysis to structure the process. Because this research takes a content analysis approach to determine various possible future applications of precise LBS, units of analysis are applications or application areas.

[128] Katina Michael, *The Technological Trajectory of the Automatic Identification Industry*, PhD thesis, University of Wollongong (2003).

### *3.3.3 Scenarios*

The definition of a scenario used in this thesis is "[a]n internally consistent view of what the future might turn out to be."[129] A scenario is a narrative story that describes possible events in the future, however, to be plausible the events must be based on the past and emerge logically.[130] They are designed to provide an overall picture of a possible future, and to describe this future in such a way that it is accessible to a layperson in the subject.[131] Legal scenarios developed to demonstrate possible outcomes of a law[132] are just one example of how scenarios are used by researchers. Perhaps the worth of scenario planning is best expressed by Godet:

> Unfortunately, there are no statistics for the future, and often personal judgement is the only information available to deal with the unknown. It is, therefore, necessary to gather other people's opinions before forming one's own, and then to place bets in the form of subjective probabilities. As in the case of a casino gambler, it is only on the basis of a series of games that one can judge the quality of his bets.[133]

A great part of the reason why a scenario approach has been chosen is that, according to Weber, "new technologies cannot be analysed in isolation from their social context."[134] A scenario will allow the possible societal impacts of precise LBS to be explored.

This thesis aims to fulfil Godet's requirements that a scenario must be relevant, coherent and plausible all at the same time, as well as being transparent.[135] In chapter four, where the scenario is presented, footnotes are used extensively to help meet the requirement of transparency.

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[129] Lindgren and Bandhold, above n 31, 21.
[130] Victor Fazakerley, *Critical Issues for the Future of the Australian Urban Water Supply Industry*, PhD thesis, Curtin University of Technology (2005) 79.
[131] Joseph P. Martino, 'A review of selected recent advances in technological forecasting', *Technological Forecasting and Social Change* (Oct 2003) Vol. 70, Iss. 8, 719, 722.
[132] UTSCLC, *Be Informed: ASIO and Anti-Terrorism Laws* (February 2005) 3.
[133] Godet, above n 34, 7.
[134] K. Matthias Weber, 'The Political Control of Large Socio-technical Systems: New Concepts and Empirical Applications from a Multidisciplinary Perspective' in Knut H. Sørensen and Robin Williams (eds) *Shaping Technology, Guiding Policy: Concepts, Spaces and Tools* (2002) 325.
[135] Godet, above n 34, 11.

As well as conforming to Godet's constraints for plausibility, the scenario must be interesting. Fazakerley cites various authors (including van der Heijden, Fahey and Randall, and Lindgren and Bandhold) as saying that no matter what scenario planning methodology is used, the story "must be memorable, interesting and rich in information whilst being creative".[136] This researcher has endeavoured to generate an original story based around precise applications of LBS, creating interest through plot and character while maintaining a rigid adherence to the requirements of plausibility, coherency and transparency.

Several authors say that the naming of scenarios is important and that a name should come from a storyline or theme within the scenario.[137] There is only one scenario presented here, however, it contains a number of different sections and each of these has been named. The title for each part of the scenario describes a major theme within that section.

In terms of the type of scenario developed, it is both exploratory and anticipatory in nature: exploratory in that it draws on present capabilities to describe a likely future, and anticipatory because it is built upon visions of the possible social effects predicted by other researchers.[138] The scope of the scenario is limited to humancentric, urban applications of LBS in an Australian context.

#### *3.3.4 Scenario Planning*

The methodology used to develop the scenario presented in chapter four is scenario planning, using the first three steps of TAIDA[139] as a framework to give structure to the process. TAIDA actually involves five steps, but the last two (deciding and acting) are beyond the scope of this thesis. The first three steps of TAIDA are:

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[136] Fazakerley, above n 130, 79.
[137] Ibid, 86.
[138] Lindgren and Bandhold, above n 31, 168.
[139] Ibid, 38.

- *Tracking:* identifying aspects of the current situation and surroundings that may have an impact on the future under consideration[140]
- *Analysing:* considering the possible future consequences of the aspects identified in the first stage[141]
- *Imaging:* approaching possible changes intuitively to create a plausible future,[142] "to create not only an intellectual understanding but also an emotional meaning".[143]

Tracking was done in part in chapter two, where several existing precise LBS applications were examined and literature pertaining to the possible future effects of LBS was reviewed. The results of this process are also partially presented in chapter four, with footnotes describing the basis for various aspects of the scenario. Analysing takes place in the background – the results of this step are not shown here other than as the basis of the actual scenario. The results of the imaging step are presented in the main part of chapter four as the scenario itself.

#### *3.3.5 Research Relevance*

The findings of this research are relevant to two main groups. First, they apply to those people and organisations involved in or connected to the LBS industry. It is important for such entities to have some vision of where they are headed so that measures can be put in place to ensure a positive outcome, both for them and for society in general.

The second group to which the research is relevant is much broader: the general populace of countries where LBS already exist or may be introduced. Many authors have stressed the need for analysis of possible future implications of technology. These are no modern-day Luddites: even Bill Joy, the respected cofounder of Sun Microsystems, strongly

[140] Ibid, 47.
[141] Ibid, 39.
[142] Ibid, 40, 47.
[143] Ibid, 40.

cautions against blind acceptance of technology-push.[144] It is vitally important for potential consumers to be aware of the implications of their use of precise LBS, and for them to comprehend how widespread use of such technology may impact society in the future.

## 3.4 Data Gathering

### *3.4.1 Sources*

Data are gathered from various sources, the main ones being journals and collections of conference papers. Some online sources are used, however, it is recognised that these usually lack the credibility inherent in peer-reviewed work. Online sources are clearly identified in the footnotes and are largely used to fill out peripheral details in the scenario.

Books are also drawn upon. As there are not enough predictions specifically related to LBS to produce a clear vision of what the future may be like, there is a need to base the scenario on more general predictions about how technology may affect society. In this case, general themes (such as increased surveillance in the workplace) are looked at and related to LBS. There are available books that are relevant to technological predictions in general, such as the compilation of papers *Computerization and Controversy: Value Conflicts and Social Choices*.[145]

### *3.4.2 Timeframe*

A piece of research can be either longitudinal, which requires data to be gathered several times during the study, or cross-sectional, where data is only collected once.[146] This thesis is a cross-sectional study and gives a snapshot of where precise LBS may lead us

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[144] Bill Joy, 'Why the future doesn't need us', *Wired* (April 2000) Vol. 4, Iss. 8 <http://www.wired.com/wired/archive/8.04/joy.html> [Accessed March 19, 2005].
[145] Rob Kling (ed), *Computerization and Controversy: Value Conflicts and Social Choices* (2nd ed, 1996).
[146] Robert Y. Cavana, Brian L. Delahaye and Uma Sekaran, *Applied Business Research: Qualitative and Quantitative Methods* (2000) 122.

based on the view from where we are today. However, the work does lend itself to later longitudinal studies that could show the evolution of both applications and thought, and either validate or contradict the findings of this study.

## 3.5 Data Analysis

### *3.5.1 Content Analysis*

Since the research conducted in this thesis takes a qualitative approach, gathered data is analysed and presented in chapters two and four via a process of content analysis. This involves dividing data into sub-issues or sub-themes within the topic area.[147] To aid in identifying the current state of development, each work found was placed in one of the following categories: enabling technologies, existing precise LBS applications, or consideration of future societal impacts. The existing applications category was further divided into tagging, tracking, and tracing, where each division is an exploration of existing and potential applications of precise LBS in that area. Organisation by application theme was selected as a better method to aid investigation and analysis than organisation by specific individual applications. This is similar to the approach taken by Masters in her relevant work on humancentric applications of RFID.[148]

### *3.5.2 Deconstruction*

Analysis of the scenario is conducted using deconstruction to draw out the social, legal, ethical and technological implications. Deconstruction is an approach to literary analysis that aims "to create an interpretation of the setting or some feature of it to allow people … to have a deeper understanding".[149] The object is to draw out the meaning of the text through interpretation.[150]

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[147] Ibid, 171-175.
[148] Amelia Masters, *Humancentric Applications of RFID: The Current State of Development*, Honours thesis, University of Wollongong (2003) 29.
[149] Martha S. Feldman, *Strategies for Interpreting Qualitative Data* (1995) 1.
[150] Patrick Hogan, *On Interpretation: Meaning and Inference in Law, Psychoanalysis, and Literature* (1996) 9.

Deconstruction as an analytical tool is usually used to expose the ideological limits of the author by examining what is said, what is omitted, and how dichotomies are used to present a particular viewpoint.[151] However, in this case, these techniques will be used to look at the underlying issues presented through the narrative. The methodology will be implemented by looking at events in the scenario and considering the issues that underpin those events.

Hermeneutical analysis was considered as a way of analysing the scenario, but if this methodology were used there would be too much emphasis on grammatical and technical interpretation rather than on drawing out the underlying issues. Deconstruction is focused on what has happened rather than how the outcome has occurred.[152] Hermeneutical analysis would be more concerned with exposing by what literary techniques certain events or views are constructed, and with giving a "complete understanding of the author's personal style".[153] This is not the focus of the analysis – the aim is to look at the social and ethical issues that are presented. For this, deconstruction is a more appropriate methodology.

## 3.6 Conclusion

This study has been designed to explore the possible future consequences and societal impacts of the widespread use of humancentric precise LBS. This chapter has described exactly how this is achieved and how the research is carried out. It has set forth the protocols that are followed in the qualitative content analysis of relevant works, scenario development and discussion of societal implications. The following chapters implement the techniques that have been outlined here.

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[151] Feldman, above n 149, 51.
[152] Ibid, 66.
[153] Ronald Bontekoe, *Dimensions of the Hermeneutic Circle* (1996) 28.

# Chapter 4: *Control Unwired*

*'The skill of writing is to create a context in which other people can think.'*

Edwin Schlossberg[154]

## 4.1 Introduction

This chapter presents the scenario that was developed through the TAIDA scenario planning framework described in chapter three. It is a plausible future scenario, grounded in the realism of today's technological capabilities. Footnotes and references are included for two reasons: to explicitly show that the technologies and applications described are feasible, or near feasible, within the current state of development of LBS; and to show that the events which occur are entirely possible. The title *Control Unwired* was chosen to represent a key issue that presents itself repeatedly throughout the scenario. The name of each section within the scenario arises from a major theme in that section.

## 4.2 Vulnerability

When Kate stepped out of the foyer and into the night, she was hit by a blast of chilly air. It was a bitter, spiteful evening, the cool breeze channelled and intensified by a tunnel created by the surrounding tall buildings. Visible between the looming structures was a slash of sky pricked with cold, hard little stars.

Kate was a young woman, attractive, in the way that most women of her age are, with smooth skin and a nubile young body whose sensuousness was not entirely hidden by a grey suit jacket.

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[154] Michael Moncur in *The Quotations Page* <http://www.quotationspage.com/quote/30527.html> [Accessed September 15, 2005].

The street appeared to be deserted. Kate wasn't surprised – this part of the city always quietened down at night, especially on weekday evenings like this one. There wasn't much around except for office buildings and coffee shops that served to provide a steady stream of caffeine to the office workers. It certainly wasn't the nicest part of the city, but the up-and-coming law firm she scored a job with straight out of university would be relocating to the central business district in a month or two.

Kate fished her PDA[155] out of her bag. Pressing a few buttons, she navigated through the on-screen menu to the *Services* option, then to *Call a Taxi*.[156] The device beeped at her, flashing the message: *No signal available.*[157]

Kate swore, shoving the PDA back into her bag. The surrounding buildings must have been blocking the signal from the GPS satellites.[158] She knew she needed to get to a more open area.[159]

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[155] Some existing PDAs, such as the Navman PiN [Navman, *PiN* <http://www.navman.com/land/products/pin/index.html> Accessed September 17, 2005], include GPS capabilities. Even run-of-the-mill PDAs can be GPS enabled via connection to a receiver. For example, CompactFlash card receivers like the GlobalSat BC-307 [FileSaveAs, 'CF Card GPS for PDA', *FileSaveAs* <http://www.filesaveas.com/gpscfcard.html> Accessed September 17, 2005] simply plug into a PDA's CompactFlash card slot. However, as GPS capabilities for mobile devices become more in demand, it is likely that such functionality will more commonly be inbuilt.

[156] The NAVFONE software available in Singapore allows a user to book a taxi directly from their mobile phone. The user selects a location on a map and simply hits the option "Book a Taxi Here" [Agis, *Agis Develops Real Time Location Service for Savvy Mobile Phone Users* <http://www.asiagis.com.sg/agis/pdf/Navfone_Press.pdf> Accessed September 18, 2005].

[157] In order to give precise location information, GPS needs line of sight (LoS) to at least three of the 24 GPS satellites orbiting the Earth. The user's position is triangulated (or more correctly, trilaterated, as distances are used rather than angles) by calculating the distance from each of three satellites to the receiving unit. Distance is determined by timing how long it takes the signal to travel from the satellite in space to the receiver on Earth [Trimble, *How GPS Works* <http://www.trimble.com/gps/how.html> Accessed September 18, 2005].

[158] GPS does not provide ubiquitous coverage. In many places LoS to three GPS satellites is not available (e.g. in tunnels, or under dense foliage). Urban canyons, which occur in streets lined with tall buildings, present this problem. A complicating factor in urban canyons is that a receiver may pick up several "versions" of the same signal – one LoS, and others that are reflections of that signal from surrounding structures. The GPS receiver must determine which signal is LoS or positional accuracy suffers significantly [Saul Dooley and Paul Gough, 'Software integration lowers the cost of A-GPS', *WirelessWeb* (2005) <http://wireless.iop.org/articles/feature/6/8/7/1> Accessed September 22, 2005].

*What a pain*, she thought. *They overload me with cases, expect me to stay late, and then the goddamn gadget they give me to get home doesn't work.*

Although Kate was irritated more than anything else, there was a niggling sort of apprehension in the pit of her stomach. She felt alone – very alone, and not at all comfortable being by herself, at half past ten in the evening, in a deserted and unfamiliar place.

Shaking off the uneasiness, she berated herself. *Get a grip, Kate. You're not a child.*

As Kate strode off, a dark shadow detached from a nearby alleyway. It had a narrow, pointed nose and a chin full of stubble. It followed, silently, at a distance, keeping out of the dim pools cast by the streetlights.

Unfortunately, Kate didn't know which direction she should go to find a clear space for her PDA to get a fix on her location.

*If I keep heading the same way*, she thought, *I'm bound to find somewhere sooner or later.*

The surrounding structures were slightly lower here,[160] the taller office blocks just down the road. As Kate walked, the breeze fluttered her skirt against her thighs. The shadow some way behind flickered in the wind too, as though it were wearing a long coat, or as if lit by a guttering candle. It followed stealthily, steadily decreasing the distance between itself and Kate.

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[159] Limiting the view to the horizon is the most significant impact of urban canyons on the ability of a GPS-enabled device to determine its location [Ibid].

[160] Low-profile urban structures are more likely to allow a GPS receiver LoS view to minimum three satellites required for accurate positioning.

Suddenly, Kate's PDA bleeped for attention. Kate pulled it out of her bag again and read the message on the screen: *Signal acquired.*

'Finally,' she breathed. Quick fingers navigated back to the *Call a Taxi* command. The PDA gave a comforting reassurance that a taxi was on its way, with an estimated arrival time of less than a minute.[161]

The shadow hung back, unsure, watching.

Within thirty seconds of making the call, a taxi veered out of nowhere and pulled to an abrupt stop alongside Kate. She opened the door and slid into the back seat.

As the taxi pulled away, the shadow shifted slightly and melted back into the darkness.

## 4.3 Liberty

The next day, the weather was gorgeous. It was the sort of spring morning where the sky was clear and the sun warmed the earth, but there was a refreshing briskness in the air reminiscent of the cooler months.

In a house in Sydney's suburbs, the sun filtered into an east-facing bathroom window, where a man stood studying himself in the mirror.

Slight lines crinkled the skin near his eyes and mouth. His hair was still quite thick and healthy, but flecked with the salt-and-pepper grey of an aging man. His eyes burned with all the curiosity and intelligence they had when he was much younger. Although Colin was well past his sixtieth birthday, he could have easily passed for a man in his fifties.

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[161] Singapore, for example, has had a GPS-based taxi despatch system in place for years. Customers can order a taxi without having to speak to an operator, and are provided with estimated pick-up time information based on the taxi's location at the time of booking [Sigtec, *Sigtec Media Release: TIBS Taxis* <http://www.sigtec.com.au/news/older/prTIBS.htm> Accessed September 18, 2005].

Suddenly, the telephone rang. Colin paused for a moment, listening – the ring only sounded in the bathroom.[162] The kitchen, bedroom and lounge room were all silent.

'Even the damn phone knows where I am,' he muttered, shaking his head. He fingered the hard lump of the RFID tag that was stitched into the hem of his shirt.[163] 'Bloody Helen.'

Colin stabbed at an unobtrusive button on the bathroom wall,[164] and his reflection instantly gave way[165] to the face of an attractive woman with bobbed blonde hair[166] – Helen, his wife, calling from the airport in Hong Kong.

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[162] In his book *The Road Ahead*, Bill Gates describes the house he is building. People wear electronic pins, so that the house "knows" where the occupants are at any time. Only occupied rooms are lit, music can follow you around the house, and "[i]f you get a phone call, only the handset nearest you will ring." [Bill Gates with Nathan Myhrvold and Peter Rinearson, *The Road Ahead* (1995) 218-219].

[163] There are currently existing applications of RFID tags embedded in clothing, although mostly for industrial laundering and the like – tracking the clothes rather than the people who wear them. For example, Star City Casino in Sydney has RFID tags in every article of its staff uniforms. The tags are located in the hem or collar of a shirt, and for trousers they are sewn into the waistband. They are used to track uniform inventory from the point of issue, through every laundering process, to the end of each garment's life [Accenture, *Silent Commerce Chips Away at Star City Casino Wardrobe Worries* <http://www.accenture.com/xdoc/en/services/technology/vision/Star_City_Casino_Final.pdf> Accessed September 22, 2005]. TAGSYS produces RFID solutions like the Ario tag for just such applications. The Ario is just over 2cm in diameter and less than 3mm thick [TAGSYS, *TAGSYS RFID Products* <http://www.tagsysrfid.com/eng/rfid/tagsys_produit/rfid_tag-4-1-1.html> Accessed September 22, 2005], inconspicuous on the inside of an article of clothing. In this scenario, the idea is extrapolated to tracking the person inside the clothes. As described in the literature review, RFID may have to be combined with other technologies like infrared transmissions to make such applications feasible.

[164] This is an example of ubiquitous computing, where computing devices are everywhere but are unobtrusively embedded in the environment [Lin, Lu and Shih, above n 114, 42]. Colin can simply hit the near-invisible button on the bathroom wall to answer a phone call, without even being aware of the complex processes taking place in the background.

[165] This is similar to M-Design's InvisiSound Mirror Frame, which is designed to fit over flat-panel displays. It reflects the room just like a mirror when the display is off, but allows images from the display behind to permeate when required [Monster Cable, 'Elegant. Beautiful. Invisible. Amazing. The award-winning Flat Screen InvisiSound Mirror Frame makes home theater audio and video disappear', (January 10, 2005) <http://www.monstercable.com/press/press_result.asp?pr=2005_01_Frame.asp> Accessed September 20, 2005].

[166] There has been a steady growth in interest in videoconferencing over IP (Internet Protocol), and current applications offer broadcast-quality reception [Greg McArthur, 'Videoconferencing Over IP – The Switch is On', *Business Communications Review* (Sep. 2004) <http://www.bcr.com/bcrmag/2004/09/p62.php> Accessed September 20, 2005].

‘Oh sweetheart, you look tired.’ Helen sounded concerned.

Colin shrugged. ‘I don’t feel tired. I think I just need to get some fresh air.’

‘Open the window, then. It might make you feel better.’

Colin thought that what would make him feel better was a nice long walk without his wife checking up on him every five minutes.

‘You haven’t been to the cupboard yet,’ Helen said. ‘Did you remember to take your tablets at lunchtime?’

‘Yes,’ he sighed. ‘I got them out when I took the morning medicines.’ Colin frowned. ‘Why don’t you stop pussyfooting around and just inject me with one of those continuous drug delivery[167] things?’

Helen smiled. ‘Great idea,’ she teased. ‘We could put a tracking chip[168] in it too. Two birds, one stone.’

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[167] Research is being conducted into “smart pills” that reside in a person’s body and deliver drug dosages as required by the body of the patient. The drug reservoir is made from special polymers and the pill’s sensor is based on molecular engineered proteins [Marc Madou, *BioMEMS/BioNEMS: Research in the laboratories of Marc Madou* (2003) <http://www.inrf.uci.edu/research/marcmadou.pdf> Accessed September 19, 2005].

[168] A wearable or implanted tracking chip can be linked to a geographic information system (GIS) to plot a person’s location on a map. This could include a blueprint of the house, allowing someone to monitor where a person is in the building, as well as which rooms they have visited and how long they have spent in each one. An example of a similar application comes from Norway, where GIS was used to monitor hunting activity. Several ptarmigan birds were fitted with radio transmitters to get an idea of their range. Hunters carried GPS units that updated their own positions every minute, and were instructed to mark the location every time they killed a bird. This allowed researchers to plot the paths of the hunters on a map of the region, and to generate a count map of bird kills. Strangely enough, the study found that the further a ptarmigan lived from the hunting cabin, the better its chances of survival [Henrik Brøseth and Hans Chr. Pedersen, ‘Hunting effort and game vulnerability studies on a small scale: a new technique combining radio-telemetry, GPS and GIS’, *Journal of Applied Ecology* (Feb. 2000) Vol. 37, Iss. 1, 182].

'At least then I wouldn't have to wear this stupid bracelet.[169] They're made for kids,[170] Helen.' Colin knew his wife was joking, but the truth was that he often did feel like a recalcitrant child these days.

'Well,' Helen replied, 'If you didn't insist on being so pig-headed, you wouldn't have to wear it. I was terrified when you collapsed. I'm not going to let it happen again. This way I know you're not gallivanting about without someone to look after you.'[171]

'Ever considered that I can take care of myself? I'm not a child.'

'No, you're not. And you're not a young man either,' Helen admonished. 'You need to accept that with your condition, it's just not safe to be going off by yourself. What if something happened to you? Who would know? How would we find you?'

'I feel like a prisoner in my own home, Helen. I can't even take the thing off without you knowing about it.[172] You know they still use these for prisoners?'[173]

'Parolees, dear.[174] And they're anklets.' She leaned in closer to the screen. 'Someone needs to take care of you, Colin. If you won't, I'll damn well do it myself.'

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[169] This is an example of wearable technology. There are many other possibilities for wearable technology, specifically in the form of "digital jewellery", such as speakers hidden in a pair of earrings, a microphone that functions as a tie pin, or a ring that also serves as a trackpad. Wearable computing needs to be designed to "not only meet our functional requirements but also our social, emotional and aesthetic needs" [Cameron S. Miner, Denise M. Chan and Christopher Campbell, 'Digital Jewelry: Wearable Technology for Everyday Life', *CHI '01 Extended Abstracts on Human Factors in Computing Systems* (March 2001) 45].

[170] Products such as the KinderGuard Personal Locator System and the Wherify Wireless Wherifone are specifically targeted at concerned parents who want to keep tabs on their children. The Wherify Wireless Wherifone and Personal Locator even come in several "cool colours" for children [Wherify Wireless, *Wherify's GPS Wherifone* <http://www.wherifywireless.com/univLoc.asp> Accessed September 22, 2005].

[171] This is an instance of a care-related application of RFID and LBS [Masters, above n 148, 22].

[172] This is a reference to the "unlock alarms" that can be set on personal locator devices like the Wherify Wireless Personal Locator and the KinderGuard Integrated Biometric Sensor and Personal Locator System.

[173] An example of LBS for parolees is the NSW implementation of monitoring for convicted child sex offenders, as described in chapter two.

Colin sighed. ‘You just don’t understand what it’s like to be getting… older. Not being able to do everything you used to. Being betrayed by your body. It’s bad enough without you babying me along like some kind of octogenarian invalid.’

‘Well, I guess that’s the downside to marrying a woman almost twenty years younger than yourself,’ Helen grinned.

‘The only downside.’ Colin smiled back at her, but his heart wasn’t really in it. They had been through this argument countless times before.

He changed the subject. ‘Heard from our dear daughter lately? Or Scott?’

‘Kate called me last night. She’s doing well.’

‘How’s her new job?’ Colin asked.

‘Well, she says she enjoys it, but she’s working very long hours,’ Helen replied. ‘Besides that, she has to walk quite a way down the street before she can call a taxi. She’s right in the middle of a dead zone for the GPS.’ [175]

Colin didn’t know what a dead zone was, but it sounded bad. ‘And I bet you’re worried about her being alone in the city at night for five minutes.’

Helen gave a self-conscious smile. ‘It’s not a very nice area. I’ll feel much better about her working late when the firm moves closer to the CBD.’

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[174] Various types of locked-on devices are currently used to monitor parolees in several countries around the world. They are also used for people serving home-imprisonment sentences, so Helen is not completely correct in contradicting Colin.

[175] “Dead zone” refers to the urban canyon effect described earlier. A dead zone (where GPS is not effective) can occur anywhere that GPS satellite signals are blocked, such as in thickly wooded areas, in tunnels and inside buildings.

‘And Scott?’

‘Haven’t heard from him. He’s back in Sydney now, though. I wish he’d call.’

‘Maybe if you weren’t always pestering him to marry his girl from Melbourne, he’d call more,’ Colin grinned.

Helen glanced up, away from the screen.

‘Sweetheart, I have to go – they’ve just given the final boarding call for my flight. Enjoy the rest of your day. I’ll see you when I get home tonight.’ She blew a rather distracted kiss at the screen, then it went blank.

Colin’s shoulders sagged. Alone again.

He shuffled into the kitchen to make breakfast. Helen had left him skim milk and pre-packaged porridge oats.

‘Wow,’ he muttered. ‘Cosmic Blueberry or Bananarama? Such decisions.’

The microwaved glop tasted bland, contrary to the promise of the exciting flavour name.

Just as Colin was finishing off the last few spoonfuls, the watch on his wrist emitted a low beep. He glanced at the screen: *Low battery – critical.*

Colin smiled. The device had been flashing low battery messages intermittently since yesterday evening. It had less than three days’ standby time, and being on a business trip, Helen wasn’t around to make sure it got recharged.[176]

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[176] Personal devices such as the Wherify Wireless personal locator and KinderGuard do not appear to provide remote low-battery alerts. There are, however, other devices that have this capability, such as the

The screen on the little device winked out.

Munching on his porridge, Colin reached over to the cutlery drawer and took out the kitchen scissors. Very carefully, he snipped out a neat little rectangle from the hem of his shirt. The RFID tag came with it.[177]

He swallowed down the rest of his breakfast and tossed the tag onto the counter.

Colin was going for a walk.

He stepped outside, sauntering up the driveway. No alert went out to Helen.[178] No neighbours came hurrying to see what he was doing. He revelled in the possibility of heading out without someone watching his every move,[179] without a babysitter to tell him when he'd had enough excitement for one day.

Colin wandered off, his own man, if only for a morning.

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location tracking module provided by Fleet Management Solutions (FMS). This system is largely for marine applications and will automatically send a low-battery alert weeks in advance of needing a charge [Environmental Studies, *GPS Marine Tracking Systems / Vessel Tracking* <http://www.environmental-studies.de/GPS/GPS-tracking-systems/Marine-Tracking/marine-tracking.html> Accessed September 18, 2005].

[177] Luggable technologies, such as PDAs, are very easily separated from a person. Wearable technologies can also be removed, but with more difficulty (an advantage to this is that they cannot accidentally be left behind). Implants are largely permanent and are about as close as computing technology can get to the human body – *inside* it.

[178] Helen is likely to have set a geofence in the immediate vicinity of the house, with an alert being tripped if Colin moves outside this predefined area. This is taken from Dobson and Fisher's 'Geoslavery' article [Dobson and Fisher, above n 26, 49].

[179] With RFID tracking in a closed environment such as the home, it is possible to monitor which rooms a person visits and how much time they spend there – even where they move within that room. A "breadcrumb trail" can be complied from this information, depicting a person's movements over a long period of time. The same can be done outdoors with a GPS locator – for example, the Wherify Wireless Personal Locator (commercially available today) allows a concerned parent to set it to leave a breadcrumb trail. The trail is plotted on both a street map and an aerial photograph. Accessing these maps via Wherify's Internet site, the parent can view a variety of zoom levels, from the entire country down to an area of about 1.5 $km^2$. Each breadcrumb is numbered chronologically so that it is simple to identify the first locate, second locate and so on [Jeff Dodd, 'Parents & Technology: The Wherify GPS Personal Locator Offers Help But Fails to Protect', *General Computing* (Feb. 2004) Vol. 15, Iss. 2, 35].

## 4.4 Society

'Hey Janet. Sorry I'm late.' Scott slid into the other seat at the table.

Janet sighed, pushing a latte and a sandwich towards him. She'd already finished her coffee. She gestured to her PDA. 'These gadgets do everything. They compare our schedules, pick a place convenient to both of us, make sure there's something vegetarian on the menu for me, and book a table.[180] Pity they can't get you here on time too.'

'I'm sure it's on the horizon,' Scott joked. 'So how's life in the Sydney office?'

'All right. The weather makes a nice change – I'm starting to get used to seeing sunshine in spring. How about your parolees?'

Scott laughed. 'There's a lot more of them. In Melbourne I had fifty or sixty cases at once. Now I've been allocated more than a hundred.' He bit into his sandwich. 'With less parole officers able to handle more cases, I guess I'm lucky to have a job,'[181] he continued with his mouth full.

Janet raised her eyebrows. 'With a lot of women intolerant of bad table manners, you're lucky to have a girlfriend. I assume the workloads are greater because they use those chips here?'

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[180] This is similar to one of the scenarios that Lin, Yu and Shih use to illustrate the uses of pervasive commerce (p-commerce). One of their scenarios involves two people, John and Nancy, at different stores in a mall wanting to meet up for lunch. Their intelligent devices identify their locations and when they are likely to be ready, and present a list of nearby restaurants that could be reserved for lunch in 20 minutes [Lin, Lu and Shih, above n 114, 166]. This idea has been extended here to filtering restaurants by available menu selections – a plausible extrapolation.

[181] There is strong competition for available parole officer positions with the Department of Corrective Services in NSW [Department of Education, Science and Training, 'Probation Officer/Parole Officer – NSW/ACT', *Job Guide 2005* (2005) <http://jobguide.thegoodguides.com.au/statespecific.cfm?jobid=615&state_id=NSW> Accessed September 24, 2005].

'The *caseload* is greater, the workload is the same – yeah, because of the chips.'[182] He smiled. 'It's crazy that NSW is already trialling these tracking implants,[183] while Victoria's only recently got a widespread implementation of the anklets. They've been around for years. They're commercially available now too. Mum's got Dad wearing a tracking watch now, for peace of mind after the whole angina scare.

'But the implants are much better,' Scott continued. 'Who wants a chunky anklet or bracelet that makes you look like collared freak? I'll bet it's really disconcerting having people stare at you suspiciously in the street, knowing that you're a criminal. It kind of defeats the purpose of parole – the idea is rehabilitation, reintegration under supervision. That's why the implants are so good – there's no stigma attached. No one can even tell you have one. And they're harder to remove, too.'

'I don't see what the big deal is,' Janet replied. 'Why not just keep people under lock and key?'

'Resources. It costs a lot to keep someone imprisoned, but the cost drops significantly if you imprison them in their own home instead.[184] It's about overcrowding, too – jails everywhere have had an overcrowding problem for years.[185]

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[182] Electronic monitoring may allow parole officers to take on more cases than was previously possible because some of their normal duties can be automated. However, it must be remembered that technology is merely a tool – electronic monitoring is not a substitute for parole officers [American Probation and Parole Association, *Electronic Monitoring* (1996) <http://www.appa-net.org/about%20appa/electron.htm> Accessed September 25, 2005].

[183] The "tracking implants" referred to here are subdermal GPS-enabled personal locators – implantable GPS tracking devices. Although such technology is not currently available, it may not be far off. Applied Digital Solutions (the same company that developed the VeriChip) has announced a working prototype of this type of device. The prototype is quite large – about 5cm long and 1cm deep – but the company expects to be able to miniaturise the implant to the point where it is about the size of a grain of rice [Applied Digital Solutions, *Applied Digital Solutions Announces Working Prototype of Subdermal GPS Personal Location Device* (2003) <http://adsx.com/news/2003/051303.html> Accessed September 21, 2005].

[184] One NSW report stated that the daily cost of full-time imprisonment for one person was around $177 in maximum security, compared to $30 for home detention [NSWLRC, *NSWLRC Report 79: Sentencing* (1996) 17]. Using home detention rather than imprisonment equates to a saving per offender of $53,655 each year.

'I also think electronic monitoring and parole are much better in terms of rehabilitation,' Scott went on. 'People can change.[186] Often they've committed a fairly minor crime,[187] then they go to prison, get mixed up with worse crowds. It can be pretty rough in there. There is certainly a danger that by imprisoning people with "harder" criminals, you run the risk of corrupting them further and exacerbating the problem.[188]

'On parole, they can still go to work and earn money, be productive members of society, get their lives back.[189] But they're watched, very closely – the tracking systems alert us if anything looks off. It's imprisonment without prisons.'

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[185] "Overcrowding is endemic to the Australian prison system … Despite [a] significant number of new prisons built in the 1990s most Australian prison systems were operating above optimal capacity in 1998-99 and some like WA, SA and Qld were well above capacity" [David Brown et al, *Criminal Laws* (3rd ed, 2001) 1468].

[186] "Parole is rooted in the fundamental belief that offenders can be motivated to make positive changes in their lives." [American Probation and Parole Association, *Discretionary Parole* (2002) <http://www.appa-net.org/about%20appa/discretionary_parole.htm> Accessed September 25, 2005].

[187] A study of a two-year electronic monitoring trial program for parolees in the U.K. found that 89 percent of low-to-medium risk parolees completed their parole successfully. This was compared with 82 percent for medium-to-high risk parolees and 75 percent for high risk [Darren Sugg, Louise Moore and Philip Howard, 'Electronic monitoring and offending behaviour: reconviction results for the second year of trials of curfew orders' (2001) <http://www.probation.homeoffice.gov.uk/files/pdf/r141[1].pdf> Accessed September 24, 2005].
Technologies such as GPS monitoring are more likely to be used in higher-risk cases. For example, the New Zealand Department of Corrections states that "electronic monitoring will only be appropriate for a small number of high-risk cases where it is deemed that an offender's successful reintegration into the community would be enhanced by the close monitoring the technology allows" [Department of Corrections – New Zealand, *Electronic Monitoring* (Dec. 2004) <http://www.corrections.govt.nz/public/aboutus/factsheets/reducingreoffending/electronic-monitoring.html> Accessed September 25, 2005].
When parole was first introduced to Australia in 1966, the element of risk inherent in such a system was recognised by the legislature. However, this was balanced against the same risks which are present when an offender is released into the community, unsupervised, at the end of his or her sentence. Parole seeks to limit community risk by promoting rehabilitation [Law Reform Commission NSW, 'Chapter 7: Parole' *Discussion Paper 33(1996) – Sentencing* (1996) <http://www.lawlink.nsw.gov.au/lrc.nsf/pages/DP33CHP7> Accessed September 25, 2005].

[188] Jails are often places where inmates learn more about crime than socially acceptable behaviour. Some prisoners are also vulnerable to brutalisation from other prisoners or even from prison officials. This can produce an embittered person who, upon release, goes on to commit far worse crimes than those for which they were originally incarcerated [Brown et al, above n 185, 1469].

[189] Ostensibly, the main rationale for parole is the community benefit that stems from the rehabilitative effects of supervised, conditional early release. However, it seems apparent that at least part of the reason

Janet smiled. ‘That’s very *Alice in Wonderland*. When the Cheshire Cat disappears – how does it go? “I’ve often seen a cat without a grin, but a grin without a cat is the most curious thing I ever saw in all my life!”’

Scott laughed. ‘I suppose you could compare it to that.’ He noted Janet’s sceptical look. ‘It’s not like we’re turfing people out of jails willy-nilly. There is a pretty thorough system in place to determine who gets paroled and who doesn’t.’

‘So how does that work?’ asked Janet.

‘Well, a while ago it was mainly based on crime-related and demographic variables. We’re talking stuff like what sort of offence they’re doing time for, the types of past convictions on their record, age, risk of reoffending.’[190]

She nodded.

‘Now a bunch of other things are looked at too,’ he continued, finishing off his sandwich. ‘It’s a lot more complex. Psychological factors play a big part. Even if someone displays

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for parole is economic – the costs to the government and community of imprisonment are fairly obvious [Law Reform Commission NSW, above n 187]. One of the most significant advantages of parole and home imprisonment is that they allow the offender to work and pay taxes (and possibly even pay for their own monitoring costs), reducing the burden on the rest of society [National Law Enforcement and Corrections Technology Center, ‘Keeping Track of Electronic Monitoring’, *National Law Enforcement and Corrections Technology Center Bulletin* (Oct. 1999) <http://www.justnet.org/pdffiles/Elec-Monit.pdf> Accessed September 25, 2005].

[190] When considering whether or not to make a parole order, the NSW Parole Board is bound to consider a number of matters under s135(2) of the *Crimes (Administration of Sentences) Act 1999*. These issues include the offender’s previous convictions, the offender’s conduct in serving his or her sentence so far, and the likelihood that the offender will be able to adapt to normal community life. The Board must also consider reports prepared by or on behalf of the Crown in relation to the granting of parole [New South Wales Council for Civil Liberties, *Parole, Sex Offenders and Rehabilitation Programs* (Feb. 2003) <http://www.nswccl.org.au/docs/pdf/Parole_SexOffenders_Note.pdf> Accessed September 25, 2005]. It is assumed that such reports may take additional factors into account besides those listed in the *Crimes (Administration of Sentences) Act 1999*.

fairly antisocial traits, they're still considered pretty low risk as long as they don't also show signs of mental illness.'[191]

'So prisons are the new asylums?' Janet frowned.

'Not quite. I see your point, but there has to be some sort of system. It's not like the 18th century madhouses – people get treatment. And really dangerous criminals, like violent murderers, are still under physical lockup.'

'What about terrorists?' Janet argued. 'How can you guarantee that there won't be another incident like the Brisbane rail bombings?'[192]

'Like I said, anyone considered really dangerous is still kept in a regular prison,' Scott said. 'All the major landmarks and places people congregate[193] in Sydney are tagged anyway.[194] There's no way a convicted terrorist would get within cooee of anything worth attacking.

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[191] This idea comes from a paper about predictive models of inmate misbehaviour in institutions, but has been extrapolated to misbehaviour on parole [Soo Jung Lee and John F. Edens, 'Exploring Predictors of Institutional Misbehavior among Male Korean Inmates', *Criminal Justice and Behaviour* (Aug. 2005) Vol. 32, No. 4, 412, 412-414].

[192] This part of the scenario was actually written before an apparent al-Qaeda video threating a terrorist attack on Melbourne came to light. The idea of "Brisbane rail bombings" was based on the London rail bombings, as well as terrorist attacks in other places such as Spain. It was speculated after the tape mentioning Melbourne appeared that the Commonwealth Games, to be held in 2006, may be a target. However, as the Victorian Opposition leader Robert Doyle says: "All of the attacks we have seen so far have happened on everyday lives, people catching public transport to work, not on major events. Major events tend to have heightened security" [AAP, 'Terror tape targets Melbourne', *The Australian* (September 12, 2005)]. Like in London, it is more probable that any terrorist attack in Australia would be directed at part of the public transport network or similar.

[193] Michael and Masters postulate that key infrastructure and other important areas could be tagged using a geographic information system (GIS). Active devices carried or worn by people could be polled in the event of an emergency to see who is in the area [Katina Michael and Amelia Masters, 'The Advancement of Positioning Technologies in Defence Intelligence' in Darryl Essam and Hussein A. Abbass (eds), *Applications of Information Systems to Homeland Security and Defense* (2005) 193, 201].

[194] This is an example of tagging LBS as described in chapter two.

'And you know that governmental powers now allow "persons of interest" to be implanted as well.[195] No one even remotely suspicious would get anywhere near a major landmark, business or tourist centre without alarm bells going off all over the place.'

Janet shook her head. 'I'm all for preventing terrorist attacks. But implanting people who haven't committed a crime? How far will they take it? What if the government decided that we should just track everyone, to be on the safe side?'

Scott shrugged. 'I guess we just need to find a nice balance between personal freedom and national security.'

He glanced at his watch and pushed his chair back. 'I need to get back to work,' he said apologetically.

## 4.5 Security

Scott paused on the landing in front of Doug's apartment and braced himself. Doug was his last visit of the day. Scott was a fairly likeable guy and had a rapport with most of his cases, but Doug, convicted of sexual assault,[196] was different. He was a sleazebag.

Scott knocked on the door.

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[195] This was written two days before the Australian government announced new anti-terrorism laws, which among other things allow people reasonably suspected of being involved in terrorism to be tracked and monitored for up to 12 months [Narda Gilmore, 'PM defends anti-terrorism laws', *Lateline* (September 8, 2005) <http://www.abc.net.au/lateline/content/2005/s1456384.htm> Accessed September 22, 2005].
In a rather prophetic statement, Michael and Michael say in their 'Microchipping People' article: "If terrorism attacks continue to increase in frequency, there is a growing prospect of the use of chip implants for identification purposes and GPS for outdoor tracking and monitoring." [Michael and Michael, above n 23, 25].

[196] It may seem strange that someone convicted of a potentially violent crime such as sexual assault would be allowed into the community on parole, but it is certainly not unusual. In the U.S., for example, "[o]n any given day in 1996, nearly 60 percent of offenders convicted of rape or sexual assault were on probation or parole rather than incarcerated" [Anne Morrison Piehl, Bery Useem and John J. DiIulio, 'Right-Sizing Justice: A Cost-Benefit Analysis of Imprisonment in Three States', *Civic Report 8* (Sept. 1999) <http://www.manhattan-institute.org/html/cr_8.htm> Accessed September 24, 2005].

A few seconds passed, then it opened a fraction and a stubbled face peered out. Doug had a face like a weasel, all angular features and dark little eyes. He wore a stained long-sleeved shirt and ratty jeans.

'Scott,' he sneered. 'So nice of you to drop by.'

'Let's just do this, Doug.'

Scott followed Doug into the living room. He pulled out a small device[197] and waved it up and down the man's left arm. It beeped and Scott checked the screen.

'Your chip seems fine,' he said. 'Just a routine check – we like to do one every now and then to make sure everything's okay. Congratulations on your new job, by the way. How do you like house painting?'

'My true fucking calling,' Doug leered.

'Er… great. Keep it up then. With good behaviour like this you'll be done in no time.'

Doug just smiled.

## 4.6 Anonymity

Doug waited more than two hours after Scott left before removing his shirt. He peeled off the electrical tape covering an ugly, ragged scar on his upper arm.[198] The scar wasn't from the chip's implantation, but from the deep cut Doug had made to remove it.

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[197] This device is an RFID scanner, used to read the information stored on the RFID implant. Doug's GPS implant may be combined with an RFID chip for identification.

[198] Existing human-implantable devices such as the VeriChip are normally inserted under the skin of the upper arm, or sometimes the hip [Julia Scheeres, 'Tracking Junior With a Microchip', *Wired News*

The tiny chip – smaller than a grain of rice – was stuck to the back of the tape. Gingerly, he set it on the table in front of the TV and smiled. His chip was having a night in.

He was going out.

Doug pulled his shirt back on and shrugged into a long coat.

He knew there would be a young woman in a grey suit leaving work soon. She worked in the law firm that was hot shit in the news. *Dumb really,* he thought, *that she's not afraid to wander the streets in that part of town at night, alone. Smart bitch like that should know better.*

The stairwell was quiet. He slipped out into the darkness, a shadow among the other shadows.

He wanted to pay that attractive little lawyer a visit before she caught her taxi home.

## 4.7 Conclusion

The scenario presented here is intended to be plausible and completely transparent – the extensive footnotes aim to show that the various aspects of the story are based on real research and real possibilities. However, there is a lot more to *Control Unwired* than the footnotes alone indicate. Each section title draws attention to a major issue within that part of the scenario, whether it be the potential vulnerability of a person over-reliant on LBS, or aspects of society that contribute to the popularity of location monitoring technologies. The scenario raises a significant number of legal, social, ethical and technological issues that go far beyond the themes of the section titles. These issues are identified and discussed in the next chapter.

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(October 10, 2003) <http://www.wired.com/news/technology/0,1282,60771,00.html> Accessed September 24, 2005].

# Chapter 5: Legal, Ethical, Social and Technological Issues in LBS

*'What we call "Progress" is the exchange of one nuisance for another nuisance.'*

Havelock Ellis[199]

## 5.1 Introduction

This chapter consists of an analysis of the scenario, *Control Unwired*, presented in chapter four. As described in chapter three, the analysis is based on deconstruction. The aim here is to draw the main themes out of the work by examining the events that occur and how the characters interact with LBS. The first part of this chapter looks at the various implications that arise from the scenario, including legal, ethical, social and technological issues. Secondly, it shows the positive and negative aspects of LBS for three different types of users. The analysis culminates in a discussion and diagrammatic representation of the LBS trade-off between privacy and security, and the presentation of a framework for issues in LBS.

## 5.2 Legal and Ethical Issues

The widespread use of LBS creates a veritable minefield of legal and ethical issues that need to be addressed. Although they are really separate categories, it makes sense here to discuss legal and ethical issues in conjunction with each other. So many of the legal concerns posed are grounded in ethical considerations that it seems inappropriate to separate them.

[199] Michael Moncur in *The Quotations Page* <http://www.quotationspage.com/quote/795.html> [Accessed September 15, 2005].

### *5.2.1 Controlling Others*

According to Ermann and Shauf, our "ethical standards and social institutions have not yet adapted … to the moral dilemmas that result from computer technology."[200] This has a great deal to do with the way Helen uses the LBS technologies available to her. In *Liberty*, Helen obviously cares about her husband and wants what is best for his health. She is willing to "help" Colin look after himself by monitoring him and restricting the activities she allows him to participate in, especially when he is alone. It is not too difficult to imagine this happening in the real world if LBS become commonplace. It is also conceivable that, for some people, this power could be held by a hospital or health insurance company.

However, Helen fails to balance her concern for her husband's physical welfare with his need to be an autonomous being. Although LBS technologies are readily available, perhaps she has not completely thought through her decision to use these technologies to monitor Colin, even if it is ostensibly for his own good. It could even be considered selfish. The scenario is set in a time where LBS are just coming into the mainstream. It is evident from the situation that exists between Helen and Colin that society's ethical framework has not yet evolved enough to deal with these circumstances.

Consideration of legal issues is also important – it does not appear that there is any Australian legislation that covers the unique possibilities of LBS tracking. One situation that is likely to appear with more frequency is people using LBS technologies to monitor loved ones "for their own good". Several issues are raised here. When is a person sufficiently impaired to warrant such monitoring? Should their consent be necessary? What if they are considered to be *too* impaired to make a rational decision about monitoring? These sorts of questions will need to be resolved, either by legislation or by the courts, if LBS monitoring becomes mainstream.

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[200] M. David Ermann and Michele S. Shauf (eds), *Computers, Ethics and Society* (3rd ed, 2003) vi.

### *5.2.2 The Human Need for Autonomy*

Autonomy is an important part of a person's identity. Resistance to a situation is often unconsciously employed to "preserve psychically vital states of autonomy, identity, and self-cohesion from potentially destabilizing impingements."[201] If a person's resistance is bypassed or circumvented, their adaptive capacities can be overloaded, inducing feelings of desperation and helplessness. The natural reaction to this is to exert an immediate counterforce in an attempt to re-establish the old balance, or even to establish a new balance with which the individual can feel comfortable.[202]

These ideas about autonomy, identity and resistance are demonstrated in *Liberty* through Colin. He experiences feelings of helplessness and vulnerability because of his loss of autonomy through constant LBS monitoring. His unsupervised walk can be seen as an attempt to redress the balance of power between himself and Helen. With these issues in mind, perhaps the kindest and least disruptive way to implement a monitoring program for an aging individual is to develop a partnership with that person. In this sort of situation, LBS tracking can be a joint process that "is continually informed by the goal of fostering … autonomy".[203]

### *5.2.3 The Legalities and Ethics of Pre-Emptive Control*

Another significant legal and ethical issue is that of monitoring people such as those suspected of being involved in terrorist activities. As mentioned in the footnotes of *Society*, this is not mere fancy – the Australian Government has proposed new anti-terrorism laws that, among other things, would give police and security agencies the power to fit terror suspects with tracking devices for up to 12 months.[204]

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[201] Elliot Adler and Janet Lee Bachant, 'Intrapsychic and Interactive Dimensions of Resistance: A Contemporary Perspective', *Psychoanalytic Psychology* (1998) Vol. 15, No. 4, 451, 454.
[202] Ibid.
[203] Ibid, 458.
[204] Gilmore, above n 195.

This kind of power should give rise to concern. Can it be considered reasonable to impinge upon the freedom of someone who is merely suspected of committing a crime? For tracking implants especially, do governments have the right invade a personal space (i.e. a person's body) simply based on premise?

Criminals give up some of their normal rights by committing an offence. By going against society's laws, freedoms such as the right to liberty are forfeited. This is retributivism (i.e. "just deserts"). The central idea is proportionality: "punishment should be proportionate to the gravity of, and culpability involved in, the offence."[205] With no crime involved, the punishment of electronic monitoring or home detention must be out of proportion.

However, this is not the first instance in which Australia has created preventative legislation. In 1994, the *Community Protection Act* was enacted in NSW. This law allowed anyone to be detained in prison for up to 6 months if the Court was satisfied that "the person is more likely than not to commit a serious act of violence [that involves a real likelihood of causing death or serious injury, or involves sexual assault],[206] and that it is appropriate, for the protection of a particular person or persons or the community generally, that the person be held in custody."[207]

The first time the law was invoked, it was struck down (to the Government's considerable embarrassment).[208] McHugh J said at the time that the law could be seen as:

> [M]aking the Supreme Court a party to and responsible for implementing the political decision of the executive government that the appellant should be imprisoned without the benefit of the ordinary processes of law.[209]

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[205] Brown et al, above n 185, 1376.
[206] *Community Protection Act 1994* (NSW) s4.
[207] Ibid, s5.
[208] Elizabeth Handsley, 'Public Confidence in the Judiciary: A Red Herring for the Separation of Judicial Power', *Sydney Law Review* (June 1998) Vol. 20, No. 2, 183.
[209] *Kable v Director of Public Prosecutions* (1996) HCA 24. Available through AUSTLII [Accessed September 27, 2005].

The Australian Constitution requires trial by jury for all indictable offences. Is it fair to imprison someone in any way, without due process of law, if they have not committed an indictable offence? Gaudron J's comments about the *Community Protection Act 1994* included the following:

> [T]he proceedings are directed to the making of a guess – perhaps an educated guess, but a guess nonetheless – whether, on the balance of probabilities, the appellant will commit an offence … [T]he Act requires the making of an order, if the conditions specified in s5(1) are satisfied, depriving an individual of his liberty, not because he has breached any law, whether civil or criminal, but because an opinion is formed … that he "is more likely than not" to breach a law by committing a serious act of violence … That is the antithesis of the judicial process, one of the central purposes of which is … to protect the individual from arbitrary punishment and the arbitrary abrogation of rights by ensuring that punishment is not inflicted and rights are not interfered with other than in consequence of the fair and impartial application of the relevant law to facts which have been properly ascertained.[210]

With measures such as those planned to be in the proposed new counter-terrorism laws, there is obviously a very great need for caution, accountability and review in the exercise of such powers. Gareth Evans, the former Labor foreign minister, commented on the proposed laws by saying:

> [I]t is crucial when you are putting in place measures that are as extreme in terms of our libertarian traditions as these that there be over and over again justification offered for them and explanations given of the nature and scale of the risk and the necessity … it is a precondition for a decent society to have that kind of scrutiny.[211]

The London bombings are the justification offered repeatedly by the Prime Minister for the new laws, reinforced by ASIO director-general Paul O'Sullivan. However, this "justification" ignores the reality that "the London bombers were 'clean skins' who had escaped police notice altogether."[212] Tagging suspicious people cannot keep society completely safe.

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[210] Ibid.
[211] AAP, 'Terror laws shouldn't go overboard: Evans', *The Sydney Morning Herald* (September 27, 2005) <http://www.smh.com.au/news/national/terror-laws-shouldnt-go-overboard-evans/2005/09/27/1127586836368.html> [Accessed September 27, 2005].
[212] Marian Wilkinson, 'Powers pave way for secret new world', *The Sydney Morning Herald* (September 28, 2005) 1, 6.

This researcher does not make a judgement on whether pre-emptive control legislation is good or bad. It is suggested, however, that the laws recently proposed by the Federal Government (and agreed to by the States) could be indicative of a broader trend.

John Howard said that "[i]n other circumstances I would never have sought these new powers. But we live in very dangerous and different and threatening circumstances … I think all of these powers are needed."[213] Could the same argument be used in the future to justify monitoring everyone in the country? Everyone's privacy being invaded in such a way would likely lower significantly the chance of crimes being committed, or at least the chance of criminals remaining unpunished. If pre-emptive control is a part of government security, then widespread LBS monitoring could be the most effective form of implementation.

Without suggesting a far-fetched Orwellian scenario where draconian policies and laws mean that the entire population is tracked every moment of their lives, there is a possibility that the current climate is indicative of individuals' willingness to relinquish their privacy (or at least someone else's) for the sake of enhanced security.

## 5.3 Social Issues

### *5.3.1 Control*

Control has emerged as a significant theme in this thesis. Going back to the three LBS categories of tagging, tracking, and tracing, it can be argued that all of them have an overarching element of control. Tagging can be to control security (for example, when tagging major landmarks and buildings).[214] Tracking is about controlling others, whether through altruism, pragmatism or necessity. It may also, in a business sense, be about controlling the types of advertisements that are delivered to a potential customer, and

[213] Joseph Kerr, 'House arrest for terror suspects', *The Sydney Morning Herald* (September 28, 2005) 1.
[214] Michael and Masters, above n 193, 201.

where the person is when they receive those advertisements. Tracing is often about control over a person's self-direction, or can be a way of controlling disasters such as disease outbreaks.

*Control Unwired* shows that even in LBS applications that are for care or convenience purposes, exhibit aspects of control. A large part of the story is about who has control and who does not (hence the title of the scenario). For example, in *Vulnerability*, Kate experiences a loss of control over her situation when her GPS-enabled PDA does not work, but a sense of control is restored when it is functioning again. Helen has control over Colin in *Liberty*, and in turn Colin has little control over his own life. In both *Society* and *Security* we see how Scott uses LBS every day as a control mechanism for parolees. Finally, in *Anonymity*, the question arises whether faith in this sort of control is fully justified.

#### *5.3.2 Trust*

Trust is a vitally important part of human existence. It develops as early as the first year of life and continues to shape our interactions with others until the day we die.[215] In relationships, a lack of trust means that there is also no bonding, no giving, and no risk-taking.[216] In fact, Marano states:

> Without trust, there can be no meaningful connection to another human being. And without connection to one another, we literally fall apart. We get physically sick. We get depressed. And our minds … run away with themselves.[217]

An issue that arises in *Liberty* is that of trust, recalling Perolle's notion of surveillance being practiced in low-trust situations and the idea that the very act of monitoring destroys trust.[218] We can see this happening in the Colin/Helen relationship. Helen does

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[215] Hara Estroff Marano, 'Trust Someone, Again', *Psychology Today* (Jul/Aug 1998) Vol. 31, Iss. 4, 7.
[216] Terry Mizrahi, 'How can you learn to trust again?', *Psychology Today* (Mar/Apr 2002) Vol. 35, Iss. 2, 12.
[217] Marano, above n 215, 7.
[218] Judith A. Perolle, 'Computer-Supported Cooperative Work' in David Lyon and Elia Zureik (eds), *Computers, Surveillance and Privacy* (1996) 47, 59.

not trust Colin enough to let him make his own decisions. Colin does not trust Helen enough to tell her he is going out by himself, without any kind of monitoring technology. He resents her intrusion into his day-to-day life, but tolerates it because he loves his wife and wants to avoid upsetting her. Their relationship could be expected to become increasingly dysfunctional, with breakdown of trust on both sides of the equation. We cannot possibly predict the complex effects of LBS when used to track humans in this way. However, if Perolle[219] and Weckert[220] are to be believed, it could well erode trust in human relationships – and what would this mean for society?

## 5.4 Technological Issues

### *5.4.1 Technology is Neutral (Or Is It?)*

There is a widely held belief that it is how people use a technology, not the technology itself, that can be characterised as either good or bad. People often see technology as neutral "in the sense that in itself it does not incorporate or imply any political or social values."[221] However, there are others who argue that technology is not neutral because it requires the application of innovation and industry to some aspect of our lives that "needs" to be improved, and therefore must always have some social effect.[222] As discussed in section 5.3.1, the LBS applications in the scenario all appear to show aspects of control. This would suggest that the technology itself is not neutral – that LBS are designed to exercise control.

*Control Unwired* seems to echo Dickson's argument that technology is not neutral because of its political nature: "dominating technology reflects the wishes of the ruling class to control their fellow men."[223] We can certainly see elements of this idea in the scenario. All of the LBS functions depicted are about control, whether it be control over one's own situation (*Vulnerability*), caring control of a loved one (*Liberty*), or forced

[219] Ibid.
[220] Weckert, above n 24.
[221] Joan Lipscombe and Bill Williams, *Are Science and Technology Neutral?* (1979) 19.
[222] Ibid, 18.
[223] Ibid, 22-23.

control over parolees (*Society, Security* and *Anonymity*). These situations imply that LBS is not neutral, and that the technology is designed to enhance control in various forms.

### *5.4.2 The Technological Momentum of LBS*

Some believe that technology is the driving force that shapes the way we live. This theory is known as technological determinism, one of the basic tenets of which is that "changes in technology are the single most important source of change in society."[224] The idea is that technological forces contribute more to social change than even political, economic or environmental factors.

This researcher would not go so far as to subscribe to this strongest sense of technological determinism doctrine. The social setting in which the technology emerges is at least as important as the technology itself in determining how society is affected. As Braun says: "[t]he successful artefacts of technology are chosen by a social selection environment, [like] the success of living organisms is determined by a biological selection environment."[225] Technologies that fail to find a market never have a chance to change society, so society shapes technology at least as much as it is shaped by technology. In this light, Hughes's theory of technological momentum is a useful alternative to technological determinism: similar in that it is time-dependent and focuses on technology as a force of change, but sensitive to the complexities of society and culture.[226]

Technological potential is not necessarily social destiny.[227] However, in the case of LBS, it is plausible to expect it to create a shift in the way we live. We can already see this shift occurring in parents who monitor their children with LBS tracking devices, and in the easing of overcrowding in prisons through home imprisonment and parole programs using LBS monitoring.

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[224] Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (1977) 76.
[225] Ernest Braun, *Futile Progress: Technology's Empty Promise* (1995) 21.
[226] Thomas P. Hughes, 'Technological Momentum' in Merritt Roe Smith and Leo Marx (eds), *Does Technology Drive History?* (1994) 101.
[227] David Lyon, *Surveillance society: Monitoring everyday life* (2001) 23-24.

As described previously, the threat of terrorist attacks has led the Australian Government to propose giving itself extraordinary powers that never could have been justified previously. In this situation, LBS has enabled the electronic monitoring of suspicious persons, however, it is not the technology alone that acts as the impetus. Pre-emptive electronic tracking could not be put in place without LBS. Neither would it be tolerated without society believing (rightly or not) that it is necessary in the current climate.

The scenario also demonstrates that technology and society evolve at least partially in tandem. In *Society*, through the conversation between Scott and Janet, we learn that LBS tracking implants were not introduced simply because they were technically feasible. The reasons for their use were to reduce overcrowding in prisons and to mitigate the burden of criminals on the ordinary taxpayer. Social and economic factors, as well as technological ones, contributed to this measure being taken.

Although technology is not the sole factor in social change, and arguably not the most important, LBS are gaining momentum and are likely to contribute to a shift in the way we live. This can be seen both in the scenario and in real-life examples today.

#### *5.4.3 Technology Is Not Infallible*

Throughout *Control Unwired* we can see LBS becoming an integral part of daily life. If this does happen, it must be considered what will happen if the technology fails – which it inevitably will. No technology is completely perfect. There are always shortcomings and limitations.

Examples of deficiencies in LBS technologies can be found scattered throughout the scenario. In *Vulnerability*, Kate appears to be over-reliant on LBS (why does she not simply call a taxi from her office before leaving?) and when the technology fails, it creates a potentially dangerous situation.

Even more dangerous circumstances occur in *Anonymity*. Doug, a convicted sex offender, is able to break his curfew without anyone knowing. Perhaps measures could be implemented to stop such breaches from going undetected, but that would not stop them from happening altogether.

One U.S. study found that about 75 percent of electronically monitored "walk offs" were re-apprehended within 24 hours.[228] That means a quarter went free for more than a day – plenty of time to commit other offences. And, although the offender may be caught and punished, it is difficult to remedy the damage done to an individual who is robbed or assaulted.

No technology is completely reliable. Even electricity, a mainstay of daily life, can suddenly fail, with socially and economically devastating effects. Most of Auckland went without power for five weeks during a massive blackout in 1998.[229] A 1977 electricity outage in New York led to widespread looting, arson and urban collapse.[230] If we become as reliant on LBS as we have become on other technologies like electricity, motor vehicles, and computers, we must be prepared for the consequences when (not if) the technology fails.

## 5.5 Evaluating LBS

Any technology can be expected to have both positive and negative effects on individuals and on the wider community. Emmanuel Mesthane of Harvard's former Technology and Society Program wrote: "[n]ew technology creates new opportunities for men and societies and it also generates new problems for them. It has both positive and negative effects and it usually has the two at the same time and in virtue of each other."[231]

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[228] National Law Enforcement and Corrections Technology Center, above n 189.
[229] CNN, 'Power outage hits Auckland hours after crisis declared over', *CNN World News* (March 27, 1998) <http://www.cnn.com/WORLD/9803/27/auckland.outage/> [Accessed October 11, 2005].
[230] Kathryn Westcott, 'New York's "good and bad" blackouts', *BBC News* (August 15, 2003) <http://news.bbc.co.uk/1/hi/world/americas/3154757.stm> [Accessed October 11, 2005].
[231] Philip Bereano, 'Technology Is a Tool of the Powerful' in M. David Ermann and Michele S. Shauf (eds), *Computers, Ethics and Society* (3rd ed, 2003) 85.

The assets and liabilities that flow from LBS (to the individual involved and to society as a whole) depend largely on whether the person using the technology does so of their own accord, or is required to use it for one reason or another. There are a different set of pros and cons related to people who do not use LBS at all. Some of the benefits and drawbacks for voluntary, mandatory and non-users of LBS are presented in Table 3.

**Table 3: Positives and negatives of LBS for different user types**

| User Type | Positives | Negatives |
|---|---|---|
| Voluntary user. The most likely type, probably using commercial LBS applications such as in-vehicle routing and navigation. | • Choice. User can opt out of LBS by deactivating the device or leaving it at home.<br>• Safety. Accurate location information may speed help in the event of an emergency.<br>• Convenience. For example, the user can have a taxi pick them up where they stand, and enjoy increased ease of routine transactions such as automatic road tolls.<br>• Security of the individual. Increased security in the form of building access and navigational capabilities. | • Security risk. Even though use is voluntary, user has a lack of control over who views location information.<br>• Privacy risk. Things such as location information and automated transactions can be traced back to the user.<br>• False sense of security. Someone watching from afar cannot necessarily help in an emergency. |
| Mandatory user. Possible in the form of government applications (e.g. home imprisonment) and domestic applications (e.g. tracking children). | • Safety. Personal security may be increased – if someone can see where the user is at all times, that person may know if something is wrong.<br>• Accountability. Location can be monitored constantly, so the user may be held responsible for their activities. If a crime is committed, they may be implicated or cleared based on location information.<br>• Security of society. The user's knowledge that someone can see their every move may deter crime. | • Invasion of privacy. Location can be viewed at any time, whether or not the user consents.<br>• Security risk. Location information is constantly available, so data leaks are potentially very serious.<br>• Decreased autonomy. Independence is important to mental and emotional wellbeing, but constant monitoring can impact negatively on this.<br>• May give user a false sense of security. Someone watching from afar cannot necessarily help in an emergency.<br>• May give society a false sense of security. Monitoring does not mean that a crime cannot be committed. |

| | | |
|---|---|---|
| Non-user. Unlikely to be a large group if LBS become widespread. Many in this category would have personal reasons for not adopting LBS, or could not afford to use the technology. | • Privacy. Personal location information remains relatively protected<br>• Autonomy. High level of independence and control over own activities.<br>• Simplicity. There is no need to deal with the possibility of the technology failing. | • Safety risk. Help may be delayed in the event of an emergency, although programs like e911 now mean that emergency services can pinpoint a caller's location with an accuracy of between 50 and 300 metres.[232]<br>• Security risk. The person's activities may pose a danger to society, and the community as a whole misses out on the security benefits that LBS monitoring can bring.<br>• Risk of prejudice. A person may be suspected of wrongdoing without evidence, simply by reason of being a non-user. |

## 5.6 Risk to the Individual vs. Risk to Society

From Table 3, it is obvious that there is an inherent trade-off between the interests of the individual and the interests of society as a whole: the privacy of the individual is in conflict with the safety of the broader community. As Marx says, "[h]ow is the desire for security balanced with the desire to be free from intrusions?"[233] This work is certainly not the first to allude to this issue. For example, Kun has said that "perhaps one of the greatest challenges of this decade will be how we deal with this theme of privacy vs. national security."[234] The original contribution of this work is that the dilemma has been related specifically to LBS and termed the *LBS privacy-security dichotomy*. Here, each side of the dichotomy is divided into three key components that combine to greatly magnify risk. The next two sections describe these significant characteristics. Removing one or more components for each set decreases the privacy or security risk. Where more elements are present in conjunction, the risk is increased.

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[232] Federal Communications Commission, *Enhanced 911 – Wireless Services* (June 17, 2005) <http://www.fcc.gov/911/enhanced/> [Accessed October 11, 2005].
[233] Gary T. Marx, 'Electric Eye in the Sky: Some Reflections on the New Surveillance and Popular Culture' in David Lyon and Elia Zuriek (eds), *Computers, Surveillance and Privacy* (1996) 195.
[234] Luis G. Kun, 'Homeland Security: The Possible, Probable and Perils of Information Technology', *IEEE Engineering in Medicine and Biology* (Sept/Oct 2002) Vol. 21, Iss. 5, 28, 31.

### *5.6.1 Privacy Risk*

Significant privacy risk occurs when the following factors are present:

- *Omniscience* – LBS tracking is mandatory, so authorities have near-perfect knowledge of people's whereabouts and activities.
- *Exposure* – security of LBS systems is imperfect, leaving them open to unauthorised access.
- *Corruption* – motive exists to abuse LBS technology. This could be unauthorised access of LBS systems by an outsider, or unethical use of LBS information by an authorised person.

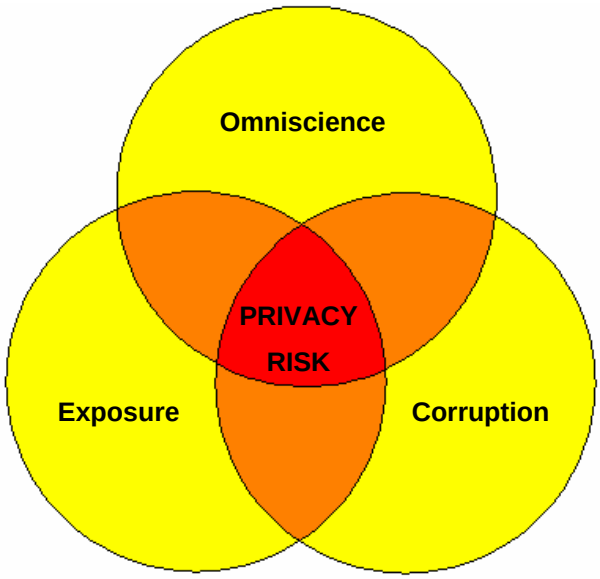


**Figure 4: Privacy risk**

It is easy to see why the danger in this privacy-risk scenario is so great. A nation with all-knowing authorities means that a large amount of highly sensitive information is stored about all persons in the country. Security of electronic systems is rarely, if ever, completely foolproof. And, unfortunately, corruption is a fact of life. The combination of all three factors creates a serious threat to privacy.

### *5.6.2 Security Risk*

Significant security risk occurs with the following conditions:

- *Ignorance* – authorities have limited knowledge of people's activities.
- *Weakness* – security of individuals and infrastructure is imperfect.
- *Immorality* – motive exists to commit crimes.

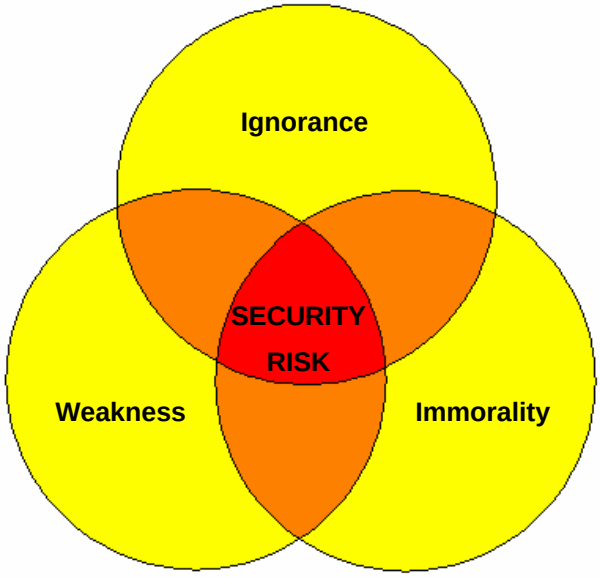


**Figure 5: Security risk**

This security-risk scenario is what we live with today: ignorance, weakness, and immorality. Law enforcement authorities cannot be everywhere at once, nor can they have instant knowledge of wrongdoings. Security of infrastructure and people can never be completely perfect. In addition to this, there are always people willing to commit crimes for one reason or another. These factors merge to form a situation in which crimes can be committed against people and property relatively easily, with at least some chance of the perpetrator remaining unidentified.

### *5.6.3 How Much Are We Willing to Compromise?*

As mentioned above, the security-risk half of the dichotomy typifies our current environment. However, the majority of society manages to live contentedly, despite a certain vulnerability and the contemporary threat of terrorism. The security risk seems magnified when examined in the context of the LBS privacy-security dichotomy. LBS have the potential to greatly enhance both national and personal security, but not without creating a different kind of risk – a threat to the privacy of the individual. The real question is: how much privacy are we willing to trade in order to increase security? Is the privacy-risk scenario depicted above a preferable alternative to the security risk we live with now? Or would we lose more than we gain?

## 5.7 How Can These Issues Be Resolved?

### *5.7.1 The Four Major Issues in LBS*

This chapter has already identified four types of issues associated with LBS: legal, social, ethical and technological. From the preceding information, we can begin to see one overriding theme for each of these categories:

- Legal – control of others, with or without their consent.
- Social – trust in human relationships.
- Ethical – privacy of the individual.
- Technological – security and reliability of LBS systems.

These four major issues can be summarised as control, trust, privacy and security.

### *5.7.2 Relationships between Control, Trust, Privacy and Security*

The issues of control, trust, privacy and security are interrelated. As discussed above, increased control actually destroys trust – there is no need to bother trusting someone when you can monitor them from afar. In contrast, increased trust means increased privacy. An individual who has confidence in another person to avoid intentionally doing

anything to adversely affect them probably does not feel the need to scrutinise that person's activities.

Privacy requires security as well as trust. A person's privacy can be seriously violated by a security breach of an LBS system, with their location information being accessed by unauthorised parties. The other effect of system security, however, is that it enhances control. A secure system means that tracking devices cannot be removed without authorisation, therefore, control is increased. Of course, control and privacy are mutually exclusive. Constant monitoring destroys privacy, and privacy being paramount rules out the possibility of LBS tracking. These relationships are summarised in Figure 6.

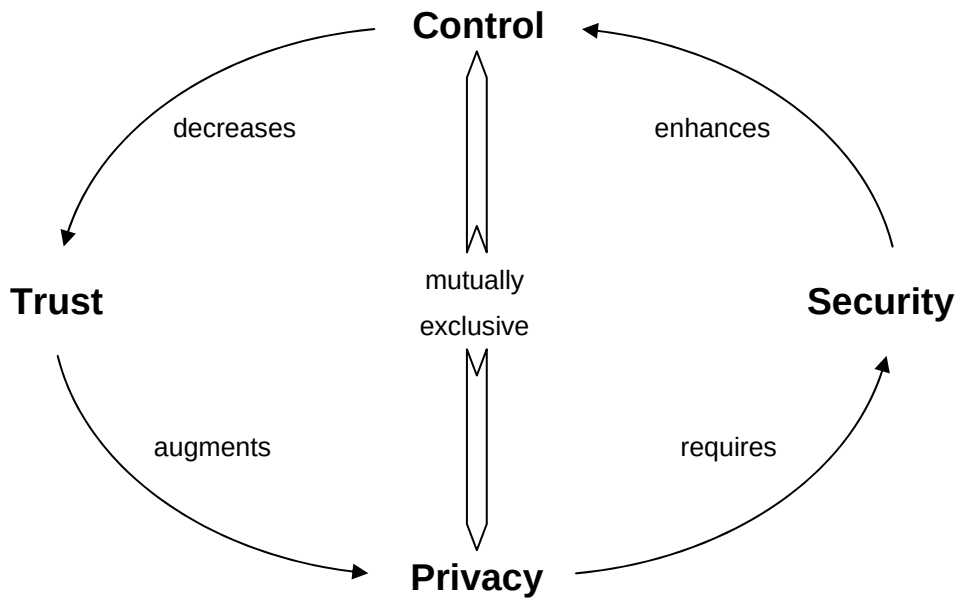


**Figure 6: Relationships between major issues in LBS**

#### *5.7.3 Guiding Deliberation*

The above discussion of major concerns in LBS begs a vital question: with the tangle of issues involved and the potentially dangerous implications of not taking these into account, how *should* LBS be used?

Mason and Mason et al developed a framework of questions for reasoning about ethical issues in electronic commerce (e-commerce).[235] This researcher suggests the use of a similar framework for discussion and thought about the most important issues in implementing LBS. This would go some way toward overcoming the difficulty of using LBS responsibly. Table 4 presents this original framework, derived from information presented previously in this chapter.

**Table 4: Issues framework for LBS**

| **Privacy** | **Control** |
|---|---|
| • Who has access to location information? What restrictions are placed on them sharing this information?<br>• Can the person wearing the tracking device deactivate it?<br>• Do the benefits that accrue from LBS in this situation outweigh the impacts of seriously invading this person's privacy?<br>• Is this person's privacy worth more than the safety and security of society? | • Who is controlling whom, and for what reasons?<br>• Does the person to be monitored consent to it?<br>• Is the person too impaired to consent to their own monitoring? If so, who should be able to make the decision for them?<br>• If the person does not consent to monitoring, are there special circumstances (e.g. an indictable crime) that warrant control without consent?<br>• How can it be ensured that inaccuracies in reported location do not adversely affect the person being monitored? |
| **Security** | **Trust** |
| • What restrictions are placed on organisations (and their employees) that handle location information?<br>• How well protected are the electronic systems?<br>• What measures are in place to manage mandatory LBS users?<br>• What backup measures are in place in case the system fails? | • Does the situation already involve a low level of trust?<br>• If there the situation involves a moderate to high level of trust, why are LBS being considered?<br>• Will the use of LBS in this situation be trust-building or trust-destroying? |

[235] Efraim Turban et al, *Electronic Commerce: A Managerial Perspective 2006* (2005) 735.

## 5.8 Conclusion

This chapter has analysed the scenario to draw out the major legal, ethical, social and technological issues represented within it. It has been shown that the benefits and drawbacks of LBS (for both the individual and for society) largely depend on the type of user. This has led to a significant original contribution of this thesis: an LBS-specific examination and diagrammatic representation of the dichotomous relationship between the privacy of the individual and the security of society. Another key achievement presented here was the LBS issues framework for consideration of the main LBS issues of privacy, control, security and trust. The major implications of the scenario and analysis are discussed in the next chapter, and links are drawn to earlier findings. Also, recommendations are made about what should be done with the information that has been learned.

# Chapter 6: Conclusion

*'They always say time changes things, but you actually have to change them yourself.'*

Andy Warhol[236]

## 6.1 Introduction

This chapter concludes the thesis. It summarises the principal findings made in the preceding chapters and describes the major implications of these: mainly, the need for caution and a sense of purpose. Links are drawn to earlier findings of other researchers and directions for future research are suggested. Finally, recommendations are made as to what should be done with the information that has been gleaned through this work.

## 6.2 Principal Findings

One of the main findings of this thesis is that LBS themselves are far more developed than research about their potential societal implications. This is not a positive situation for a technology that is often so closely aligned with people's private lives and has such potential to affect society. *Control Unwired* and its analysis are an attempt to redress the balance. The scenario is one of a kind in this field: a properly researched and referenced narrative that brings some of the issues involved in the use of LBS to the fore. The accompanying analysis draws several significant legal, ethical, social and technological issues out of the scenario. A major concern is that all LBS applications seem to have an overarching element of control in some shape or form. Another is that the potential uses of LBS to enhance national security produce a very real privacy risk, as seen in the LBS privacy-security dichotomy. It has also been shown that four of the principal issues – control, trust, privacy and security – are interrelated. The LBS issues framework

[236] Laura Moncur in *The Quotations Page* <http://www.quotationspage.com/quote/25824.html> [Accessed September 15, 2005].

developed around these concerns is a unique, potentially useful tool for guiding thought and decision-making about LBS in specific situations.

## 6.3 Major Implications

The most significant implication of the work presented here is this: the potential for LBS to create social change raises the need for debate about our current path and consideration of where we are going. Will the widespread application of LBS significantly improve our lives? Or will it have negative social effects?

Technological progress is not synonymous with social progress. Social progress involves working towards socially desirable objectives in an effort to create a desirable future world.[237] Instead of these lofty ideals, technological progress is based on what is technically possible.[238] However, there is a difference between what *can* be done, and what *should* be done – the relentless pursuit of technological advancement for its own sake is pointless. Do we really need more electronic gadgets in our daily lives? As Kling states:

> I am struck by the way in which the news media casually promote images of a technologically rich future while ignoring the way in which these technologies can add cost, complexity, and new dependencies to daily life.[239]

In the *Society* section of the scenario, Janet's remark about *Alice's Adventures in Wonderland* can be seen as more than just a surface comment. In the chapter of Lewis Carroll's famous book where Alice meets the Cheshire Cat, which is where Janet's paraphrasing is from, Alice has the following conversation with the Cat:

> 'Would you tell me, please, which way I ought to go from here?'
>
> 'That depends a good deal on where you want to get to,' said the Cat.
>
> 'I don't much care where –' said Alice.
>
> 'Then it doesn't matter which way you go,' said the Cat.[240]

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[237] Braun, above n 225, 4.
[238] Ibid, 21.
[239] Rob Kling, 'The Seductive Equation of Technological Progress with Social Progress' in Rob Kling (ed.), *Computerization and Controversy: Value Conflicts and Social Choices* (2nd ed., 1996) 22, 23.

Martin Gardner says that John Kemeny, author of *A Philosopher Looks at Science*, compares Alice's question and the Cat's answer to the "eternal cleavage between science and ethics."[241] The same could be said of LBS technologies and possible future applications. New technologies provide exciting opportunities, but human decisions based on social and ethical considerations are needed to determine where to go. Technology merely provides us with a convenient way to reach the destination. Without a sense of direction, where will we end up? And what is the point of getting there anyway? There is a serious need for thought and discussion about how we want LBS to be used.

Besides developing a sense of purpose for the use of LBS, we need to examine very carefully the possibility of the technology having unintended side effects such as the breakdown of trust. Certainly, the potential effect of unplanned consequences should not be underestimated. According to Jessen:

> The side effects of technological innovation are more influential than the direct effects, and they have the rippling effect of a pebble hitting water; they spread out in ever enlarging concentric circles throughout a society to transform its behaviour, its outlook, and its moral ethic.[242]

Of course not all secondary effects can be foreseen. However, this does not mean that thinking about possible consequences is worthless. Surely some form of preparation to deal with adverse outcomes, or at least to notice them before it is too late, is better than none at all.

## 6.4 Links to Earlier Findings

In this thesis, the scenario itself stands apart from earlier research. It is unique in that it is a plausible, fully developed, well researched and thoroughly referenced scenario about

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[240] Lewis Carroll and Martin Gardner (ed.), *The Annotated Alice* (1970) 88.
[241] Ibid, 89.
[242] Peter Jessen, cited by Mark A. Boroush, Kan Chen and Alexander Christskis (eds), *Technology Assessment: Creative Futures* (1980) 245-246.

the possible future effects of LBS. However, there are certainly elements of the thesis that have relevance to earlier findings made by other researchers.

The similarities to 'Geoslavery'[243] should be fairly obvious. Dobson and Fisher's article is focused on applications of LBS for control purposes, and this thesis found that there appears to be an inherent, overarching element of control in one form or another in all LBS. There are also parallels with Weckert's[244] ideas about trust and surveillance in the workplace, although here the issue of trust was extended beyond the workplace to personal relationships.

The framework for issues in LBS developed in this thesis is reminiscent of Mason and Mason et al's[245] ethical framework for e-commerce, although the framework has been fundamentally changed to create a new one specific to LBS. It is the concept of an "issues" framework, rather than the framework itself, that is similar. It could also be said that the LBS issues framework is comparable to Durocher's "Laws of LBS"[246] in that the framework is intended to act as a set of guidelines for the use of LBS. However, the issues framework is much more specific than Durocher's LBS laws, and perhaps more highly developed. The framework certainly echoes Raisinghani[247] in identifying privacy as a major issue in the use of LBS.

There are also undercurrents in this thesis similar to Michael and Michael's article 'Microchipping People'[248] and Michael's thesis on the technological trajectory of auto-ID.[249] Both works, like this one, stress the need for serious consideration of the ethical implications of a technology that allows people to be constantly tracked and monitored.

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[243] Dobson and Fisher, above n 26.
[244] Weckert, above n 24.
[245] Mason and Mason et al, cited in Turban et al, above n 235, 735.
[246] m-travel.com, above n 107.
[247] Raisinghani, above n 53, 61.
[248] Michael and Michael, above n 23.
[249] Michael, above n 30.

One thing which must be said is that the scenario developed in this thesis, *Control Unwired*, totally contradicts the *Project Oxygen*[250] scenario. *Control Unwired* looks at both positive and negative aspects of LBS, and is a fully fledged narrative. In comparison, *Project Oxygen* is utopian and somewhat austere. An explanation for this discrepancy is that *Control Unwired* was developed as a properly researched, plausible future scenario to look at the issues involved with the use of LBS, while *Project Oxygen* is merely intended to illustrate the possibilities of the Oxygen system.

## 6.5 To Whom These Findings Apply

The results of this thesis have wide-ranging relevance. Firstly, they may be useful to people in the LBS industry as a means of guiding thought about what kinds of LBS should be developed and how they should be marketed responsibly, as well as indicating the paramount need to consider security in LBS systems. The thesis may also be helpful to other researchers in this area as a platform for future work.

Perhaps, however, this thesis is even more important to the broader community. LBS are becoming commercially available without a great deal of accompanying discussion about their potential implications and how they should be used. With a technology so closely coupled with people's private lives, it is essential for the public to have access to research that is comprehensible and can be related to the real world. *Control Unwired* helps to achieve this. Without being patronising, it creates an accessible introduction to the potential implications of LBS. The framework for LBS issues builds on this to suggest a constructive way for specific applications of LBS to be evaluated.

[250] MIT, above n 27.

## 6.6 Recommendations and Directions for Future Research

### *6.6.1 Future Research*

*Control Unwired* is not intended to be an exact prediction of the future. It is merely an example of one possible outcome that could arise from the current environment and state of development. One potential direction for further research could be an analysis of the technological trajectory of LBS, determining the accuracy of the scenario. Another option is to conduct a longitudinal study to see if similar issues appear to be of concern at a later stage in the development and market penetration of LBS, and to establish any evolution of applications and thought. Also, *Control Unwired* is supposed to be appealing and accessible to a wide audience, especially those who are not particularly well acquainted with LBS. It would be interesting to assess public reaction to the scenario to determine if it fulfils these goals.

### *6.6.2 Actions*

This thesis has demonstrated the potential of LBS to create social change. It has also shown that the use of LBS may have unintended, adverse effects. For this reason the major recommendation is caution. We need to think about LBS, its potential applications, and possible side-effects instead of just hurtling along with the momentum of technology-push. We need to think about why we want to use LBS in each particular situation, perhaps with the aid of a framework like the one presented in this thesis.

Now is the time for deliberation, while LBS are still in their infancy. Once they become completely mainstream it may be too late for attention to ethical and social considerations to have much of an impact. As Michael and Michael say: "[r]esistance after the voluntary adoption stage can be futile if momentum is leading the device towards a mandatory role."[251] This researcher is not suggesting that LBS be abandoned altogether, but simply recommending that we slow down and *think* about what we are doing instead of just doing it.

[251] Michael and Michael, above n 23, 25.

## 6.7 Conclusion

LBS are beginning to make their way into the mainstream. However, it seems that there has been little consideration of the possible implications of these technologies, particularly compared to the degree of attention that technical and commercial aspects of LBS have received. With the very real potential of LBS to create social change it is vitally important to start looking at why LBS should be used in certain areas and to address the social, legal, ethical and technological issues that arise from the technology's implementation. Certainly, LBS may be very useful in some situations. But we need to determine what these situations are, and perhaps even to say that there are some purposes for which LBS should never be used.

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