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# MOBILE COMMERCE INTEGRATION ACROSS THE SUPPLY CHAIN IN BUSINESSES IN NEW ZEALAND

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## Abstract

*This research investigates mobile commerce (MC) adoption in the supply chain (SC) of businesses in New Zealand. The evidence provided suggests that most of the MC applications are concentrated in the B2B type of relationships. Its use in B2C is limited. However, the evidence suggests that most of the MC activities are internally focused in streamlining operations and processes. The customers of these businesses are not involved in these activities or in interlinking with their MC systems. MC in businesses in New Zealand is used to drive efficiencies in operations in order to fulfil orders and requests (coordinate tasks and schedules) and hence, increase customer satisfaction. This research highlights implications in MC research in businesses in New Zealand and suggests areas for further research in this newly introduced technology. The outcome of this research could be of interest to businesses, researchers, and professionals interested in diffusing MC in businesses in New Zealand and elsewhere.*

**Keywords:** Mobile commerce, supply chain integration, B2B, New Zealand

## Introduction

The information revolution is changing the facet of business in three different ways (Porter & Miller, 1985): it changes industry structure, it gives companies new ways to outperform their rivals, and it spawns whole new businesses, often from within a company's existing operations. A strategic building block in highlighting the role of Information Technology (IT) in competition is the role played by value chain (VC). A company's VC is a system of interdependent activities (primary, support), which are connected by linkages (Porter & Miller, 1985). Linkages exist when the way in which one activity is performed affects the cost or effectiveness of other activities. Careful management of linkages is often a powerful source of competitive advantage (Porter & Miller, 1985). The VC for a company in certain industries is embedded in a larger stream of activities called the value system (VS). The VS links the organisation and its suppliers (upstream) and buyers (downstream). The reported success of IT in general and electronic business (EB) specifically in integrating the VS at every point, transforming the way value activities are performed and the nature of the linkages among them, is highly publicised amongst researchers (Kalakota & Robinson, 2001; Porter & Miller, 1985; Schneider & Perry, 2001; Turban et al., 2002). IT and EB also affects the competitive scope and reshape the way products meet buyer needs where every value activity has both a physical and an information-processing component (Porter & Miller, 1985).

We are currently witnessing an overwhelming growth in technologies aiming at delivering remote or wireless, rich, personalised, localised, and real-time content on handheld mobile technologies to users (usually very busy) anywhere anytime. Thus, providing more convenience to traditional EB buyers and suppliers existing in the wired marketplace. Let us not forget that mobile business is the result of this wired marketplace and pervasive computing, where mobile computing and communication capabilities are envisioned to be embedded in everyday activities of the different users (Lee, 2002; Samaras, 2002; Turban, King, Lee, Warkentin & Chung, 2002).

Being a novel technological innovation, the true effectiveness of mobile commerce (MC) in business is yet to be determined. What are the MC technologies that are being used by businesses in New Zealand and where they are being used in the business channels? Therefore, the first objective of this research is to explore the impact of MC in organisations in New Zealand with respect to their VC/VS activities. The second objective aims at identifying the factors that influence MC success in organisations in general. The initial insights emerging from these perspectives are important to researchers and to professionals interested in this area. Thus, such insights could be the foundation for further research in this area.

In review of the Supply Chain Management (SCM) literature, Mentzer et al. (2001) observed two concepts recurring frequently: supply chain (SC) and SCM. They found that the concept of SC has attracted the attention of researchers more than the Supply Chain Management (SCM) and pointed to the difference between both notions. Mentzer et al (2001) define SC as “a set of three or more firms or individuals involved directly in the upstream and downstream flows of products, information, services, and finances from a source to a customer”. Mentzer et al (2001) classified the arguments surrounding SCM into three categories: philosophical business paradigm, the implementation of a management philosophy, and identifying a set of management processes where SCM could govern business relationships with partners. Thus, the first point acknowledges the importance of SCM as a business paradigm and the following categories represent the activation and the management of this developed SCM philosophy in organisations. However, this depends on how successful the members of the VS are in aligning their strategies and goals in serving customers. Accordingly, Mentzer et al (2001) defined SCM as “the process of managing relationships, information and the flow of materials across the enterprise borders to deliver economic value and enhanced customer service”. The advantages sought from establishing the SCM are to build an integrated set of processes downstream and upstream aiming at improving Customer Relationship Management (CRM) and services provided. This could lead to: increased profits, competitive advantage, and lower costs in providing customer value service (Porter & Millar, 1985).

## **EB in the SCM**

In order to highlight the different IT and EB technologies involved in automating the VC/VS of the different organisations, Kalakota and Robinson (2001) provided EB application architecture (Figure 1). At the back end, the different automation processes are involved in integrating the company’s systems (logistics, production, distribution) with business partners, suppliers, distributors, and resellers - where at the heart of the back-end VC/VS is the Enterprise Resource Planning systems (ERP, e.g., SAP, Oracle, Siebel, People Soft, etc.). At the front end, the different automation processes are involved in integrating the selling channels (marketing, sales, customer service) with customers and resellers – where at the heart of the selling VC/VS is the CRM. The seamless integration across the front end and the back end VC/VS is very important, as this could lead to the development of state of the art business intelligence, decision/executive support systems and knowledge management applications. This allows for better analysis, forecasting and optimisation (Casati et al 2001; Kalakota and Robinson, 2001). Automation of a firm’s SCM operations faces many challenges since this process involves automating operations internally and across organizations and automating heterogeneous and independent systems (Casati et al 2001).

## **Mobile Commerce**

MC is defined as “content delivery (notification and reporting) and transactions (purchasing and data entry) on mobile devices” (Leung & Antypas, 2001) or mobile networks. That is to enable mobile users and businesses to compute, to commerce and access information from anywhere and any time (Samaras, 2002). MC involves different stakeholders in the mobile industry such as mobile hardware manufacturers, mobile applications and portals developers, middleware developers and integrators, and wireless networks providers and carriers, intermediaries, and finally services and content providers.

MC has a number of advantages over EB due to the unique features that MC possess such as portability, flexibility where mobile users are capable of receiving information or conducting transactions regardless of their location, through their Internet enabled devices, personalization where MC applications can be personalized to represent information or provide services in more appropriate ways to the specific user, dissemination where a large number of the consumer population can receive information simultaneously due to some wireless infrastructures that support simultaneous delivery of data to mobile users within a geographical region, and ubiquity where business entities can reach their customers regardless of their location and time, through Internet enabled mobile devices (Keng et al., 2001). MC flexibility arises from the convergence of the Internet, enterprise applications and wireless technology. Enabling MC to deliver information to the right place at the right time, and to reach customers, suppliers, and employees regardless of their whereabouts, making this technology of significance to the business and in SCM. On the other hand, people could work or execute large parts of their work from their offices (even between floors, out

of the office, break, etc.), home, and even while travelling from/to office during the rush hours in the morning and afternoon. Varshney and Vetter (2002) believe that as wireless technology evolves, its applications in business will be more creative and many more MC opportunities will be implemented such as mobile finance applications, mobile advertising, mobile inventory management, and product location shopping.

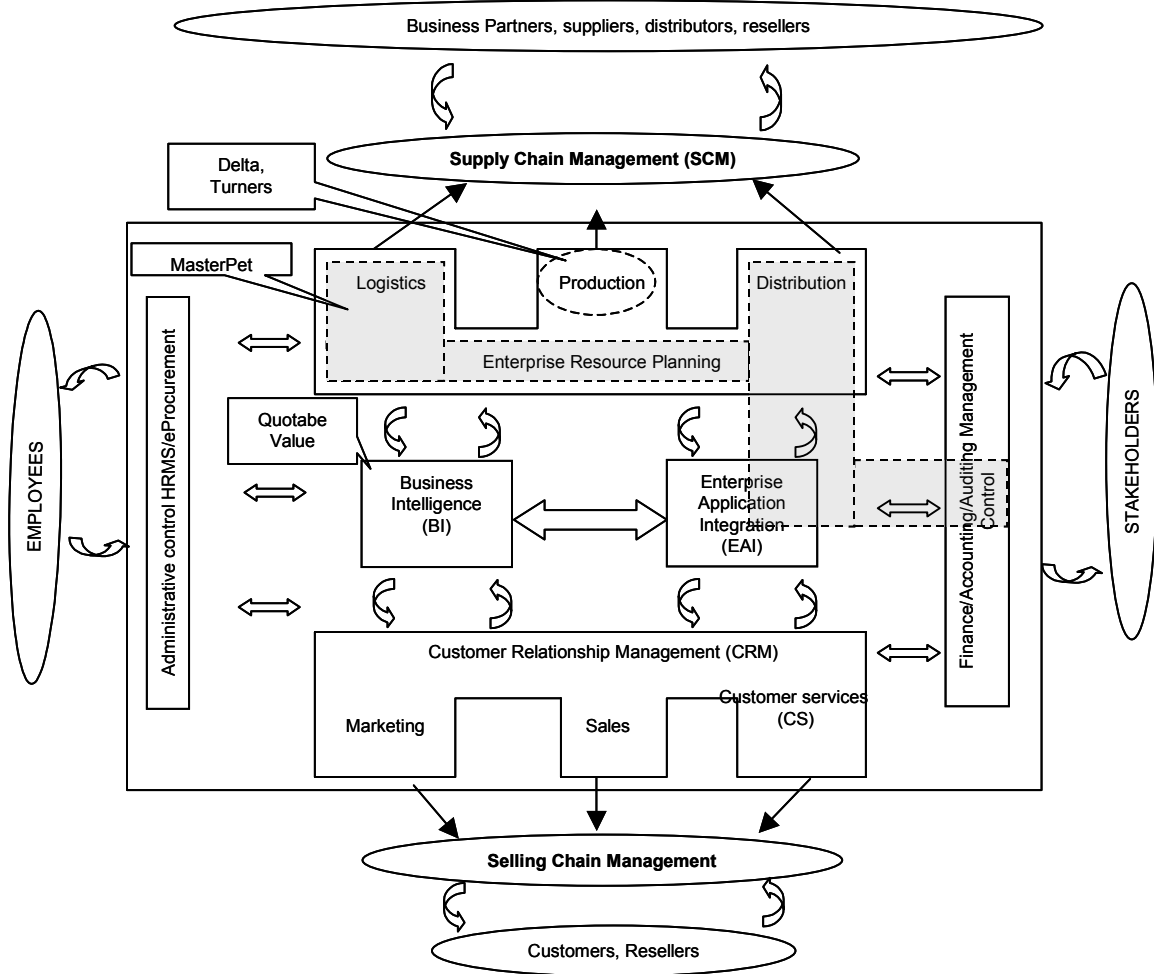


Figure 1. EB Application Architecture [Kalakota and Robinson, 2001: 164]

On the other hand, MC has the following disadvantages:

**Speed:** MC faces a number of obstacles due to either technical restrictions in the wireless communication and mobile devices or business and legal concerns (Keng et al., 2001). Speed so far is the major barrier for the success of MC and this relates directly to the handset itself (small processing power and small mobile browsing screens) and to the existing operator/carrier (O/C) telecommunication infrastructure that exists in the different countries. The situation varies from country to another depending on the supporting infrastructure (e.g., 2G, 2.5G, 3G).

**Lack of standards:** lack of a unified wireless protocol (i.e., WAP/WML Vs. NTT DoCoMo's iMode) represent a challenge for standardising the development of mobile applications in order to guarantee seamless services (compatibility) to customers across different: telecommunications equipment, mobile devices, and applications.

**Organisational:** realising the full potential of SCM in organisations is made more difficult by the fact that introducing MC requires a complete change in business strategies (e.g., BPR, BPI, SCM, CRM). Organizations will have to be redesigned, make changes to organizational behaviours, develop new business models and eliminate inefficiencies of the old organizational structures to

remain competitive and gain the productivity benefits from MC (Keng et al., 2001). The introduction of MC in the organisation is expected to impact the organisation holistically in the sense that it will impact logistics, procurement, and asset management issues surrounding the increased number of devices and software and hence, the organisation must be ready for such a challenge by providing appropriate support for such a wide range of mobile customers and employees, which is a challenge to the traditional customer service and help desk function (Keng et al., 2001).

Economical: financial risk is another impediment and whether the developed business case could provide adequate returns on the MC investment (ROI) is challenging (Anonymous, 2000; Keng et al., 2001) due to the lack of detailed information about MC success or operational use. High profit-schemes enforced by O/C as a way to increase the ROI made on MC infrastructure represent another challenge and will deter many users from buying into the technology. These schemes were based on lack of competitors in this area (Anonymous, 2000) where earlier players make most of the profits and dictate the rules of the game. Therefore, it is expected that the prices will rationalise in the short term due to the rapid advancement in technology and as more competitors enter the field and as prices of technology plummet. The promise of the 3G-technology is that it will enable the delivery of various services at the same transaction-completion time but through different bandwidths. Although the preceding make the connection time fee uneconomical to wireless providers, as it does not reflect the actual use of the bandwidth (radio spectrum usage, e.g., downloading video requires far more bandwidth than wireless Web access) (Geng & Whinston, 2001) but this will benefit the consumers because they can utilise the full bandwidth without worrying about different pricing schemes.

Social and Environmental Impacts: despite the push from O/C for their services over MC, recent statistics indicate that 82% of mobile consumers have shown no interest in mobile data (Anonymous, 2000). Simplicity in use is therefore important. Organisations need to improve the reliability and the stability of communications with customers by providing comprehensive technical and operational support to assure them that their financial information is safe and secure. This process increases customers' loyalty. It is worth noting that legal issues and privacy concerns are still unresolved fully. With the proliferation of different mobile technologies in the market and advancement in mobile technology, more business processes could be integrated very easily, enabling workers to squeeze more jobs within the one day. This "burnout" effect will create an environment of high expectations and hence, put greater strain on employees to increase their productivity and this will have devastating social impacts on our lives in the long run, e.g., social ties, psychological problems, etc. Displaying ads on mobile phones will prevent the user from using the mobile phone effectively. Issues like privacy and security, represented here by the ability to know the exact location of the mobile user anytime, anywhere, will put great strain on our personal lives. Since the mobile services provider or carrier already knows our profiles and personal details as subscribers this will open up a large venue for customer profiling and direct personalised marketing campaigns. Intercepting the wireless communication spectrum by hackers is much easier than tapping into the wired medium. Stealing the mobile device with its valuable contents is another challenge. Serious issues like viruses are starting to surface on the mobile arena and need to be resolved. Still we expect the mobile device to have a convenient display, longer battery life, faster performance, buffer and bigger storages, support multi-features (colours, tones, digital camera, voice recognition, roaming, etc.). Recent research shows great health hazards to the human brain as a result of the radio spectrum and waves used by the different mobile operators and how receiving a mobile call by a user will increase the amount of waves around the mobile phone reception end, which is located near the user's head (Turban et al., 2002). Also, issues like getting rid of, or recycling, old or used mobile stocks are very important as it represents a great threat to the environment. However, getting rid of these stocks is very costly and requires conscious handling by the different countries.

## **Methodology**

This research adopts 7 cases that have been published in the print media and the Web (Table 1). The reason behind selecting these cases in this research is due to the fact that the print media promoted these cases as being successful in adopting and implementing MC in their organisations. Further, the print media provided detailed information about their adoption of MC technologies and applications. This initial approach is useful and is considered safe because the generated insights could assist this research later on in focusing on the main issues that are of essence to the businesses environment in New Zealand. Potential adopters of MC in SCM could benefit from the experience of early adopters in this new area. Due to the novel nature of the MC in general and the concept of integrating it in SCM specifically, there is a concern about not developing sufficient insights. Searching for businesses that have adopted MC could prove lengthy and expensive process. Hussey and Hussey (1997) have suggested using secondary data for completing a research project – especially if there is not sufficient time to collect primary data. It is hoped that by organising the secondary data in a useful form it could provide meaningful information, which could be used to further our understanding about MC in SCM in organisations in New Zealand. Selecting an appropriate research strategy is dependent on the type of research question posed, the extent of control an investigator has over actual behavioural events, and the degree of focus on contemporary as opposed to historical events (Yin, 1994). This research's question (what), "...is a justifiable rationale

for conducting an exploratory research, the goal being to develop pertinent hypotheses and propositions“ (Yin, 1994: 5). In addition, the second research question (where) is “...advantageous when the research goal is to describe the incidence...” (Yin, 1994: 6). In both types of questions, the use of archival records such as business records or print-media records (issues) in this research is appropriate (Yin, 1994). Archival analysis does not require any control over behavioural events and can, of course, be used for both historical and contemporary events (MC in this research). Both researchers completed the case-analysis separately and then compared their results to validate the research outcomes.

### MC in the SCM: Cases from New Zealand

Keng et al (2001) found that most of the early participants in the MC SCM were companies belonging to transport, basic enabling services, transaction support, presentation service, personalization support, user application and content aggregators. Different cases focusing on the use of the MC technology in businesses in New Zealand were analysed and categorised according to the adopted MC technology and to the type of MC application (Table 1).

**Table 1. MC Cases from New Zealand**

<b>Business Name</b>	<b>Mobile Technology</b>	<b>Application</b>	<b>Findings</b>
U-Bix	027 mobile phones, PDAs with wireless data cards and scanners using Telecom’s mobile JetStream network	U-Bix dispatching jobs to technicians via pager or cell phone was time consuming, inaccuracies occurred while noting down on paper 15-character part numbers of certain parts required for a maintenance job. Therefore, there was the need to mobilise its technicians who are on the road all day, every day with an 027 mobile phone and a handheld device with wireless data cards supported by telecom’s Mobile JetStream network and scanners to record bar-coded parts. When a customer calls, the job is linked automatically to area technician, technician replies whether to accept job or not, if not job is passed on to another technician otherwise details of the job is sent to the technician via an on site message server.	<ul style="list-style-type: none"> <li>• 30% increase in productivity</li> <li>• 20% improvement in service response times</li> <li>• Reduced errors and inefficiencies</li> <li>• Better customer service through empowered staff</li> </ul>
Green Acres	PDAs with wireless data cards using Telecom’s JetStream mobile network.	Franchised service groups, e.g., lawn mowers, gardening, cleaning services, etc. Green Acres intend to deliver a unique level of customer service, so they chose a new wireless system, which they have tested with their Auckland’s electricians. Trades people use PDAs complete with mobile data cards, to access the Green Acres Job Management system while on the run, and receive and respond to job bookings sent by their area managers. Their hand held devices provides them with detailed information about customers and a notes field for important additional information. When a job is accepted, data flows back and forth through the data network until the job is completed.	<ul style="list-style-type: none"> <li>• Better customer service</li> <li>• Lower operating costs</li> <li>• Less time consumed to despatch jobs</li> <li>• Increased job throughput and more benefit</li> </ul>
Quotable values	Laptops and mobile phones using Telecom’s JetStream mobile network.	A crown owned entity (niche). It maintains a database with records for every property in New Zealand. Mobile office applications to enable the manager who travels frequently to have an efficient and high speed access (80 kbps) to his email, all of his files, internet, intranet and to download files with a Mobile JetStream-enabled data card that fits both his laptop and handheld via Quotable Value’s LAN. The fact that the user pays only for the data he uses, not the time he is connected is an advantage to equip other Quotable value staff (executive team/valuers) with mobile JetStream devices. There is a B2B opportunity whereby some of their 1400 monthly subscribers use a handheld to get direct access to their Web site.	<ul style="list-style-type: none"> <li>• Efficiency</li> <li>• Cost effective</li> <li>• Customer satisfaction</li> <li>• Convenient and reliable high speed experience (80 kbps)</li> <li>• Better decision making</li> <li>• Competitive advantage</li> </ul>

<b>Business Name</b>	<b>Mobile Technology</b>	<b>Application</b>	<b>Findings</b>
Turners	PDA's and mobile phones using Telecom's JetStream mobile network.	Auctioneer: provide vehicle inspection services to customers. The system allow Inspectors to take photos with a digital camera, complete a card that can be popped into the back of the handheld and transmitted along with written data, back on to the turners vehicle inspection intranet via Mobile JetsStream. Clients reduce freight costs since vehicles don't have to be transported to a central inspection point.	<ul style="list-style-type: none"> <li>• More efficient services</li> <li>• Cost competitive</li> <li>• More jobs through</li> <li>• Less time consumed to complete an inspection</li> </ul>
MasterPet	PDA, mobile phones using Telecom's JetStream mobile network.	Leading pet food and pet accessory supplier. The solution provides a mobile sales tool to the sales staff, where orders can be placed in the customer's premises via a handheld device, the order is immediately synchronized with the head office database and sales staff can check for product availability, pricing information and a customer's purchasing history on the PDA (iPAQ). Invoices can be automatically generated, orders placed can be taken of the warehouse shelf, and delivered to customers within 10 minutes. Hand held devices enable staff to have customer information with them on the road, access their email and other company resources, and managers keep in touch with their reps.	<ul style="list-style-type: none"> <li>• Less time consumed for processing orders</li> <li>• More efficiencies achieved within the business (better team communication, instant fulfilment)</li> <li>• Improved customer service</li> <li>• Reliable connections</li> <li>• User friendly</li> </ul>
Inter City Urgent Couriers	WAP mobile phones using Telecom's mobile network.	An electronic mobile dispatch system, DispatchIT, to advise drivers of new jobs through their mobile phones and then access details from the internet site, automatically update the status of each job in the company's computer system. The company's accounting processes have also been streamlined, with all transactions automatically entered into its financial systems for billing purposes.	<ul style="list-style-type: none"> <li>• Improved customer satisfaction</li> <li>• 25% increased productivity (more jobs were completed)</li> </ul>
DELTA	Laptops, complete with a mobile data card using Telecom's virtual private network (VPN)	An asset management and contracting company. This company has civil works and electrical services divisions. It is New Zealand's fifth largest electricity distribution company. The nature of this business managing physically distributed long-life assets requires geographically captured records, that can be updated instantly, therefore, a geographic Information System (GIS) was required to enable DELTA to record and track the presence and technical specifications of all the assets it manages across New Zealand. Field staff have been armed with Citrix-versioned GIS software on laptops, complete with a mobile data card through which they are able to securely log onto the DELTA server via the web using Telecom's virtual private network (VPN) and standard Microsoft VPN products to see the same information they would be able to access from their office PC. They can query, update and map data from the field, where a designated data administrator audits the versioned field data in the office before posting it into the main database.	<ul style="list-style-type: none"> <li>• Exceptional field service at a competitive cost</li> <li>• Improved communication with geographically dispersed staff and contractors</li> <li>• Great efficiencies through reduced double-entry requirements and real-time information exchange</li> <li>• Information accessed in the field 100% up to date and accurate</li> </ul>

This research attempted to map the use of the MB in the above cases across the different SCM channels in Figure 1 (dotted lines). The position of the different cases with respect to the different VC/VS is explained in Table 2. Each case is analysed in terms of the specific entity it addresses in the SCM, the system/s involved in delivering the MC application. The value pursued by the different cases in having MC is depicted as well in Table 2. These are discussed in the following section.

**Table 2. Mapping MB Use in the SCM in Cases in New Zealand**

#	Business Name	Entity (Figure 1)	System/s involved in Entity	Value
1	U-Bix (Mainly services)	Customer/business service Production	CS, EAI	Efficiency (productivity) and improve business/customer relationships.
	Green Acres (services)	Customer/business service Production	CS, EAI	Efficiency (productivity) and improve business/customer relationships.
3	Quotable values (Mainly services)	BI and production	BI, EAI	Enhance efficiency (productivity in the near future), effectiveness (remote decision making tool) and strategic advantage when subscribers join in.
4	Turners (Mainly services)	Production	CS, EAI	Enhance efficiency (productivity) and improve business relationships.
5	MasterPet (Mass Product)	Logistics and distribution	Distribution, Logistics, ERP, EAI, Finance/accounting	Enhance efficiency and improve business relationships.
6	Inter City urgent couriers (services)	Distribution	Distribution, EAI, Finance/accounting	Enhance efficiency and improve business relationships.
7	DELTA (services)	Production	Production, EAI	Enhance efficiency (productivity in surveying sites).

## Discussion and Conclusion

This research was interested in identifying MC in the context of its use in the SCM in business in New Zealand. According to the many reported challenges in establishing seamless and integrated technologies in SCM and to the lack of research in this area, this research adopted this exploratory focus in order to generate insights around this area. This conjecture is important to many researchers, policymakers, and professionals interested in MC-SCM in organisations. What could be synthesised from the cases provided in this research is that the rapid development in the MC technology (JetStream) is encouraging businesses to adopt MC in their business. MC in these cases is not engaging customers (B2C) in different information/financial transactions. This could be attributed in part to the high costs involved in having or providing MC transactions (Anonymous, 2000) and to issues pertaining to security concerns highlighted in this research.

All the cases did not empower their customer/businesses in initiating mobile activities. Most of the applications of the MC technology in business in New Zealand were concentrated in automating part of their internal processes in the field services area with an aim to increase the efficiency and productivity of the business operations. This is in line with Keng et al.'s (2001) research. These activities were more towards the upstream end of the SCM (B2B) where sales (MasterPet) and technical (U-Bix, Green Acres, Quotable Valuers, Turners, Delta) staff and drivers (Inter City Urgent Couriers) are equipped mostly with PDA's, mobile phones or laptops to access the organisational database to implement different remote operational activities. The emphasis in these activities is to drive efficiencies in operations (fast, error free, initiate a sequence of processes). Such activities would lead to efficient order fulfilment leading to better business relationships. This indeed, represents a progress in the MC area with more businesses going mobile. However, its use in B2B was limited to only automating internal processes and operations. For example, in the case of MasterPet it was able to streamline the whole internal ordering process starting from the mobile device in the hand of the sales people and ending with the goods being ready to be delivered in 10 minutes along with the corresponding paper work (shaded area in Figure 1). For example, their IT manager indicated that, "... the reduction in erroneous orders is an immediate noticeable return on investment for MasterPet, each erroneous order costs MasterPet \$60. The savings occur because the sales force sends their orders directly to our ERP. This avoids the need for double entry of paper based orders, and errors caused by illegible faxes". On the other hand, there was no internetworking as such between MasterPet and its nationwide pet stores, veterinaries, and supermarkets. In comparison with other cases, the case of MasterPet was the only one with extensive utilisation of the MC, EB, and IT in the SCM. It was suggested that the type of customers influence the direction of the adopted



MC in the SCM. It is worth investigating this perspective from businesses that belong to the mobile B2C model. For example, Green Acres and U-Bix may serve businesses and individuals (CS in Figure 1) but their emphasis was put on enhancing internal operations and productivity. The type of products was also suggested to influence the adopted MC in the SCM. For example, dealing with bulk commodities that require bulk distribution might initiate interlinking in internal systems to encourage efficiencies in the procurement/distribution channels (MasterPet). A good suggestion for MasterPet is to empower their distributors to place their orders directly without the need for sales staff. Companies like U-Bix (sell few expensive equipment) and Green Acres, Turner, Inter City are more concerned in increasing efficiencies and productivity in internal operations and this may not necessitate having many intelligent systems in place. The complexity of the EAI integration in these organisations calls for further investigation. This issue raises another point in that the MC infrastructure is fully dependent on the available IT and EB infrastructure to judge its sophistication in organisations. This refers to the earlier argument amongst researchers about the prerequisites for having the EB infrastructure which is fully dependent on the availability of fully integrated IT infrastructure in addition to the other environmental, organisational, individual, social, and political influences (Schneider & Perry, 2001; Turban et al., 2002).

This research represents an initial step in this MC-SCM direction. This research identified some of the MC technologies used in businesses in New Zealand and attempted to position those in the SCM highlighting relationships and interrelationships between the different strategic entities and processes in the SCM. There was some serious investment in MB technologies for automating part of the internal operations like in the case of MasterPet. It was suggested that this could be attributed to product/customer specifics. Above all, more work is needed to measure the true use of the MB technologies in businesses in New Zealand. The evidence suggested so far indicates that MB is still growing in New Zealand and businesses are still experimenting with it to judge its effectiveness in their business.

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