

Assessing the Business Value of Mobile Applications¹

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Abstract

This paper presents a framework for evaluating the business value of mobile technology in the context of process transformation. It is argued that evaluating mobile applications must be done in that context. The proposed framework provides a starting point for companies to evaluate technology investment decisions in the context of enabling the enterprise for the next generation eBusiness practices.

1. Introduction

This paper focuses on the broader perspective of the value of mobile business (m-Business) from the perspective of the customer. It is argued that a “killer application” approach to assessing value is fundamentally flawed in the sense that the driving force should be eBusiness enablement. Consequently, a framework for value assessment is necessary. In the processes of working within such a framework, one would obviously look for high-value applications, but at the same time avoid the pitfall of short term value that is inconsistent with the medium and longer term objectives of the company.

In the current stage of eBusiness, companies must focus on process transformations that will enhance their competitive position, and there is a growing awareness among senior executives that a process-oriented approach that focuses on customer-orientation, agility, and efficiency is a key success factor. Consequently, addressing issues related to mobile technologies and their use must be done within and consistent with an overall framework for eBusiness transformation. Given the combinatorial explosion of options faced by business executives, we argue that a broader perspective is superior to a short term one for the

very simple reason – there are always many alternatives to achieve a short term solution, which are similar in terms of the relevant performance measures, but are radically different in serving a basis for further eBusiness transformation.

This paper should be viewed as a high-level guidance for decision makers who face decisions related to m-Business investments, rather than a formal methodology. It is organized as follows. The next section discusses the key trends and success factors in enabling eBusiness transformation, which is the context for mobile imperative discussion. Section 3 presents a framework for evaluating the business value of mobile technology and applications, and Section 4 summarizes the paper.

2. Enabling eBusiness Transformation

When discussing mobile technology and its applications, it is crucial to understand the key business and technology drivers that are impacting every enterprise. In fact, it is argued here that the key drivers and issues are common to all industries – customer driven competition. We distinguish between the concepts of being customer-centric and customer-oriented. In fact most of CRM related efforts of companies is a continuation of the struggle that started with the enterprise integration initiatives in the '80s as business models changed from account-centric to customer centric – that is how to have a universal information view of a customer and all of the related interaction with the company. Customer centric is “knowing every thing about your customer” while customer-oriented is “doing the right things in customer interaction”; obviously the former is a necessary but not sufficient condition to the latter. On the architecture level both processes and systems must be architected to

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provide an adaptive infrastructure (also referred to as sense-and-respond infrastructure). Finally legacy systems can easily be created using modern technologies, the most problematic of which is at the process level.

The two strategic key drivers for evolution from traditional business to next generation eBusiness are “personalization” and “total” solution trends. They are explained briefly in this section (detailed discussion is in [3]). Process Interleaving in Enabling Customer-Oriented Total Solution

As was discussed earlier in this paper, the customer-focused competition in a dynamic business environment requires significant transformations to enable companies to move to next generation stages. The key requirements related to that transformation are as follows.

IMPERATIVE I

TO BE AN ADAPTIVE CUSTOMER ORIENTED COMPANY YOU MUST HAVE

- Context dependent Interleaved processes
- Sense-and-respond architecture (management, people, processes, and technology)

The internet and the web have changed the requirements for inter-process functionality dramatically. Tying processes together at the back end did not work when multiple processes had to come together through a web window. Time to market and agility associated with higher degree of inter-company business demand a level of integration and flexibility way above traditional levels. We view this as one of the major issues in enabling eBusiness transformation in enterprises in general and high added-value mobile applications in particular.

Interleaving is a relative term and denotes a higher level of integration compared to a base state. Its significance is in eBusiness enablement to achieve dynamic “configurations” of various processes in general and customer solutions in particular (see [1] and [2] for a more formal discussion). It is important to note that our discussion here is at the business process level and not the system level. When two processes are interleaved the level of context-dependent two-way interaction is much higher than the integrated case.

The approach to process interleaving must take into consideration Imperative I. Detailed design principles are beyond the scope of this paper, but it should be emphasized that following a process-

centric methodology at all levels is crucial. In addition, fundamental understanding of context dependent processes is required to achieve effective interleaving.

3. A Framework for Evaluating the Value of Mobile Applications

Following the principles of the process interleaving model, we argue that the primary criteria used in evaluating the value of mobile applications should be process related. A process oriented analysis can then serve as a road map for ROI-based analysis of specific mobile applications. The enablement factors of mobile applications are:

IMPERATIVE II

THE FOCUS ON M-BUSINESS MUST BE PROCESS ORIENTED AND FOCUS ON

- Providing process continuity
- Preserving Process properties
- Increasing level of interleaving

The above factors have ROI-related business ramifications at three levels:

Level I: increased efficiency that manifests itself in reduced cost, faster execution, higher throughput, etc. for existing processes.

Level II: Increased effectiveness through the introduction of new process functionality. This level denotes the achievement of higher level objectives than just efficiency.

Level III: New business processes which are enabled by emerging mobile technologies.

The added-value of mobile applications and at which level it falls depends of course on particular applications. Nevertheless, some useful generalizations can be made, which in turn is helpful in constructing more specific evaluation frameworks.

Before we present the conceptual results, it is important to define several terms and concepts related to e-mobility that are often used in confusing and ambiguous way in practice. We assume that a particular business environment is the subject of an evaluation regarding the value of m-Business. The environment is characterized by the several distinct elements and properties, the intersection of which creates particular scenarios. They are explained below.

Resources

Resources are elements in a given business environment, which participate in the business

processes relevant to the analysis. These elements can be viewed as a network of connected resources such as people, manufacturing and office machines, transportation vehicles, computing and communication devices, software components, and content.

Mobility

Mobility characterizes the degree to which each element is mobile within the context of the business processes. Some elements, such as desktop computers and personnel, are always stationary; while others such as laptop computers and traveling sales persons could be mostly mobile. Note that the fact that a person is naturally mobile does not imply that s(he) is mobile within the context of the business process; furthermore, mobility has to be beyond a certain distance to be relevant to our discussion.

Connectivity

Connectivity indicates the degree and mode of communication infrastructure among the resource elements. The connectivity determines who can communicate directly with whom, other type of constraints, and the type of connection (always connected Vs. on demand; synchronous Vs. Asynchronous etc.).

Communication

Communication is characterized by the specific technologies (physical links and protocols) that can be used to establish particular connectivity for relevant process links. Much of the research and discussion in the literature are in the context of cellular technology. In this paper we don't discuss specific communication technologies, but rather focus on specific enabling properties that should be provided by the technology offerings.

Applications

An application is a collection of software components that implements business tasks or processes involving particular combinations of the above four categories. Again, most of the research, discussion, and commercial products have been focused on particular classes of applications, using mostly cellular technology and hand-held devices. The potential negative ramifications here are much more significant than in the communication technology category since next generation process enablement is more likely to be effected.

The above distinction is very important as it helps focus attention on particular added value elements with a higher likelihood of identifying ROI related

cause and effect relationships. Table 1 illustrates an application classification based on the above concepts. We have found this classification very suitable for a process-oriented analysis. The classification is not disjoint and particular applications can span multiple classes. Application classes are presented relative to important process properties.

The process disruption column indicates the most dominant type of disruption when mobile technology is not used. There is a wide range of possible consequences caused by the process disruption and the table list one possible outcome for each application type for illustrative purposes. The e-Mobility Value column specifies the generic value of mobile technology usage in reducing or eliminating the process disruption effect.

Utilization type of applications are those that are involve writing and administrative tasks where the key objective is increased productivity; for mobile employees a process disruption can be reduced by having mobile access to e-mails, calendars, etc. Time-sensitive applications cover a very large number of cases; the mobility value is can be avoidance of lost opportunities, e.g. communication between a customers and the company in the context of buying processes, etc.

The mobility value is higher when the application class falls in other categories as well, e.g., time sensitive decision processes (see below). For decision support processes, the process disruption is typically lack of information and the lack of functional capability such as that of a decision support system. An example is a traveling manager who is on the critical path of a decision process and she needs to get to the hotel and connect her laptop to a high speed line in order to establish the required connectivity and functional software environment.

For collaborative process the disruption, in addition to other categories, is typically functional. e.g. inability to participate in n-way video and data conferencing; and an information unavailability disruption. A less effective collaborative process takes place also when basic connectivity is established. The transactional class is and interesting one, and involve both traditional and new transaction types. A classical case is e-mail notification of stock prices which may not be of use, if transactional connectivity (e.g. web access) is unavailable. The impact on non-traditional transactions will be discussed later in the context of the impact of web services.

Application Class	Process Disruption	Examples of Consequences	e-Mobility Value
Utilization	Time	Productivity	Reduced idle time, etc.
Time-sensitive	Time	Lost Opportunities	Shorter time to ...
Decision Support	Information & Functional	Inferior Decisions	Up-to-date information availability
Collaborative	Functional & Information	Inferior Design	Better collaboration with more up-to-date information
Transactional	Failure of Transaction	Customer Dis-satisfaction	Enabling Transactions
Location-Based	Availability	Higher Cost	Continuous availability of resource
Non-relationship Commerce	Availability	Lost Revenues	Availability of seller-buyer connectivity and information

Table 1: A Framework of e-Mobility Value Based on Application Classes

Location based applications are not new and have been used extensively in shipping and dispatching applications. The biggest enablement aspect of mobile technology is the extension of that capability more universally and interactively (not just broadcasting) in both synchronous and asynchronous communication. Note the process level enablement and interleaving in these cases. For example, a consumer shopping process could start in a non-mobile context at home, and continue through the use of m-business application when he leaves home, continuing with a visit to the store and interleaving with the store-based applications (such as location of items, checkout, etc.).

The last application class in the table refers to non-relationship commerce, in contrast to relationship based commerce between trading partners. We emphasize this class of commerce since most of the new models require new capabilities including mobility. An example is provided in the discussion on web services below.

The following examples will demonstrate the value of the framework in analyzing existing applications and new ones.

Prior Mobility Analysis

Mobility issues are not new and have been investigated before. The most insight can be found in application classes represented by the following examples:

TRAVEL. This example is probably the best one in illustrating the difference between inherent process mobility and technology enabling it. At the pick of the debate about the business value of teleconferencing in the early 1990s, the debate centered on the value of personal Vs. non-personal meetings. The particular results and practices are

not the important issue here; rather the reader should identify the fact that in order to make intelligent business decisions various properties of the process and their impact on some objective function had to be analyzed.

The particular business process could have been related to marketing, sales, R&D, collaborative design, etc. The primary mobile resource addressed at that time was the person involved in the process. In characterizing the mobility level of the process, one can normalize it to percentage of the time or of tasks where the person is mobile; costs and benefits can be analyzed as a function of mobility related variables, such as distance, time, dollar cost, etc. Taking this approach it is not surprising to find processes where mobility does not add any business value in which case lowering the associated transaction cost is not very relevant.

WAREHOUSING. Mobile warehousing (inventory) has been studied in the 1980s by various companies (e.g., Pacific Bell in the Telecommunication industry). The focus indeed was the inherent mobility properties of processes related to installation and repair service calls. The mobile resources in question were the trucks, technician, and the inventory items. The inherent mobility value of two of the resources was obvious – the vehicle and the technician must arrive at the service site. Excluding the cost of enabling the inventory mobility, the business case was made.

The cost of enabling basic models of mobile inventories was at first too high; interestingly, it was not communication related but rather scanning related. From a process disruption perspective note that in the context of the base level analysis, the process mobility issue is similar to the travel case. A higher than necessary mobility level of the truck and

person, created process disruption in many cases (in addition to the direct cost of the mobility – driving back to the warehouse for necessary items)

New Mobility Opportunities and Issues

The new mobility-related opportunities are primarily a result of technology convergence in several areas, including mobile devices and standards, workflow and process management, and web services. The effect of this convergence coupled with the support for web services standards across vendors and device classes (from mainframes to mobile phones and various appliances) has been the creation of a better connected infrastructure which is a requirement for cost effective development of new applications. This basic infrastructure combined with higher level middleware technology enables more dynamic and flexible process management.

We are currently engaged in two projects as a proof of concepts for the value of these new capabilities. The projects which are supported by the state of California's Next Generate Internet Applications initiative deal with change management in supply chains as described in [5], and enabling design-centric business processes [6]. While not specific to mobile technology, these projects reveal particular process disruption points that are amenable to value-added application of mobile applications.

One of the new enablement issues is transaction support. Traditional transaction systems were designed for large volume of simple and short duration synchronous transactions. Furthermore, they assumed that all nodes participating in the network are of known addresses and are online in normal operations (off line is considered a failure). Web services and related technologies offer support for other types of transactions, most notably long asynchronous transactions. This capability enables higher level of process interleaving and mobile technologies are inherently part of it.

Referring back to the application classes listed in Table 1, it was mentioned earlier that a high value of mobility exists for application classes that support processes of non-relationship commerce. A detailed discussion of this subject is beyond the scope of this paper, but the following simple example illustrates key points. A traveler driving his car gets to a small town at 1am with no hotel reservation; through a GPS based GIS application he gets a list of hotels and motels within 2 miles of his position that satisfy price and room type constraints. Rather than calling in or stopping and getting into each one of these; he drives by for another 5-10 minutes examining the locations and starting an automated negotiation protocol with selected ones. When a deal is

reached; his credit card is charged, he is notified of the room number, and after parking the car, he gets the key from a key dispensing machine that communicated with his device via a web service applications (using the physical credit card is also possible). Other business practices involving various push/pull combinations are also possible. For examples, the hotels are broadcasting real-time

4. Summary

In this paper, the business value of m-commerce has been discussed in the context of process transformation. It is argued that evaluating mobile imperative arguments must be done in that context. The framework proposed in this paper, provides a starting point for companies to evaluate technology investment decisions in the context of enabling the enterprise for the next generation eBusiness practices. In order to do that, it was emphasized that concepts must be separated from specific implementations and certainly from buzzwords.

The mobile imperative is real, and we believe its biggest value is in reducing process disruptions, and enabling new processes and new levels of interleaving. To take the most advantage of this enabling technology various obstacles need to be removed. Normal technology, security and adoption issues are present, but due to the interleaving nature of eBusiness and the responsiveness imperative, the complexity of this endeavor is very high and potentially expensive. A key success factor is therefore senior executives' commitment to the principles outlined in this paper, which imply different trade-offs between short term and longer term objectives than those commonly followed.

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