# MOBILIZING THE ENTERPRISE: A CONCEPTUAL MODEL OF TRANSFORMATIONAL VALUE AND ENTERPRISE READINESS

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**Abstract**

Mobile enterprise initiatives are evolving from small projects focused on productivity improvements and cost savings to large-scale enterprise-wide strategic implementations that enable companies to gain and sustain competitive advantages. Despite its many potential benefits, however, widespread enterprise adoption of mobile solutions has not been as extensive as anticipated. This article explores the salient factors that lead to an enterprise's decision to adopt mobile solutions and suggests their transformational impact. This research illustrates the importance of understanding the level of mobile enterprise readiness and provides a basis for future mobile enterprise oriented studies. Managerial and strategic implications are discussed.

**Introduction**

Recent advances in mobile information and communication technologies (ICT) have led to an increasing demand for enterprise mobility solutions. Mobile enterprise initiatives are evolving from small projects focused on productivity improvements and cost savings to large-scale enterprise-wide strategic implementations that enable companies to gain and sustain competitive advantages (Kornak et al., 2004). Despite its many potential benefits, however, widespread enterprise adoption of mobile solutions has not been as extensive as initially anticipated (Daley, 2005).

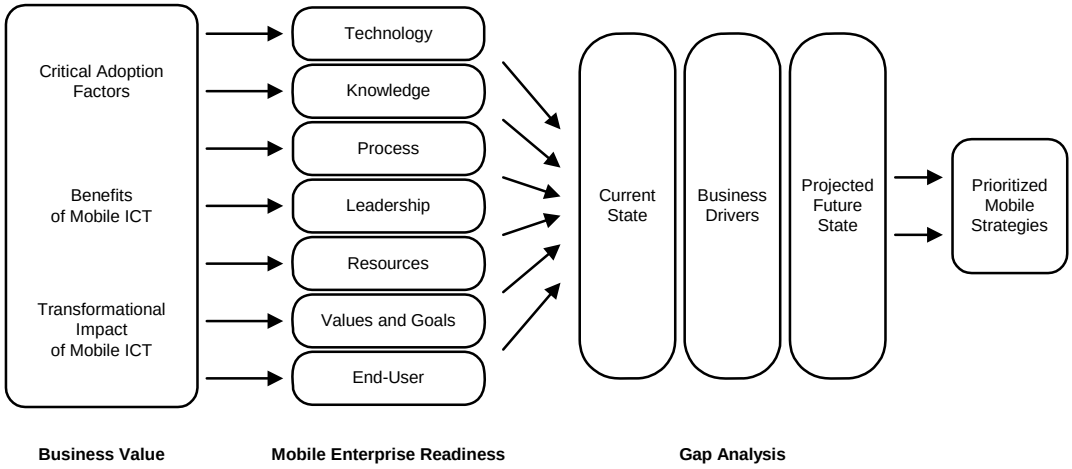
Commonly cited reasons for the slow speed of enterprise adoption are often technology-related, such as concerns regarding security and privacy, evolving technology maturity, and a lack of compelling mobile enterprise applications. However, other equally significant reasons are of strategic and organizational nature and include a lack of understanding of the value and impact of mobile enterprise solutions, the economic risks and uncertainties involved in mobilizing the enterprise, and the complexity of when and what to mobilize (Basole, 2004). Some studies suggest that a good starting point for emerging technology decisions - such as enterprise adoption of mobile ICT - is to understand where the organization is right now, and what benefits you can harvest today and anticipate for the future given the current state of the technology (Rouse, 1996).

Similarly, practitioners have called for a structured and measurable approach to technology adoption decisions, one that can aid decision makers in quantifying the value of emerging technologies and making objective judgments (Kalakota and Robinson, 2001). To this extent, researchers have developed scorecards, techniques, and tools that help identify technology opportunities and align technology with strategic objectives (Hartman and Sifonis, 2000, Kaplan and Norton, 1996, Ward and Peppard, 2002). Hartman and Sifonis (2000), for example, introduced the concept of net readiness and developed a structured approach that aids companies in exploring e-business strategies. Rouse et al. (2000) developed a technology decision advisor that navigated users through the complex decision space and provided technology recommendations. Others have used economic valuation and decision-theoretical techniques to elicit the value of adopting emerging technologies (Fichman, 2004, Kauffman and Li, 2005). Empirical studies on technology decisions identified critical success factors and provided case studies and anecdotal evidence (Cooper and Zmud, 1990).

While there is a plethora of research related to technology decisions, surprisingly little research has focused on mobile ICT in enterprises. This research attempts to fill the theoretical and practical gap by exploring the transformational value and impact of mobile ICT in enterprises and introducing the novel concept of mobile enterprise readiness.

The remainder of this article is organized as follows and is shown in the mobile enterprise adoption framework in Exhibit 1. The research first explores the salient factors that lead to an enterprise's decision to adopt mobile solutions. Drawing on theories from the engineering management, enterprise transformation, and information systems literature, the article then identifies the salient dimensions that determine an enterprise's mobile readiness and provides a comprehensive investigation of the value propositions, associated costs and benefits, and transformational impact of mobile enterprise solutions. The research concludes by highlighting managerial implications and providing future research directions.

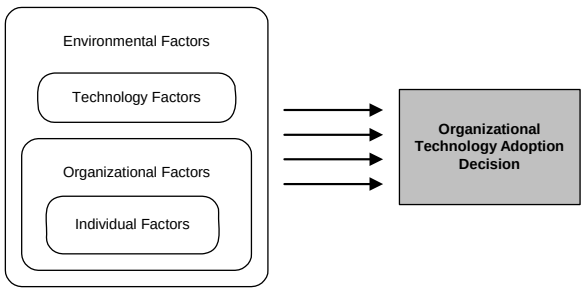
**Exhibit 1.** Mobile Enterprise Adoption Framework




**Critical Adoption Factors**

Previous research has identified several critical success factors related to technology adoption decisions (Agarwal et al., 1997, Damanpour, 1991). The majority of this research stream has focused on individual technology adoption of technologies. Rooted in theories of consumer behavior and psychology, a variety of models explain technology acceptance and use by individuals. While these studies provide an important insight to technology adoption decisions, it was found that they do not adequately describe organizational technology adoption decisions (Legris et al., 2003). Using a technology-organization-environment (TOE) framework, researchers from the information systems, engineering management, strategy, and organizational behavior domain developed new models that more accurately explained organizational adoption decision-making (Lai and Guynes, 1997, Tornatzky and Klein, 1982). These models include factors which fall into four distinct but related categories, namely individual, organizational, technological, and environmental (see Exhibit 2).

**Exhibit 2.** Categories of Critical Adoption Factors




**Individual Factors.** The basic perspective of any organizational technology adoptions is that end-users will eventually utilize it. As such individual factors play an important role in understanding technology adoptions. Among these are the innovativeness of the individual, degree of skills, and perceived value (Agarwal, et al., 1997, Legris, et al., 2003, Sarker and Wells, 2003).

**Organizational Factors.** Previous research indicated that several organizational-level factors have a significant influence on adoption decisions. Commonly cited factors include top management support, technology and infrastructure readiness, organizational culture, risk orientation, innovativeness of the organization, financial resources, size of the firm, and availability of support staff (Agarwal, et al., 1997, Cooper and Zmud, 1990, Damanpour, 1991, Lai and Guynes, 1997).

**Technological Factors.** Among the four adoption categories, technological factors seem to play the most important and visible role. These factors refer to the characteristics of the technology considered being adopted. Relative advantage, complexity, compatibility with existing infrastructure, and perceived benefits are some of the most important (Tornatzky and Klein, 1982). Others include technology maturity, ease of use, and cost (Agarwal, et al., 1997).

**Environmental Factors.** An often ignored category of adoption determinants are environment-related factors. This category includes market conditions, regulatory influence, customer and supplier pressure, and vendor influence (Damanpour, 1991).

The previous discussion highlights that a range of factors influence organizational technology adoption decisions. However, researchers and practitioners alike have stated that a major driver for adoption is the perceived value and potential benefit of the new technology. While value and benefits are often measured in economic terms or financial gains, technologies provide a range of intangible benefits that cannot be found on a balance sheet (Ward and Peppard, 2002). It is often these benefits that drive enterprises to adopt emerging technologies. Enterprise technologies hence require a careful evaluation of both its tangible and intangible benefits, and its related value and impact. Because of the novelty of mobile ICT, these benefits are poorly understood and still relatively unexplored. The following section provides a description of some of the key tangible and intangible benefits that mobile ICT delivers.

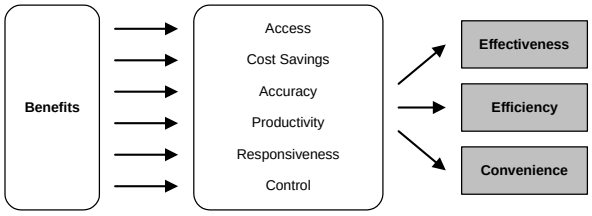
**Benefits of Mobilizing the Enterprise**

Every enterprise constantly looks for ways to reduce cost, improve productivity and accuracy, and be more responsive to its clients and customers. Mobilizing the enterprise may provide means to achieve one or more of these objectives. According to (Basole, 2004, Gebauer and Shaw, 2004, Nah et al., 2005), enterprise use of mobile ICT may lead to the following benefits:

1. Access. The ability to access the corporate network anywhere and anytime is a primary benefit and driver to adopting mobile enterprise solutions. Field workers are no longer tied to desktop PCs to check their mission-critical data such as available inventory, updated contact databases, e-mail requests, or test and marketing results. The use of mobile ICT hence provides timely answers that can lead to timely decisions.
2. Cost Savings. A mobile enterprise has the potential of significantly decreasing expenditures. Expensive computing equipment can be replaced with smaller, more portable, and less expensive handheld devices. Field workers can use these devices to be immediately connected to all the sources they need.
3. Accuracy. Replacing paper with handheld devices reduces the potential for errors in transferring information to a call report or clinical chart. Instead, the use of mobile enterprise solutions enables seamless data transfers and synchronization, updating the corporate picture and others in the field.
4. Productivity. Better access naturally leads to a higher level of productivity, as mobile workers are able to call up data that allows them to respond faster to market conditions, provide accurate and current information, and push for the sale.
5. Responsiveness. A clear benefit of a truly mobile enterprise is the ability to get accurate answers quickly, and then pass them on. Mobile professionals with access to the rest of the enterprise know the status of mission-critical information and can act immediately.
6. Control. Having a clear corporate picture and access to all your people, processes, and information, provides enterprises with an unmatched level of control. Status of current corporate data and the location of its mobile professionals can be easily captured.

As mobile ICT continue to advance and mature and new mobile enterprise applications emerge, it can be argued that potentially more benefits and value propositions of mobile ICT will appear. However, the aforementioned benefits delivered by current and future mobile ICT capabilities broadly fall into three categories, namely (1) efficiency, (2) effectiveness, and (3) convenience (see Exhibit 3).

**Exhibit 3.** Benefits of Mobilizing the Enterprise




**Efficiency.** It is human nature to try to make everyday activities as efficient as possible. With the use of mICTs enterprises provide a mean to utilize work time more efficiently. Users who are away from their desks and on the go are capable of having access to information and people from anywhere, raising the overall productivity level. Mobile professionals that travel frequently can utilize their "dead time" at airports or hotels more efficiently by checking, updating, and viewing important corporate information (Kalakota and Robinson, 2001). Fundamentally, mobile ICT change the way people work and interact. In addition to being able to address time-critical and instantaneous needs, mobile ICT also enable enterprises lower cost expenditures. Using a single device to perform a variety of tasks reduces the overall equipment costs an enterprise often has to bare with traditional wired network environments and computing services. In essence, mobile ICT applied in the right functional areas and deployed to the right users

therefore lead to a more agile, adaptive, real-time, and cost-efficient enterprise (Gebauer and Shaw, 2004, Heck, 2004).

**Effectiveness.** An equally significant contribution of mobile ICT is the contribution to task effectiveness. Time-critical and location-sensitive tasks are excellent candidates for mobilization. By providing information at the point-of-action, task effectiveness improves (Nah, et al., 2005). In this paper, the author goes one step further and proposes that a higher potential of task and decision-effectiveness is achieved when the right information is delivered to the right place, at the right time and to the point-of-thought.

**Convenience.** Mobile ICT offer several conveniences. First, it delivers a whole new way of interacting. The convergence of wireless communications and the Internet allows users to interact and communicate via voice, data, or multimedia (Kornak, et al., 2004). Users can check their voice mail, send e-mail or view the latest videoconference, all from a mobile device. This leads to the second convenience of mobile ICT. The use of mobile applications often involves the operation of only a single, integrated device. The ability to perform several different tasks with a single device increases a user's familiarity, proficiency and utilization (Heck, 2004). While personalization of services has been used extensively in the traditional wired environment, it is an even more important condition in the mobile ICT domain. This is mainly due to the limited screen size and computing capabilities of today's mobile devices, where personalized and localized information adds significant value to the user (Perry et al., 2001).

**Transformational Impact of Mobile ICT**

It is without a question that new mobile ICT-based capabilities have the potential of providing enterprises with the means to achieve the aforementioned gains in productivity, efficiency, convenience, and other important business performance metrics (Gebauer and Shaw, 2004, Nah, et al., 2005). While mobilizing enterprise applications and providing business professionals access to information anywhere and anytime is an important step (Kornak, et al., 2004), these gains are only the beginning; this research argues that enterprises can realize a much broader range of benefits over time by following a mobile transformation process. Current research has shown that information technology has the ability to change and radically transform enterprises in a number of ways (Basole and DeMillo, 2005, Hammer and Mangurian, 1987, Rouse, 2005). The transformational impact can be realized at the strategic, business process, organizational structure and cultural level, among many others. However, the unique functionalities and capabilities of mobile ICT require a new perspective on technology-enabled transformation. While initial case studies have alluded to the potential value and impact of mobile enterprise applications, only little is known about the dynamics of mobile transformations.

A few select studies have alluded to the fact that mobile solutions have a potential value far beyond mere business process improvements and enhancements (Basole, 2004). Extending this work, four distinct phases of mobile transformations, as shown in Exhibit 4, are proposed.

**Stage 1 - Mobilization.** Phase 1 of the transformation process begins with the mobilization of existing data and applications. Mobilization refers to the process of making current enterprise data, processes, and applications available for use on mobile and wireless devices. The first phase aims to provide end-users with a new level of convenience by enabling access to context-relevant information anywhere and anytime. Early solutions within this phase were primarily mobile extensions of their fixed-wired counter-parts and were often 'mobilized' without the mobile end-user and context in mind. Enterprise applications were "transcoded" or "morphed" to fit and be used on mobile devices, and often customized to the end-user target group. Examples include access to corporate e-mail, the Intranet, and other internal data sources. More recent mobile applications take the contextual environment – such as user-specific information and environmental conditions – into consideration, delivering a higher level of technology-fit and ease-of-use. These types of applications are generally off-the-shelf mobile applications that have been specifically developed for mobile environments. Previous research on re-engineering, automation, and transformation efforts has shown that the introduction of information technology in organizations has a profound impact on several operating performance measures (Davidson, 1999, Venkatramam, 1994). This research adapts these findings and proposes that in addition to a higher level of convenience the use of mobile applications will also generate significant performance gains in productivity, speed, efficiency, quality, and customer service (Heck, 2004).

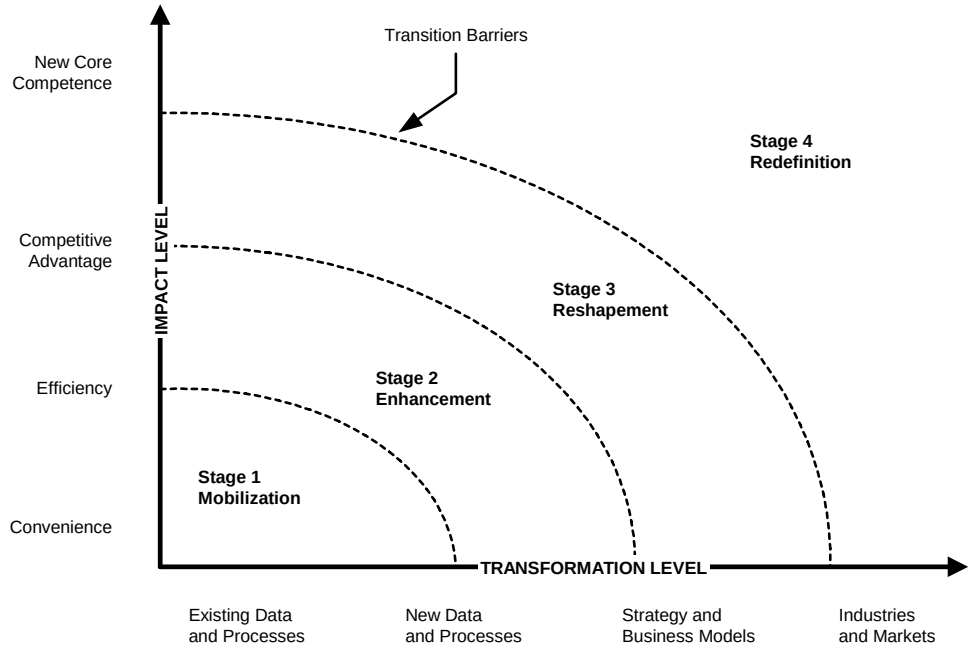
**Stage 2 - Enhancement.** The second phase shifts its focus from mobilizing existing data and applications to initially existing and then enhancing and creating new business processes that leverage the unique functionalities and capabilities of mobile technologies. Characteristics of these business processes generally include two elements, namely (1) mobility (do it anywhere) and (2) immediacy (do it now). Examples

of common mobilized business processes include sales force automation, customer service oriented applications, parcel delivery processes, and bedside healthcare data collection. Enhancements typically appear in the form of value-added services; as end-users continue to use mobile applications, new services and flow of information will emerge (Kalakota and Robinson, 2001). These enhanced mobile processes enable end-users to perform their tasks with a higher level of convenience and efficiency. One example of mobile enhancement can be seen in the emergence of location-based applications. While the enhancement phase may impact working practices and modify business processes it seldom changes the business in a fundamental manner. This occurs in Stage 3 of the mobile transformation process.

**Stage 3 - Reshapement.** As enterprises transition to phase 3, mobile solutions begin to reshape business models and strategies. The creation of innovative new mobile processes and services provide enterprises with a source of competitive advantage. In this phase, mobile solutions often enable a business capability and become a critical element in the overall business model. For example, wireless sensors could enable a pharmaceutical company to shift from selling medication to a business model in which the company provides both medication and sensors, and enters into a contract with a medical practitioner to perform continuous monitoring and keep a patient's blood pressure within an agreed range (Shnayder, 2005). Another example of mobile reshapement is the check-in and check-out procedure employed by car rental agencies. Customers can completely bypass the service counter process, head straight to their vehicle, and leave with the touch of a few buttons on their cell phone. Leading car rental agencies have reshaped their business strategies around these emerging mobile technologies, facilitating the rapid check-out of vehicles, and improving customer service. The emergence and use of radio frequency identification (RFID) tags offers also several mobile reshapement opportunities; as more enterprises use and require RFID in their supply chain, business models and strategies will change significantly.

**Stage 4 - Redefinition.** In the fourth and final phase of the transformation process, mobile solutions create entirely new core enterprise competencies. Business models and strategies are based and revolve around enterprise mobility and in turn lead to a redefinition of entire markets and industries. Concrete examples for this phase of the mobile transformation have not emerged yet, however, as enterprises continue to embrace mobility and mobile ICT mature, mobile redefinition is expected to become a common enterprise phenomenon.

**Exhibit 4.** Stages of Mobile Transformations



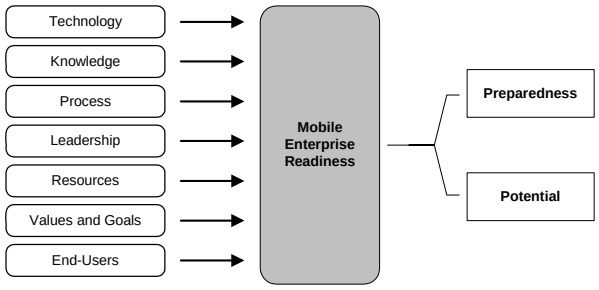
The four phases of mobile enterprise transformation are not purely sequential. Activities performed during Phase 1 continue during Phases 2-4. Some companies have directly moved from Phase 1 to Phase 3 or started in Phase 2. Phase 4 examples are still scarce, but are poised to emerge as mobile technologies continue to evolve and new business models take shape. Yet, all four phases are inextricably linked in significant ways. Diligent pursuit of Phase 1 initiatives will lead to many Phase 2 and 3 opportunities. Similarly, Phase 4 opportunities will emerge as enterprises realize the full transformational potential of mobile solutions.

**Transition Barriers.** Mobilizing the enterprise is an immensely complex undertaking (Kornak, et al., 2004). As with most change processes, enterprises will face a number of transition barriers between the four mobile transformation phases. These transition barriers can be broadly categorized as organizational/strategic, technological, and environmental-related. The first transition barrier is related to an enterprise's strategy. Investment in mobile enterprise solutions requires a careful consideration of the "business value versus cost" issue. With shrinking IT budgets, it becomes critical to understand what enterprise mobility can deliver and where it can improve, optimize, and transform the bottom-line. Mobile enterprise solutions must therefore be aligned with the overall business strategy and support enterprises current and future business objectives. In order to avoid a "fragmented" transformation, enterprises should have a common vision, leadership support, and a strategic path to implementing enterprise mobility. A related transition barrier commonly experienced in the infusion of emerging technologies is the resistance to change. Newly mobilized business processes may require end-users to adopt, use, and learn new ways of performing tasks, and unlearn old methods. Appropriate reward systems, organizational encouragement, training, and support may aid in overcoming this barrier. Another barrier to mobile transformation is organizational culture and level of innovativeness. As end-users have the capability to conduct their work anywhere and anytime, and are not bound to traditional work environments, new enterprise structures and work environments may emerge. New business models and strategies will also lead to a change in organizational processes and structure. Hence, enterprises with flexible structures, cultures, and high levels of innovativeness may experience a more successful mobile transformation.

**Mobile Enterprise Readiness**

The previous two sections highlighted that mobile enterprise solutions provide numerous benefits and a tremendous potential of transforming the enterprise. Enterprise transformation-capable technologies, however, require a level of strategic pre-planning and careful evaluation and selection (Basole and DeMillo, 2005, Mintzberg, 1994, Rouse et al., 2000). Not only is it important that these transformational technologies actually align with the strategic objectives of the organization, but it is also critical to have an understanding of how the new technology will affect people and processes, and fit within the organizational culture. In other words, it is of significant importance to have a clear picture on how it will impact the organization as a whole and whether the organization is in fact ready to embrace the new technology. Organizations considering adopting mobile enterprise solutions must therefore (1) understand their value and impact and (2) exhibit a level of mobile readiness. Mobile readiness is defined as an enterprise's preparedness and potential of adopting, implementing, and using mobile ICT. It is based on an integration of the concept of net readiness (Hartman and Sifonis, 2000), country-level networked readiness (Harvard CID, 2002), and individual technology readiness (Parasuraman, 2000). Drawing on these studies and the previously identified critical adoption factors, it is argued that mobile enterprise readiness is a multi-dimensional concept and is shown in Exhibit 5.

**Exhibit 5.** Dimensions of Mobile Enterprise Readiness




**Technology.** Technology readiness refers to the compatibility of the underlying infrastructure, systems, and support structure with mobile ICT. Organizations planning mobile enterprise solution adoptions must carefully evaluate their current systems and technologies in place. One way to ensure compatibility is the establishment of an architecture that facilitates growth and change, in general, based on open standards and interfaces (Basole and DeMillo, 2005).

**Knowledge.** Knowledge readiness reflects both general and specific kinds of knowledge required by decision makers in the mobile ICT adoption and implementation process. This knowledge includes the level of

awareness about the state of mobile ICT, in general, and about the current infrastructure, processes, and target users in particular.

**Process.** Process readiness reflects the fit between mobile ICT characteristics and existing and potential future business processes and information support requirements. A high level of process readiness indicates that mobile ICT characteristics closely match current processes. A low level of readiness may be indicative of a need for process redesign and this should be addressed prior to mobile ICT implementation.

**Leadership.** Previous studies have shown that one of the most critical factors in technology adoption decisions is the support and vision of top management. Leadership readiness, hence, reflects the skills, background, innovativeness, and risk orientation of top management. It also indicates the level of support and strategic vision of management with respect to mobile ICT. Leadership needs to ensure that the mobile strategy fits their way of doing business rather than changing their ways of doing business to fit the strategy. As such, leadership needs to be aware of the obstacles in adopting and implementing mobile ICT and guide the organization in the right direction.

**Resources.** Resource readiness represents an organization's ability to support mobile ICT adoption and implementation. These resources may include (1) financial, (2) human, and (3) technical assets.

**Values and Goals.** Values and goals readiness reflects the fit between existing structural and nonstructural enterprise characteristics and mobile ICT characteristics. Structural characteristics may include organizational size, centralization, formalization, autonomy, specialization, functional differentiation, strategic objectives and goals. Nonstructural characteristics may include culture, bureaucracy, task environment, and political climate. An enterprise transformation capable technology like mobile enterprise solutions will require an in-depth examination of its organizational value and goals. Organizational culture in particular, will play a crucial role. Culture is the intangible set of beliefs, behaviors, and assumptions that guide people's day-to-day activities. Care must be taken to ensure they are in alignment with those needed to support the technology change. If the organization is hesitant to move to a mobile enterprise and change the way work is done, adoptions and implementations will be ineffective and ultimately fail. Fostering an innovative and forward-looking organizational culture will improve mobile enterprise readiness.

**End-Users.** End-user readiness reflects the attitude towards change, level of skills, and perceived benefits by the end-users. A high level of end-user readiness can lead to a faster adoption and diffusion of mobile ICT.

All of these dimensions have an influence on each other and must therefore be considered as a whole. A lack in one dimension may impact the overall mobile enterprise readiness. It should be noted that preparedness alone does not necessarily translate into mobile enterprise success. An understanding of the value and impact, and the associated potential is therefore a critical ingredient. Having a clear understanding of the critical adoption factors, the current state of the enterprise in terms of mobile enterprise readiness, the business drivers in terms of strategic, economic, and social factors, and the projected desired future state within the transformational framework, decision makers can then analyze the gap and construct a feasible migration plan.

**Conclusions**

Successful mobile transformations require a long-term vision and support from all the stakeholders. This research argues that mobile enterprise solutions have a value and impact far beyond today's applications. In fact, it is argued that mobile solutions will transform enterprises in several significant ways. Mobile transformations occur in four distinct, but not necessarily sequential, phases. Between each phase, enterprises will experience transition barriers.

This research also identified some of the most critical factors associated to adoption of mobile enterprise solutions. Having an understanding of their influence and impact, decision makers can make a more objective judgment on why and when to adopt mobile ICT. This research also argued that a critical ingredient to adoption is a careful evaluation of mobile enterprise readiness. Only when these factors are considered and evaluated, enterprises will experience a smooth adoption process and can harvest the benefits of mobile enterprise solutions in the most effective and efficient way.

The mobile enterprise adoption framework presented in this research provides an overview and suggestive structured approach to organizational decision-making with respect to mobile ICT and a basis for future mobile enterprise oriented studies, enhances our understanding of mobile application opportunities, and facilitates the development of appropriate mobility strategies. Future research directions of particular interest will include an in-depth investigation of the dimensions and development of an instrument for mobile enterprise readiness, empirical examination of the factors during inter- and intra-phase

transitions, and a qualitative case study approach to studying successful and failed mobile transformations.

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