

MOBILE BUSINESS RESEARCH, 2000-2004: EMERGENCE, CURRENT STATUS, AND FUTURE OPPORTUNITIES

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Abstract

The convergence of mobile communications and distributed networked computing has provided the foundation for the development of a new channel of electronic business – mobile business. Building on the strengths of this medium, the context of the individual and the nature of mobile devices, the scope of this new channel is immense, and we see novel solutions being applied in consumer, business, government, healthcare and many other areas. Following practice, research into mobile business has begun to grow significantly over the last five years to the point where we now see dedicated journals and conferences. The aim of this paper is to provide an assessment of the state of mobile business research. Using a detailed longitudinal analysis and taxonomy of more than 230 papers from key research outlets, we demonstrate the emergence of this research area and its current status. We also provide a critique of current research and some recommendations for future research into mobile business.

Keywords: Mobile Business, Literature Survey, Longitudinal Analysis, Taxonomy

1 INTRODUCTION

Distributed networked computing has had a profound impact on the way we live, work, learn and communicate. These technologies continue to affect peoples' lives in ways that were impossible to imagine just a few short years ago (e.g. Negroponte, 1995; Tapscott, 1997). The Internet especially has proven to be an easy and efficient way of delivering a wide variety of services to nearly a billion 'wired' users. Users now enjoy convenient global access to services via their web browsers; providers are able to easily construct web-based services using off-the-shelf tools, resulting in short time-to-market and global reach, changing forever the way business is conducted.

In parallel with the Internet, another technology stream has emerged to play an increasingly important role in business and society: mobile communications. Driven by the penetration of mobile phones and related devices, mobile applications have become especially valued in an age where time is precious and the weight attached to convenience is high. A new study by the Yankee Group predicts that by the end of 2007 there will be 1.87 billion mobile users worldwide (InfoSync World, 2004).

Until recently, these technologies have followed largely separate paths. However, since the late 1990s, convergence between the two has been accelerating, resulting in a variety of wireless data communication capabilities, in particular the wireless Internet. This has led to the development of sophisticated wireless data services, based on mobile data access and electronic messaging on mobile devices.

While the markets for these services are diverse, the most commonly cited applications are in the business-to-consumer (B2C) and business-to-employee (B2E) segments (AT Kearney, 2003). Such applications are built on some fundamental value propositions, including as ubiquitous access to information, the personal and customizable nature of the devices, and fit between the application and the requirements of the task and its context (e.g., the need for time and/or location independence).

Consumer-oriented wireless applications include person-to-person messaging, email, banking, games, music, shopping, ticketing, and news and other information feeds. Businesses have applied wireless technologies to such things as sales force automation, navigation, tracking, field force automation, wireless telemetry, and the mobile office. According to Forrester Research (2004) in 2005 mobile applications will be in use in a majority of enterprises and even more widely deployed among small and medium-size businesses.

The rapid growth of mobile applications has given rise to a new term: m-commerce. M-commerce is defined as the application of wireless communications networks and devices to the execution of transactions with monetary value – either direct or indirect (Clarke, 2001). The commercial value of m-commerce applications is predicted to be very significant (Forrester Research, 2004).

More broadly, mobile (m-) business is expected to have an even greater impact on organizations, as wireless technologies and applications begin to challenge the existing processes, strategies, structures, roles of individuals, and even cultures of organizations. Here, m-business is defined as the use of the mobile information technologies, including the wireless Internet, for organizational communication and coordination, and the management of the firm (Scornavacca and Barnes, 2004). Indeed, by 2004, cost savings alone could result in wireless business services around the world generating additional annual value of 80 billion USD, and at least as much value could be created if corporations used wireless services to improve their current offerings or to deliver new ones (Alanen and Autio, 2003).

Associated with this trend has been the emergence of a new research stream, building on research in areas such as electronic business, marketing, computer science, and business strategy. The last five years have seen a steadily increasing number of papers in the area of mobile business in existing journals and conferences. As well, there have appeared numerous special issues of journals focussing on m-business, m-business conference tracks, as well as entire conferences, journals and books devoted to aspects of mobile business.

This paper is aimed at assessing the state of mobile business research. Via a detailed examination of all major publication outlets, we attempt to characterize the development of this research stream, where it is today, and, most importantly, where effort should be focused in the future in order to build a strong research tradition.

The paper is structured as follows. In the next section we discuss the method used to gather and analyze the data. Then, the results of the analysis are presented and discussed. The paper concludes with a summary and some recommendations for future research into mobile business.

2 RESEARCH METHOD

There is an established tradition in information systems research of examining the research literature itself in order to better understand the “state of play” of research in the field, and to discern patterns in the development of the field itself (Culnan and Swanson 1986; Alavi and Carlson 1992; Banker and Kauffman 2004). In that tradition, the principal aim of this study is to understand the state of mobile business research, via an examination of the m-business research literature published to date.

First, it was necessary to locate conferences and journals, which have published relevant research on this topic. The search began with an examination of previously published lists of outlets containing information systems research (e.g., Mylonopoulos and Theoharakis 2001) and e-commerce research more specifically (e.g., Bharati and Tarasewich 2002). The selection was refined via discussions with senior academics actively researching in this domain.

Since research in this area is relatively recent, the scope of this investigation was limited to the time frame January 2000 to September 2004. Table 1 presents the initial list of journals and conferences examined.

M-business Conferences
International Conference on Mobile Business (mBusiness)
Mobility Roundtable
M-business Journals
IJMC - International Journal of Mobile Communications
MONET - Mobile Networks and Applications
IS and e-business Conferences
ICIS - International Conference on Information Systems
HICSS – Hawaii International Conference On System Sciences
ECIS - European Conference on Information Systems
PACIS - Pacific-Asia Conference on Information Systems
ACIS - Australian Conference of Information Systems
ICEB - International Conference on Electronic Business
Bled eConference
AmCIS - Americas Conference on Information Systems
ICEC – International Conference on Electronic Commerce
IS and e-business Journals
IJEC - International Journal of Electronic Commerce
CACM - Communications of ACM
MISQ - MIS Quarterly
IJEB - International Journal of Electronic Business
JAIS - Journal of the Association of Information Systems
JMIS - Journal of Management Information Systems
E-services Journal
Electronic Markets
CAIS – Communications of AIS
ECRA -Electronic Commerce Research and Applications

Table 1. Scope of the m-business literature review

The next step was to examine the abstracts of every paper published during the selected period in these research outlets. All abstracts were scrutinized and any articles considered pertinent to the topic were selected for analysis. The general guideline for article selection was as follows:

- The central theme should be mobile or wireless applications; and
- Articles should be in the information systems / e-business domain

Papers with a primarily technical focus were not considered pertinent to this research effort and were therefore excluded. This included papers in the computer science domain such as those published at MONET and in the technical tracks at HICSS. A total of 530 papers were selected for further analysis. Table 2 details the source and year of publication of the articles selected for this analysis.

Source (total)	Number of Articles/year				
	2000	01	02	03	04
M-business Conferences (183)					
mBusiness (112)	-	-	62	50	NA
Mobility Roundtable (71)	-	-	22	22	27
M-business Journal (37)					
IJMC (37)	-	-	-	18	19
IS and e-business Conferences (247)					
ICIS (7)	0	1	3	3	NA
HICSS (62)	1	8	15	16	22
ECIS (24)	0	2	7	6	9
PACIS (21)	0	0	4	7	10
ACIS (9)	1	2	5	1	NA
ICEB (9)	-	2	7	NA	NA
Bled eConference (30)	1	1	9	13	6
AmCIS (67)	1	10	13	14	29
ICEC (18)	0	2	8	8	NA
IS and e-business Journals (65)					
IJEC (6)	0	0	0	6	0
CACM (25)	0	2	4	15	4
MISQ (0)	0	0	0	0	0
IJEB (8)	-	-	-	1	7
JAIS (0)	0	0	0	0	0
JMIS (0)	0	0	0	0	0
E-service Journal (5)	-	0	0	5	0
Electronic Markets (8)	0	0	8	0	0
CAIS (9)	0	0	4	3	2
ECRA (2)	-	-	1	1	0
Total (530)	4	30	172	189	135

(Note: (-) it did not exist at that time; (NA) not accessible/available)

Table 2. Articles selected by year and source of publication

In addition to the 530 articles mentioned above, we also wanted to include key articles published in other available sources. To this end, a keyword search (using the keywords mobile, wireless, m-business, and m-commerce) was executed on three major bibliographic databases (Proquest, Emerald and Interscience). The articles produced by these searches were scrutinized by reviewing the papers' abstracts. Consequently an additional forty articles were selected for inclusion. The final database included 570 publications on mobile business. This database is currently available online at "M-lit" - the mobile business literature website (<http://www.m-lit.org>).

3. RESEARCH QUESTIONS

The following research questions were posed in order to assess the state of mobile business research:

- What is the main focus of research (e.g., consumers, business applications, telecommunications industry, wireless technologies)?
- What research methods were used?
- Was primary data collection carried out?
- What were the key contributions of the studies?

In order to answer the questions above, the 570 candidate articles needed to be carefully categorized and selected for detailed analysis. One of the main issues that arose was the overall quality of the research published. Perhaps due to the novelty of the subject area, the review and selection process of some of the conferences and journals from which articles were extracted did not appear very rigorous. For this reason, 183 articles from two of the m-business conferences were dropped from further consideration (most of the higher-quality papers published at these conferences also appeared in IJMC or in special issues of other journals). On the other hand, papers from the AIS (Association for Information Systems) sponsored conferences and forums (ICIS, AmCIS, ECIS, PACIS and CAIS), as well as those from HICSS, were included in the analysis on the assumption that sufficiently rigorous reviewing would have occurred.

After careful examination, 235 articles, from eight sources, were selected for detailed analysis: 181 (77%) from conferences and 54 (23%) from journals (see Table 3). These articles were read in their entirety, categorized and subsequently analyzed.

Sources	N	Percentage
AmCIS	67*	28.5%
HICSS	62*	26.4%
IJMC	37	15.7%
ECIS	24	10.2%
PACIS	21	8.9%
CAIS	9	3.8%
e-markets	8	3.4%
ICIS	7	3.0%
Total	235	100%

(Note: (*)) The difference from the reference distribution is highly significant.

Chi-square = 136.51, df = 7, 1-p = >99.99%. Chi-square is calculated with equal expected frequencies for each modality).

Table 3. Sources for the detailed m-business literature analysis

The absolute contribution from AmCIS and HICSS is notable. This is mainly a reflection of the overall size of these conferences and the large number of papers presented there.

4. RESULTS OF THE ANALYSIS

First and foremost, it is clear that mobile business research has expanded rapidly, more than doubling each year so far. More than half of the sample was published within 12 months of our study. See Figure 1.

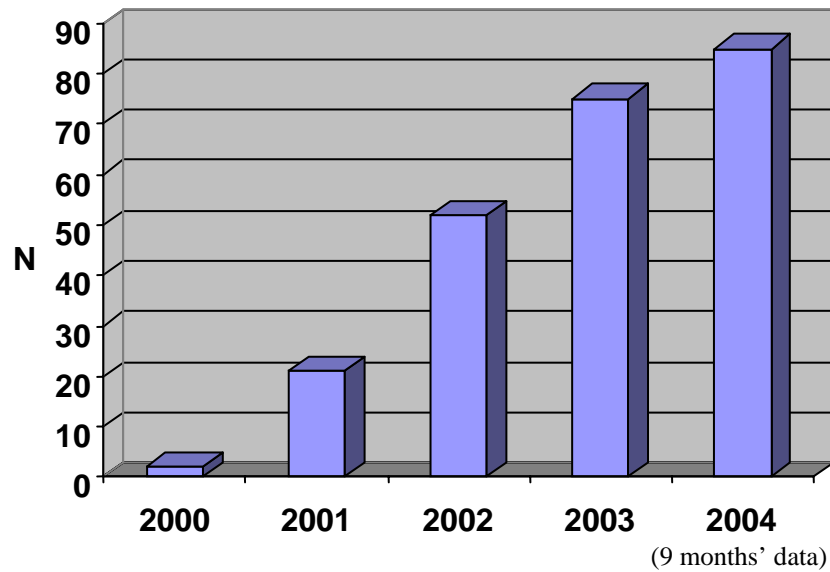


Figure 1. Number of publications per year

There is a general perception that most academics have approached m-business research from a consumer point of view, as was the case with the early e-business literature. In order to identify the research focus in relation to the target group, each article was classified into one of the following five categories: consumer, business, technology, industry and general. Table 4 presents a characterization of each category, and the distribution of articles across the five categories. The hypothesis – that mobile business research to date has been skewed towards a focus on consumer issues - was confirmed by our analysis at a very significant level ($p < 0.01$). Overall, research focused on consumer applications corresponded to 55.7% of the total.

Category	Characterization	N	Percentage
Consumer	Consumer applications, consumer behaviour, implications of mobile/wireless technology for consumers	131*	55.7%
Business	Business applications, organizational impact, implications of mobile/wireless technology for businesses	41	17.4%
Technology	Mobile/wireless technology, networks, development of applications	38	16.2%
General	General issues about m-business, broad and unspecific focus	17	7.2%
Industry	Telecommunications industry and wireless service providers	8	3.4%
Total		235	100%

Note: (*) The difference from reference distribution is highly significant. Chi-square = 204.13, df = 4, 1-p = >99.99%. Chi-square is calculated with equal expected frequencies for each modality.

Table 4. Focus of m-business research

This result has important implications. Practitioner research published by the Boston Consulting Group (Manget 2002), Media Lab South Pacific (2003) and AT Kearney (2003), point out that the international market for business applications of mobile technology - especially business-to-employee

wireless applications – is expected to grow twice as rapidly as the market for consumer applications. Yet the analysis above indicates that a large proportion of m-business research has been focused on consumer issues. This suggests that *business* applications of mobile/wireless technology is an area which is in need of more thorough development in future research.

A wide range of research topics were evident in the 235 articles. Based on the purpose (goal, aim, objective) *stated* in each article, the classification presented in Table 5 was developed. Since this classification did not aim to interpret the research goal, rather to reflect the primary topic of research according to the authors, an occasional overlap of semantics does occur (e.g. technologies and 3G). As expected, the most frequent topic was m-commerce (16.6%), usually approached from a consumer perspective. Typically this topic was approached in a very broad manner without focusing on a specific type of m-business application. Strategic analysis (e.g., describing or conceptualizing business models and presenting intuition-based reasoning about the future of m-commerce) also emerged as a popular topic (7.2%). It is interesting to observe that among the 41 papers published about business applications, nine focused on enterprise applications such as field force automation and job dispatching, eight investigated wireless applications in healthcare, and only four explored the strategic implications of wireless and mobile technologies for businesses. It's also remarkable that among 235 papers only one article had as its main topic the use of wireless and mobile technologies in government agencies.

Topic	N	Freq.	Topic (cont)	N	Freq.
M-commerce	39*	16.6%	Entertainment	4	1.7%
Strategy	17*	7.2%	3G	4	1.7%
Location	16	6.8%	Mobility	4	1.7%
Network	16	6.8%	Security	4	1.7%
Healthcare	13	5.5%	Context	4	1.7%
Internet (WAP, i-mode)	13	5.5%	Emergency Alerts	3	1.3%
Services	13	5.5%	Education	3	1.3%
Marketing	12	5.1%	Media	3	1.3%
Finance	10	4.3%	Social	2	0.9%
Enterprise	9	3.8%	Agriculture	2	0.9%
Mob. communications	9	3.8%	Government	1	0.4%
Devices	8	3.4%	Knowledge Mgt.	1	0.4%
Content	8	3.4%	Insurance	1	0.4%
Technologies	8	3.4%	Real estate	1	0.4%
Software development	7	3.0%	Total.	235	100%

Note: (*) The difference from reference distribution is highly significant. Chi-square = 208.64, df = 28, 1-p = >99.99%. Chi-square is calculated with equal expected frequencies for each modality.

Table5: Research topic

In order investigate whether the m-business literature is dominated by intuition-based reasoning and conceptual analysis rather than empirical investigations, a categorization was needed to classify the selected articles (Hirschheim 1991). In this case, “empirical research” was considered as all research originating in or based on observation or experience, independently of whether the researcher gathered data through primary or secondary data collection (e.g. case studies based on information collected from secondary sources such as websites and practitioner reports were considered empirical). Papers based on intuition-based reasoning and academic literature reviews were classified as “conceptual research.” Following classification, 153 articles (61.5%) were found to be empirical research and 82 (34.9%) conceptual (see Figure 2).

A substantial number of studies were not based on primary data collection. In most cases, these were case studies or simulations based on data gathered from external sources. As well, 89.4 % (34) of the papers focused on technology and 76.6% (13) of the papers focused on general issues were not based

on primary data collection. On the other hand, among the 41 papers published about business applications, 28 (68.2%) were based on primary data collection.

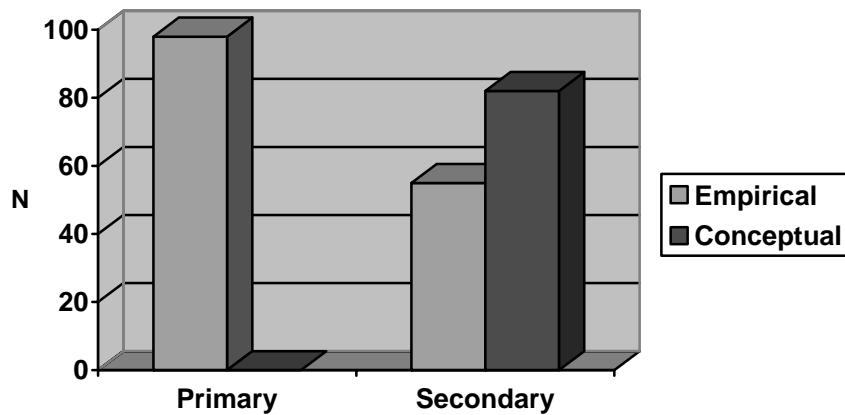


Figure 2. Nature of research and data collection

Another positive finding is the increasing proportion of articles based on primary data collection published in 2004 (Table 6). As m-business gains credibility as a separate area of research worthy of study, it is likely that the growth of primary research will continue to increase.

Year	Data Collection		Total
	Freq. (%)	Freq. (%)	Freq. (%)
	Primary	Secondary	
2000	0 (0.0)	2 (0.9)	2 (0.9)
2001	8 (3.4)	13 (5.5)	21 (8.9)
2002	20 (8.5)	32 (13.6)	52 (22.1)
2003	26 (11.1)	49 (20.9)	75 (31.9)
2004	44 (18.7)	41 (17.4)	85 (36.2)
Total	98 (41.7)	137 (58.3)	235 (100)

Table 6. Year of publication and data collection

In order to identify the research methods or research approaches used in the m-business literature, all articles were classified according to the method or approach stated in each article (Yin 1984; Benbasat et al.1987; Kaplan and Duchon 1988). Table 7 presents the distribution found in the sample. Due to the large number of papers base on conceptual analysis, literature review was the most common research approach used by the authors (31.9%). Case studies, usually focused on specific applications, were also commonly employed (23.8%). (It should be noted that 44% of the case studies were based on secondary data collection.) Surveys were also commonly used in the m-business literature. Most of surveys were administered to large samples of consumers, and questionnaires were administered through the Internet. Surveys of university students were common.

It has been observed in other domains that early research tends to be dominated by conceptual studies, later giving way to empirical work (Keen 1980). In order to determine whether there has been a longitudinal variation in the research methods used in the m-business literature, an independence test between year of publication and research method was carried out. It did not reveal significant relationship between these two variables. Nonetheless, it seems likely that in the near future the

proportion of conceptual analyses will decrease with the establishment of a more robust, empirically-based body of knowledge in m-business.

Finally, we conducted an analysis of each article's main contributions. Many authors clearly highlighted the main contributions of their articles; however, in a number of cases (86), due to the lack of information given by the authors, this classification required a reviewer judgment. Table 8 presents the findings. The fact that "literature review" was the most common research method undoubtedly resulted in "insights" and to a lesser extent "frameworks" emerging as the most common type of contribution of the articles reviewed. Also it is interesting to observe that only 30% (18) of the papers that offered a framework as its main contribution are based on primary data collection.

Method	N	Percentage
Literature review	75*	31.9%
Case study	56*	23.8%
Survey	40	17.0%
Simulation	32	13.6%
Experiment	13	5.5%
Interviews	6	2.6%
Focus Group	5	2.1%
Field study	3	1.3%
Delphi	3	1.3%
Not Stated	2	0.9%
Total.	235	100%

Note: (*) The difference from reference distribution is highly significant. Chi-square = 260.19, df = 9, 1-p = >99.99%. Chi-square is calculated with equal expected frequencies for each modality.

Table7. Research methods used

Contribution	N	Percentage
Insights	67*	28.5%
Framework	60*	25.5%
Model	58*	24.7%
Future research	30	12.8%
Application	15	6.4%
Algorithm	2	0.9%
Construct	2	0.9%
Policy	1* (-)	0.4%
Total	235	100%

Note: (*) The difference from reference distribution is highly significant. Chi-square = 193.49, df = 7, 1-p = >99.99%. Chi-square is calculated with equal expected frequencies for each modality.

Table 8. Primary contribution of articles

Finally, a longitudinal analysis of the articles revealed that in 2004 there was a significant reduction in papers with future research directions as their main contribution. Also in 2004, there was a significant growth in the number of articles offering mobile business models (Chi-square=25.94, df = 8, p<0.01).

5. CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Through a categorization and statistical analysis of the salient academic literature on mobile business, in this paper we have attempted to provide a general picture of the main characteristics of past and current research into mobile business. The initial motivation for this analysis was Anckar, Carlsson and Walden's (2003) statement that much of the m-business literature is descriptive, dominated by intuition-based reasoning and conceptual analysis rather than empirical investigations. The findings above provide evidence that their perception is quite accurate. However this is not likely to remain for much longer. The increasing interest of researchers and the rapid growth of the m-business body of knowledge will result in a transformation of research practice. Similar patterns of development have also been found in the e-business literature, particularly when many researchers aimed to establish the value proposition of business-to-consumer applications.

As the body of research into mobile business grows, the area of research is likely to mature and develop a research tradition of its own. However, our analysis suggests that for this to happen, mobile business researchers should begin to focus their efforts more carefully. In particular, the following areas are promising candidates for a future m-business research:

- *Research into business and organizational applications.* Current research is heavily skewed toward consumer issues, despite evidence suggesting that business and enterprise applications are the biggest growth area. In order better bridge the gap between theory and practice more research into business, government, healthcare and other industry areas is needed.
- *Empirical research.* The existing body of research on mobile business has a disproportionately high level of secondary research studies. Although there is some evidence that the balance is being redressed, more effort should be focused on high-quality research projects using first-hand, empirical data that lend themselves to the development of theory. While there are plenty of case studies (23.8%), taken at face value this implies a change to research method: there should be a reduction in the proportion of papers based solely on literature reviews (currently 31.9%) and an increase of empirically-based studies (surveys, interviews, experiments, action research, ethnography, and so on) as well as simulation.
- *Theory development.* Mobile business is unlikely to become fully recognized as a research area in its own right until it has a solid theoretical foundation. The IS discipline has a number of key theories, such as the technology acceptance model (TAM), that have become a cornerstone of IS research. While other theories have been applied to mobile business, it does not yet have theory to call its own.

REFERENCES

- Alanen, J. and Autio, E. (2003). Mobile business services: A strategic perspective. In *Mobile Commerce: Technology, Theory and Applications* (Mennecke, B.E. and Strader, T.J. Eds.), pp. 162-184, Idea Group Publishing, Hershey PA.
- Alavi, M. and Carlson, P. (1992). A Review of MIS Research and Disciplinary Development. *Journal of Management Information Systems* 8: 45-62.
- Anckar, B., Carlsson, C. and Walden, P. (2003). Factors affecting consumer adoption decisions and intents in mobile commerce: Empirical insights. *Proceedings of the 16th Bled eCommerce Conference*, Bled, Slovenia.
- AT Kearney (2003). The new mobile mindset.
http://www.atkearney.com/shared_res/pdf/Mobinet_Monograph_S.pdf, accessed 3 December 2003.
- Banker, R. D. and Kauffman, R. J. (2004). The Evolution of Research on Information Systems: A Fiftieth-Year Survey of the Literature in Management Science. *Management Science* 50(3): 281-298.

- Benbasat, I., Goldstein, D. and Mead, M. (1997). The case research strategy in studies of information systems. *MIS Quarterly*, 11 (3), 369-386.
- Bharati, P. and Tarasewich, P. (2002). Global perceptions of journals publishing e-commerce research. *Communications of the ACM* Volume, 45 (5), 21-26.
- Clarke, I. (2001). Emerging value propositions for m-commerce. *Journal of Business Strategies*, 18(2), 133-148.
- Culnan, M.J. and E.B. Swanson (1986). Research in Management Information Systems, 1980-1984: Points of Work and Reference. *MIS Quarterly*, 10 (3), 288-302.
- Forrester Research (2004). Trends 2005: Enterprise Mobility. <http://www.forrester.com/Research/Document/Excerpt/0,7211,35606,00.html> , accessed 20 March 2005.
- InfoSync World (2004) 1.87 billion mobile users by 2007. <http://www.infosyncworld.com/news/n/5048.html> accessed 15 March 2005
- Hirschheim, R.A. (1991). Information systems epistemology: an historical perspective. In *Information Systems Research: Issues, Methods, and Practical Guidelines* (Galliers, R. Ed.), pp. 28-60, Blackwell Scientific Publications, Oxford.
- Kaplan, B. and Duchon, D. (1988). Combining qualitative and quantitative methods in information systems research: a case study. *MIS Quarterly*, 12 (4), 570-586.
- Keen, P. (1980). MIS Research: Reference Disciplines and a Cumulative Tradition. *Proceedings, 1980 ICIS Conference*, Boston.
- Manget, J. (2002). Competitive advantage from mobile applications. http://www.bcg.com/publications/files/competitive_adv_mobile_apps_ofa_feb02.pdf, accessed 3 December 2003.
- MediaLab South Pacific (2003). No wires, no limits: an industry analysis of New Zealand's mobile and fixed wireless sector. <http://www.wirelessdataforum.co.nz/article.php?sid=855&catid=354>, accessed 3 December 2003.
- Mylonopoulos, N.A. and Theoharakis, V. (2001). Global perceptions of IS journals. *Communications of the ACM*, 44 (9), 29-33.
- Negroponte, N. (1995). *Being Digital*. Alfred Knopf, New York.
- Scornavacca, E., and Barnes, S. J. (2004). M-banking services in Japan: A strategic perspective. *International Journal of Mobile Communications*, 2(1), 51-66.
- Tapscott, D. (1997). *Growing Up Digital*. McGraw-Hill, New York.
- Yin, R.K. (1984), *Case Study Research: Design and Methods*. Sage Publications, Thousand Oaks.