Increasing Organizational Performance by Transforming into a Mobile Enterprise

This article identifies how IT organizational performance can be improved in a mobile enterprise through specific management activities within The Mobile IT Conversion Process, The Mobile Use Process and The Competitive Process. Using a comprehensive model of mobile IT business value creation, we provide recommendations for CIOs on how to manage the transformation into a mobile enterprise.¹

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The Rise of the Mobile Enterprise

In recent years, the diffusion of smartphones and other mobile devices such as tablets has rapidly increased. Market researchers forecast that, by 2016, 350 million smartphone owners worldwide will be using their devices for business purposes, changing the working environment, offering new potential business benefits and confronting CIOs with new challenges. As reported in Gartner’s 2012 annual CIO survey, organizational aspects of mobile work have become a focal point of interest, and CIOs plan to spend most of their budgets on mobile technologies in the near future.² Given the recent widespread adoption of smartphones in the EU and the U.S., Forrester Research has declared that mobile is the “new face of engagement.” The emergence of so-called mobile apps in particular creates new, novel opportunities for using current mobile devices and networks that already have a high level of maturity. Accenture has forecast a high level of organizational adoption within the next few years for both mobile business apps (to support general business activities) and mobile enterprise apps (designed for a specific company to provide access to internal IT systems).

The ubiquitous availability of information through mobile devices also leads to an increasing independence of employees from fixed workplaces. As a consequence, the traditional workplace

¹ Dorothy Leidner, ShanLing Pan and Juliana Sutanto are the accepting senior editors for this article.
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To answer this question, we based our analysis on a previously published model by Soh and Markus that captures how IT expenditures can be converted to IT assets that, when appropriately used, can significantly impact organizational performance. Using a modified version of this model, we analyzed data collected from CIOs and IT managers, as well as from experienced mobile users in consultant roles.

In general, we found that it is not a simple task to adopt mobile services as part of an organization's enterprise information systems. To successfully manage the transformation process to the mobile enterprise, several technological and organizational challenges need to be addressed via a comprehensive strategic approach that results in appropriate actions. We used these findings to develop a comprehensive framework of IT management activities that we believe will result in the successful adoption of mobile services that create business value. First, though, we introduce the Soh and Markus model that we built on for our own study.

**Creation of Business Value from Mobile IT**

According to prior research, IT can create higher business value by increasing the overall performance of the organization, including productivity, profitability, inventory, competitive advantage and costs, as well as other measures of performance. More recent studies suggest that mobile enterprises can increase workforce productivity by providing employees with real-time access to data in various situations (e.g., while in business meetings) and by faster provisioning of ad hoc communication services.

(office) is beginning to lose its importance and a growing share of work-related activities takes place outside the office, resulting in the "mobile enterprise." In this article we define the mobile enterprise as an organization that provides access to enterprise systems via wireless mobile devices such as smartphones or tablets. Employees are able to use mobile devices to interact with colleagues or customers, to access all needed information, as well as to share information. Mobile access and activities might include managing documents, connecting to the customer relationship management system (CRM), accessing email and social business software, and confirming specific steps in workflows via Internet-based data transmission. In the mobile enterprise, employees can thus remotely access and update enterprise databases from any location and at any time by using mobile enterprise applications or mobile web browsers.

This goal, however, cannot be achieved by merely equipping employees with mobile devices: organizational strategies have to be developed to allow mobile access to relevant enterprise systems such as ERP and CRM. In this sense, mobile information and communication technologies are a hardware- and software-specific infrastructure that enables employees to fulfill their tasks while maintaining mobility. Prior academic studies on mobile phone usage have shown that the emergence of mobile devices has caused working time to encroach into traditional private life time. On the other hand, mobile technologies enable employees to be productive in situations where they traditionally lacked access to needed data resources (e.g., while traveling).

The objective of this study was to address the question: *How can CIOs successfully manage the transformation process to a mobile enterprise with the goal of increasing organizational performance?*

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To achieve these goals, however, requires a well-designed, corporate-wide strategy that addresses both technical (e.g., choice of devices and functionality supported) and organizational issues (e.g., integration of mobile business applications within business processes).  

According to Soh and Markus, three underlying processes need to be effectively managed in order to convert IT expenditures (monetary investments) to IT assets that are effectively and efficiently used to create business benefits: 1) The IT Conversion Process, 2) The IT Use Process and 3) The Competitive Process.

Not every enterprise is able to effectively and efficiently convert its IT investments into IT assets. The IT Conversion Process is, for example, influenced by the number of supported business activities, the level of integrated management, and the level of technical and business knowledge. Traditionally, the IT unit has been responsible for all of a company's IT expenditures and converting these investments into assets. As other studies have shown, however, employees are increasingly providing mobile devices and using mobile services at their own expense and are adapting them to their daily working practices. For our adaptation of the Soh and Markus model, we have therefore first added private IT expenditures and employees' private conversion activities to the original model and relabeled it as "The Mobile IT Conversion Process" (see Figure 1).

Second, according to the Soh and Markus model, IT assets may result in positive IT impacts (e.g., new services, redesigned business processes) when they are being appropriately used for work activities. For an effective Mobile IT Use Process, user skills, as well as the existing business processes, need to be taken into account. Finally, an effective Competitive Process is needed for an enterprise to transform its IT impacts into greater organizational performance—i.e., to achieve competitive advantages relative to its competitors.  

To identify the most important management tasks associated with the three processes shown in the model in Figure 1, in January 2012 we collected and analyzed survey data from 192 CIOs and other IT managers in German companies. Because we expected the survey participants

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10 For a discussion of the "c-abilities" (context, configure, consume) needed to adopt mobile devices, see Pitt, L., Berthon, P. and Robson, K. “Deciding When to Use Tablets for Business Applications,” MIS Quarterly Executive (10:3), 2011.

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to have only a limited knowledge of the specific needs and demands of mobile workers, we also analyzed data collected from 40 "road workers" to better understand the managerial implications for The Mobile IT Use Process. (According to Boronowsky et al., road workers are employees who spend more than 75% of their working time outside of their fixed offices.) More details of our research process and methods can be found in the Appendix.

Before describing our findings for the three processes shown in Figure 1, we first present the three potential mobile IT impacts that were captured from the CIOs and IT managers who provided examples that could lead to competitive advantages for their companies.

Mobile IT Impacts That Can Influence Organizational Performance

We asked the CIOs and IT managers who participated in our survey to provide us with a "use case which generates a winning margin compared to your competitor." Based on responses from 119 (62%) of the 192 participants, we identified the following three areas where competitive advantages could be realized.

Ubiquitous Data Access

The most frequently mentioned mobile IT impact (86% of those who provided a use case) was that specific information can be made ubiquitously available (e.g., project information, business intelligence information or customer information to support sales activities). Employees often gather new information while visiting customers or while travelling, but the provision of this information to colleagues is usually time-delayed. By giving mobile employees direct access to document management systems (like Sharepoint) and cloud services (like Google Drive or Dropbox), the new information can be uploaded and made available for others within the company without delay. As one of the CIOs in our survey stated: "It is surely important to share data among colleagues, but it is rather more important to find the needed data in a very short time." Mechanisms like tagging or full-text search can also be provided, even when using mobile devices.

Business Process Improvements Based on Mobile IT

Another area often mentioned (74% of those who provided a use case) was the integration, as well as automation, of business processes via mobile devices. The most requested mobile support for business processes were travel expense accounting, automatic driving records and approval processes. This type of support enables employees to speed up workflows while not in the office. A robust wireless-access platform is needed to provide secure mobile services (such as access to email or other applications). Integration problems can arise as employees demand wireless access to an increasing number of back-end systems and data repositories. Moreover, workflows have to be extended, or even redesigned, to include data that is provided by mobile services (e.g., in decision management).

Unified Communication Strategy

The third group of competitive use examples comprises collaborative work scenarios (mentioned by 83% of those who provided a use case): businesses want their employees to easily share documents and other information via their smartphones or to share tasks with their colleagues. This requires a unified communication strategy that encompasses the integration of mobile devices and mobile services.

As well as influencing organizational performance at the enterprise level, these three mobile IT impacts might also allow individuals and certain work groups to directly benefit from the adoption of mobile devices. Table 1 describes both the enterprise-level and individual-level performance benefits from each of these impacts.

Mobile IT Conversion Process

To ensure that mobile IT creates business value for enterprises, management has to make expenditures for IT assets. However, these expenditures need to be managed appropriately if they are to generate beneficial IT assets. Therefore, it is most important to carefully

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12 Boronowsky, M., Ottein, H., Knackfuss, P. and Lawo, M. WearIT @ work - Empowering the Mobile Worker by Wearable Computing—the First Demonstrators, TZI—Mobile Research Center, University of Bremen, 2005. This study examined the requirements of wearable IT devices for road workers.
analyze employees’ demands for mobile technology and then design appropriate solutions.

We asked the CIOs and IT managers about which goals should be achieved by integrating mobile IT assets into the corporate infrastructure. An equal number of respondents (53%) said that the employees who would benefit from mobile IT assets are those who 1) strongly rely on current information and knowledge, and 2) who have to make decisions regularly. Furthermore, 74% said that the development of so-called mobile enterprise apps has a high potential to increase organizational performance. To avoid usage barriers and to increase the perceived benefits of use, 85% said that the technical design of mobile services should focus on high usability, and 81% on performance. Mobile applications should be usable in an intuitive way to keep set-up times low and so they are appropriate for numerous target groups.

Another technical issue needing to be addressed mentioned by respondents was access and data security (84%). Mobile devices with confidential enterprise data are especially vulnerable and thus need a high level of security, both for access and data. However, there is a trade-off between some security solutions and usability. For example, having to enter a password to start an application increases data security but decreases usability, while other mechanisms like remote wipe increase security without decreasing usability.

A third of respondents mentioned that social media functionalities (e.g., apps that provide access to a company’s internal social networks like Yammer or IBM Connections) should be provided on mobile devices and that specific operating systems should be supported. This leads to additional challenges and increases the complexity of providing access and data security.

Additionally, some IT expenditures are now made privately by employees (e.g., when buying smartphones or mobile apps or when acquiring technical skills), and these investments are also used for business purposes. This means that organizations need to establish an external adoption process that is not part of the traditional IT Conversion Process. Though this seems to be positive for the enterprise, because employees take on part of the IT expenditure, many challenges arise from having to manage two types of IT assets and transforming them into IT impacts. For example, allowing privately owned devices to access enterprise resources can significantly raise the risk of malware attacks. It was therefore not surprising that a significant number of respondents (48%) mentioned that the management of mobile devices would be a crucial task in the next years.

It also is important to consider the prevalent "bring your own device" (BYOD) mindset. Employees often have a strong emotional attachment to their own mobile devices and tend to use them for work tasks, thus speeding up the workflow, raising productivity and saving IT expenditures for the enterprise. Prohibiting the use of these devices may therefore lead to reduced usage of mobile services and applications in general, as well as diminishing satisfaction among employees. Most respondents agreed that employees who bring their own devices are "tech-savvy" and have high levels of usage skills,
which can be an additional mobile IT asset for the enterprise.

Additionally, 66% of respondents mentioned that it is important to consider several different operating systems and platforms when developing mobile enterprise apps. Nowadays, there are several mobile device management systems, including SAP Sybase iAnywhere, RIM BlackBerry Mobile Fusion and McAfee Enterprise Mobility Management. By deploying such systems, it is possible to administer different operating systems and devices, as well as manage security, data sharing and applications.

The Mobile IT Use Process

The next stage in our modified Soh and Markus model is The Mobile IT Use Process—determining appropriate use of mobile IT assets to achieve mobile IT impacts. This requires employees to integrate mobile devices, mobile services and their own IT skills into their daily work routines. To better understand The Mobile IT Use Process, we sought the views of CIOs and IT managers, and of road workers.

CIO and IT Manager Survey Findings

Based on the survey data, 71% of respondents said that the involvement of employees in defining requirements for mobile services is an important success factor. They stated that, when designing mobile services, it is important to get information directly from the potential users about their needs and the ways in which the services will be used. In contrast to traditional structured enterprise systems, the use of mobile IT is discretionary and requires self-organization. CIOs must therefore ensure that employees are able to identify the benefits to them as individuals and be positive about using the mobile services. As one survey respondent stated:

“If employees dislike the mobile application or do not recognize the potential benefits, they will not use it and [they will] retain their traditional behavior.”

Road Worker Mobile Communication Behaviors

Our research among road workers was designed to gain insights into the communication activities employees initiate while on the move. Each of the 40 road workers in our study was asked to record the details of every mobile communication session over a period of two to three days. The data collected for each session was the reason, context (location), urgency, content, mobile device and media channel. The findings from this research are summarized in Boxes 1 and 2.

The road workers explained that their low use of mobile devices to access corporate intranets (14% of the communication sessions) to gain access to, for example, ERP or CRM systems, or communication tools like Chatter or Yammer, is caused by the constraints of using smartphones. Twelve of the road workers said...
that the complicated and rather slow access to their enterprises' virtual private networks (VPNs) reduces their willingness to access the intranet while on the road.

The findings shown in Boxes 1 and 2 make clear that mobile access for road workers is predominantly for high-prioritized, ad hoc and decision-relevant information.

**Mobile Communication Barriers for Road Workers**

In some cases, the reason for a road worker cancelling (or not initiating) a communication session was a dead battery in the mobile device or connection problems caused by insufficient network coverage (e.g., in the countryside or on a train). Also mentioned were application system crashes or errors, though these were rare.

More significant communication barriers, which cannot be clearly assigned to technical or human failures, are those due to insufficient usability of hardware or software. These issues do not necessarily prevent communication but can be considered as barriers to effective communication. Additionally, a synchronous communication session cannot occur when the other party (system or person) is not available. In this situation, the communication session has to be re-initiated, resulting in additional cost and efforts. Furthermore, if the expected benefit of a planned mobile communication session is perceived to be lower than the cost and time it entails, the session may not be initiated at all.

Analysis of the road workers' records show that they use mobile devices to share information, depending on its priority, despite the barriers. However, when other communication alternatives are unavailable, road workers will use their mobile devices to make a voice call. From an organization's point of view, making a phone call might be an ineffective way for receiving or transmitting information. Reasons for this are not knowing the best person to contact to obtain the right information, lack of awareness of their location and availability and the inability to archive the transmitted content. However, it is crucial for a road worker to know all of these things if he or she is to make effective use of mobile IT services and therefore create the required IT impacts.

**Facilitators of the Mobile IT Use Process**

Respondents to our survey mentioned some more challenges concerning the creation of mobile IT impacts. 57% said that training leads to appropriate use of mobile systems and 73% said that the benefits of mobile services should be transparent. Potential users need to know what functionalities mobile applications provide and what advantages they will gain by using the applications. As with any IT adoption process, this can be achieved by identifying best practices and use cases for those departments and roles that should be equipped with mobile services. Additionally, 79% of respondents said that identifying use cases is an effective way to develop a mobile strategy, and, later on, of helping to encourage and enable employees to adopt mobile applications. As a consequence, it is not sufficient to merely provide a mobile system. A crucial success factor is to ensure employees understand the rationale for adopting mobile systems and the benefits they will bring.

**The Competitive Process**

The competitive process is concerned with how enterprises can transform IT impacts into improved organizational performance in the three primary areas of financial performance (e.g., higher turnover), market performance (e.g., higher productivity) and shareholder value (e.g., higher ROI). All of these areas can potentially be increased by using mobile devices in effective ways. However, given the potential usage of IT within an enterprise, intermediate outcomes should also be considered. For example, Sambamurthy and Zmud have identified the following four intermediate outcomes, which also have relevance for mobile enterprises:

1. Incorporating IT into new products or services (e.g., using mobile applications for product support)
2. Using IT to improve business processes (e.g., speeding up processes and making them ubiquitously accessible)

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13 See Carmel, E. “Building Your Information Systems from the Other Side of the World: How Infosys Manages Time Zone Differences,” *MIS Quarterly Executive* (5:1), 2006. This article describes how awareness technologies permit awareness of someone’s availability, their current work, their location, etc. These technologies can include individual calendars, current time zone calendars, holiday schedules or even desktop video cameras.

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3. Providing IT services that enable decision makers to better understand market resources and customers (e.g., mobile business intelligence)

4. Creating flexible and adaptive organizational structures based on IT services that measure performance (e.g., mobile reporting of sales figures).

However, intermediate outcomes such as these do not necessarily lead to changes in organizational performance compared with competitors. For instance, if an enterprise increases productivity by integrating new mobile access into an enterprise system, and the key competitor did so as well, there may be no improvement in the bottom line.

From our survey, we identified two types of management tasks needed for the Competitive Process: controlling tasks and evaluation tasks. 64% of respondents said that it is very important to control and measure the usage of mobile devices and applications; they also stated that it is very helpful to get information about mobile users’ acceptance and their perceived satisfaction. Evaluation tasks help CIOs to measure the success of the entire Competitive Process. For example, usage of mobile systems might increase the business’s turnover (42% of respondents mentioned this) by facilitating business-to-consumer communication through, for example, mobile marketing and m-commerce applications. Or mobile services might help to reduce costs (mentioned by 48% of respondents). For example, adopting mobile services could reduce the costs of information management.

In general, keeping the costs of developing and deploying mobile services as low as possible is important, but the trade-off between usability, performance and employee satisfaction has to be considered as well. As employees gain more experience of using mobile devices and systems, enterprises will gain more knowledge about their preferences and needs. It is therefore important that enterprises continuously monitor, evaluate and (if necessary) redesign the mobile IT infrastructure.

Generally, the controlling and evaluation tasks (e.g., regarding the intensity of mobile IT usage or the speeding up of business processes) ensure and quantify intermediate outcomes, and provide a foundation for improving organizational performance.

Framework for Achieving Business Value from Mobile IT

We present below a cycle-based framework for achieving business value from mobile IT. This framework identifies the management tasks, and the activities within each task, that need to be performed for each of the three processes in our modified Soh and Markus model (see Figure 2).

- Analysis and (re-)design activities are part of the Mobile IT Conversion Process, and result in mobile IT assets.

- The Mobile IT Use Process requires CIOs and IT managers to actively support the adoption and operation of mobile IT assets, leading to mobile IT impacts.

- As a part of the Competitive Process, CIOs and IT managers need to control and evaluate the impacts of mobile IT so they can measure the effects on organizational performance.

We describe the activities for each task and, for each process, summarize them in a table, together with the methods that can be used for carrying them out.

Mobile IT Conversion Process

As shown in Figure 2, the Mobile IT Conversion Process involves analysis and (re-)design tasks. Table 2 summarizes the management activities and suggested methods for the process.

Analysis Task. One of the first steps of the analysis task is to define the target group for mobile communication. One indicator is the amount of traveling done by a group. The internal and external environment (e.g., employees’ acceptance of and willingness to use mobile devices) should also be investigated to obtain necessary information to support and design an effective transformation process into a mobile enterprise. This can be achieved by, for example, running workshops or interviewing lead users.

Additionally, CIOs should estimate the demand for mobile services in the enterprise.
and prioritize certain departments or specific user groups. In carrying out this activity, CIOs should focus on information sharing, communication and collaboration scenarios, as well as on workflow support (i.e., business process management). One of the road worker consultants in our study complained that, when he is on the road, it is difficult to access information, because the responsible persons in the back office are not available (different work times) or suitable communication channels are not usable (e.g., while in meetings). This confirms that interfaces to existing enterprise systems are one of the key drivers of transforming to the mobile enterprise.

(Re-)Design Task. The (re-)design task includes both the technical and the organizational structures needed for mobile services to create mobile IT assets. Most importantly, there are some non-surprising general technical challenges involved in motivating employees to use mobile systems. These include stability, performance and usability, which are also important when developing software in other contexts. It is particularly important to avoid creating user-acceptance barriers, and this can be achieved by carrying out interviews or usability tests.

Especially important for the design of mobile devices is the inclusion of new security concepts and control mechanisms. A mobile enterprise system must enable the secure use of wireless handhelds and ensure that data transmission does not compromise enterprise-wide security such as firewall integrity. An obvious challenge is the physical security of handheld devices. A major concern for CIOs is that a lost handheld could fall into the wrong hands and give competitors access to sensitive data. While it is important to make employees aware of the extent of damage that could occur when enterprise data is lost, enterprises should also have mechanisms in place (such as remote shut-off or GPS tracking of devices) that can minimize the damage if a handheld is lost.

It is crucial that CIOs identify which enterprise systems should be connected to mobile services (e.g., CRM or ERP systems) and which mobile devices can be used by employees. Enterprises should therefore be prepared to support a broad range of mobile devices and services.

Another challenge for the design task is the rapid pace of smartphone innovation, which has resulted in a huge range of handheld choices and flexibility. Enterprises should focus on wireless solutions that provide the optimal support for industry-leading smartphones across multiple mobile platforms. CIOs need to decide either to support a heterogeneous variety of devices and operating systems or to concentrate on specific solutions.

The leading smartphone platforms are the iPhone operating system, Android-based devices...
### Table 2: Summary of Management Activities for The Mobile IT Conversion Process

<table>
<thead>
<tr>
<th>Task</th>
<th>Activities</th>
<th>Method</th>
</tr>
</thead>
</table>
| **Analysis** | Define target groups:  
- Involve specific employees (e.g., knowledge workers), departments (e.g., consultancies, IT) or the whole organization  
- Focus on information and communication scenarios, as well as workflow support  
- Run scenario workshops to predict business values  
- Align activities with the overall strategies of the company | |
| | Analyze internal and external organizational environments:  
- Find similar best-practice examples within and outside the company  
- Examine users’ acceptance of mobile services  
- Identify lead users and potential promoters  
- Consider the enterprise’s culture (norms, rules, image)  
- Analyze internal reports and conduct interviews with project managers; search for studies that provide best practices  
- Consider experiences from earlier technology-adoption processes  
- Screening  
- Pyramiding (interviews, surveys, workshops)  
- Consider existing guidelines (corporate identity, general orientation, vision) | |
| | Estimate demand for mobile services:  
- Provide knowledge about adequate initial services and content  
- Focus on employees’ needs  
- Interviews  
- Surveys  
- Lead user workshops | |
| | Decide which mobile devices, applications and enterprise systems interfaces will be supported:  
- Align mobile services with users’ preferences (consider BYOD)  
- Avoid user acceptance barriers  
- Provide interoperability/connections to enterprise systems  
- Workshops/interviews/surveys  
- Policies/guidelines  
- Prototyping  
- Agile software development | |
| | Establish mobile device management:  
- Gain knowledge about which devices are used for business purposes  
- Set up security and control mechanisms  
- Choose mobile device management software  
- Restrict access to enterprise systems by corporate mobile phones or registered private phones  
- Surveys (to get information of device landscape)  
- Market research  
- Consider experts  
- Workshops/interviews  
- Software tests (user pre-tests) | |
| | Decide on initial content and configuration:  
- Implement mobile services and functionalities based on the results of the analysis  
- Analysis of reports  
- Provide mockups | |
| | Create compliance and security policy:  
- Avoid legal/policy problems  
- Increase acceptance of the services  
- Avoid data loss and avoid data leaks  
- Make employees aware of risks of mobile devices  
- Develop a security concept  
- Provide rules about what data is analyzed (log files, etc.)  
- Establish contingency plans (e.g., remote shut off, GPS tracking) for lost handhelds | |
| | Prepare code of conduct:  
- Build trust  
- Ensure transparency  
- Prevent conflicts  
- Create rules for usage of mobile services (e.g., private usage, etc.)  
- Run lead user workshops  
- Create usage guidelines | |
and BlackBerrys. As the expansion of mobile platforms continues, enterprises are confronted with the challenge of how to support the growing number of mobile operating systems. We advise enterprises to consider the ability and willingness of wireless vendors to support other platforms they develop.

The problem of deciding which mobile platforms to support is compounded by the continuing BYOD trend, which makes the decision for CIOs more complex, raises security issues and can diminish employees’ satisfaction. CIOs will need to weigh the additional efforts of, for example, providing the same enterprise applications for several platforms against employee satisfaction.

To help decide which platforms to support, enterprises will need to continuously analyze user statistics and interview employees about their preferences. As well as taking account of the BYOD trend, CIOs should ensure that enterprise applications are designed with a higher degree of efficiency and are platform-independent (HTML5 or web apps), and should deploy mobile device management software for administration tasks. Indicators for deciding for or against multiple device support are, for example, the required security level, enterprise culture (open vs. hierarchical) and the extent of employees’ business travel.

Finally, CIOs should establish and distribute a code of conduct for mobile communication to support trust and transparency, and to prevent conflicts between work and private life.

**Mobile IT Use Process**

The Mobile IT Use Process involves adoption and operational tasks (see Figure 2). Table 3 summarizes the management activities and suggested methods for the process.

**Adoption Task.** One crucial activity in facilitating the adoption of mobile IT services is to illustrate the benefits enabled by these services (e.g., supporting unified communication and business processes). We believe that transforming into a mobile enterprise needs strong support from the IT department as well as from business managers of different departments (e.g., internal communication). CIOs should therefore help business managers to understand the potential of mobile services, and business managers should evaluate how mobile services can be used to improve productivity, service quality, speed of workflows and communication efficiency. The CIO should develop use cases that, for example, show the benefits of a mobile service or support the forecast growth of user participation. However, it might be hard to quantify the benefits, so the CIO should prepare to argue the case for mobile services based on qualitative benefits.

CIOs should also involve potential users of mobile services in adoption tasks at an early stage (requirements specifications, pre-tests, agile project management). In addition, they should apply tried-and-tested change management methods such as incentive schemes and training courses to increase user acceptance. We suggest that adoption of mobile services can be promoted through extrinsic benefits (e.g., prizes) or intrinsic incentives (e.g., “gamification” approaches). Gamification involves applying game-design thinking to non-game applications to make them more fun and engaging and thus helps to achieve a high rate of user participation.

**Operational Task.** Employees who use mobile devices and services also have to perform activities that do not involve use of a mobile device. Given this, it is important to continuously reinforce the willingness of employees to use mobile services by providing incentives and making the benefits transparent (e.g., supporting new mobile devices that can be used privately and that simplify workflows). It is also important to make clear that, when using mobile services, employees should not feel reachable 24x7.

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15 Unified communication is the integration of real-time communication services such as instant messaging (chat), presence information or telephony, with non-real-time communication services such as unified messaging (integrated voicemail, email, SMS and fax). See Riemer, K. and Frößler, F. “Introducing Real-Time Collaboration Systems: Development of a Conceptual Scheme and Research Directions,” Communications of the Association for Information Systems (20), 2007, pp. 204-225.
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Table 3: Summary of Management Activities for The Mobile IT Use Process

<table>
<thead>
<tr>
<th>Task</th>
<th>Activities</th>
<th>Methods</th>
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<tbody>
<tr>
<td>Adoption</td>
<td><strong>Demonstrate benefits:</strong></td>
<td>• Integrate different media channels (e.g.,</td>
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<td></td>
<td>• Increase speed, quality and access of communication among employees</td>
<td>phone, email)</td>
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<td></td>
<td>• Reduce business process cycles</td>
<td>• Provide support for workflow steps via</td>
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<td></td>
<td>• Provide organization-wide data (e.g., about customers)</td>
<td>mobile services (decision management)</td>
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<td></td>
<td>• Provide access to enterprise systems</td>
<td>• Provide access to enterprise systems</td>
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<td></td>
<td><strong>Identify use cases:</strong></td>
<td>• Story-telling</td>
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<td></td>
<td>• Continuously identify and provide best-practice examples to better</td>
<td>• Close contact to (potential) users</td>
</tr>
<tr>
<td></td>
<td>communicate potential benefits</td>
<td>• Trainees</td>
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<tr>
<td></td>
<td>• Continuously identify and provide best-practice examples to better</td>
<td>• Incentives</td>
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<tr>
<td></td>
<td>communicate potential benefits</td>
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<td></td>
<td><strong>Foster interdivisional cooperation:</strong></td>
<td>• Create a group or board that includes</td>
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<tr>
<td></td>
<td>• Get insights from different perspectives</td>
<td>members from different departments (e.g., IT,</td>
</tr>
<tr>
<td></td>
<td>• Better align strategies with customers’ needs</td>
<td>business, legal, sales, marketing)</td>
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<tr>
<td></td>
<td><strong>Provide incentives:</strong></td>
<td>• Gamification approaches (e.g.,</td>
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<tr>
<td></td>
<td>• Increase employees’ motivation to use mobile services</td>
<td>competitions, highest score)</td>
</tr>
<tr>
<td></td>
<td>• Incentives</td>
<td>• Incentives (e.g., prizes)</td>
</tr>
<tr>
<td></td>
<td><strong>Provide training and promote use of mobile technologies:</strong></td>
<td>• Show values/benefits</td>
</tr>
<tr>
<td></td>
<td>• Achieve a high rate of user participation</td>
<td>• Appeal to intrinsic motivation</td>
</tr>
<tr>
<td></td>
<td>• Enable users to exploit the potential of all mobile services and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>functionalities</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Ensure appropriate use:</strong></td>
<td>• In-house promotions</td>
</tr>
<tr>
<td></td>
<td>• Consider user demands</td>
<td>• Provide text and video material (use cases)</td>
</tr>
<tr>
<td></td>
<td>• Prevent communication barriers</td>
<td>to promote the introduction</td>
</tr>
<tr>
<td></td>
<td>• Link to intranet systems</td>
<td>• Organize virtual and on-site training</td>
</tr>
<tr>
<td></td>
<td>• Provide ubiquitous access to information</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Provide support:</strong></td>
<td>• Questionnaires</td>
</tr>
<tr>
<td></td>
<td>• Increase user satisfaction</td>
<td>• Communication behavior analyses</td>
</tr>
<tr>
<td></td>
<td>• Gather information for redesign</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Provide support:</strong></td>
<td>• Institute incident and problem management</td>
</tr>
<tr>
<td></td>
<td>• Institute incident and problem management</td>
<td>• Establish service level agreements</td>
</tr>
<tr>
<td></td>
<td>• Use agents as fixed contact person</td>
<td>• Continuously document problems for redesign</td>
</tr>
</tbody>
</table>

A major mobile IT impact is to improve mobile information sharing by providing ubiquitous access to information, preventing communications barriers and providing interfaces to enterprise systems. This means that further operational factors such as the richness of the communication channel and the local environment of mobile workers need to be considered. As our survey data shows, the choice of communication channel strongly depends on the current situational context (i.e., location) of the mobile worker. For example, the contexts most suited for mobile voice calls are “car,” “train,” “on foot,” “waiting” and possibly “other.” Contexts suited for laptop use are “train,” “meetings” and “hotel.” Tablets would probably mostly be used in the “train” or “waiting” contexts.

The question for CIOs to address is: “Where are the mobile IT impacts?” CIOs ought to think laterally and develop ideas for using mobile devices in new contexts, taking needs, cost, benefits and employee preferences into account. For instance, smartphones could be used in
meetings in combination with an enterprise or business app to check attendee lists, schedule appointments, poll the attendees or obtain the latest customer information. Tablets could be used in presentations instead of notebooks, or in conversations to show products or explain complex topics.

**Competitive Process**

The Competitive Process involves controlling and evaluation tasks (see Figure 2). Table 4 summarizes the management activities and suggested methods for the process.

**Controlling Task.** It is crucial to continuously monitor the usage and acceptance of mobile services. By establishing a controlling task to do this, the CIO is able to evaluate The Competitive Process and identify ways to further increase the organization's competitive performance. However, measuring the ROI of communication and collaboration technologies is a difficult task; costs can be accurately measured but the benefits are difficult to estimate. The best way of proceeding is to identify specific key performance indicators that can help to operationalize and measure the resulting benefits (e.g., number of emails sent from mobile devices or number of apps downloaded to the devices). Above all, gaining a better understanding of the amount and type of usage of the most active users helps to identify lead users and provides valuable insights into the acceptance and perceived usefulness of mobile services. CIOs should use this data for reports and further internal communication (e.g., briefing the CEO and the board).

**Evaluation Task.** CIOs and IT managers should also evaluate the organization's competitive performance regularly. They should benchmark their own performance in facilitating the mobile enterprise against key competitors and, if necessary, initiate redesign activities in The Mobile IT Conversion Process. But CIOs should recognize that it is not sufficient just to create mobile IT impacts that help to increase organizational performance; the enterprise also needs to be competitive and able to react faster than others in its industry. CIOs should therefore gain an overview of the current state of the transformation to mobile enterprises within their industry sectors.

**Guidelines for CIOs**

Based on the above framework, we provide some high-level guidelines for each process. We recommend that CIOs focus on these guidelines to ensure their organizations achieve business value from mobile IT.

**Mobile IT Conversion Process**

The key guidelines for the *Analysis task* are to:

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**Table 4: Summary of Management Activities for The Competitive Process**

<table>
<thead>
<tr>
<th>Task</th>
<th>Activities</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controlling</strong></td>
<td><strong>Monitor user statistics:</strong></td>
<td>• Analysis of log-files</td>
</tr>
<tr>
<td></td>
<td>• Get a better understanding of the amount of usage, most active users, etc.</td>
<td>• Surveys</td>
</tr>
<tr>
<td></td>
<td><strong>Monitor users’ acceptance and perceived satisfaction:</strong></td>
<td>• Usability tests</td>
</tr>
<tr>
<td></td>
<td>• Gain a better understanding of the acceptance and perceived usefulness of mobile services</td>
<td>• Surveys, interviews</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td><strong>Measure target achievement rate:</strong></td>
<td>• Benchmarking</td>
</tr>
<tr>
<td></td>
<td>• Measure the success of the entire process, as well as predefined goals</td>
<td>• Quantify usage values</td>
</tr>
<tr>
<td></td>
<td><strong>Establish concept for redesign:</strong></td>
<td>• Identify future goals (e.g., by SWOT analysis)</td>
</tr>
<tr>
<td></td>
<td>• Identify current weaknesses of the mobile services (e.g., missing applications, insufficient usability)</td>
<td>• Analyze identified problems and define specific solutions</td>
</tr>
<tr>
<td></td>
<td>• Extend the mobile environment based on the redesign concept</td>
<td>• Interviews, surveys</td>
</tr>
</tbody>
</table>
Increasing Organizational Performance by Transforming into a Mobile Enterprise

- Prioritize and consider employees' demands and wishes by including both enthusiasts and laggards in The Mobile IT Conversion Process.

- Identify an appropriate target group in an early stage. For example, road workers have a high demand for mobile IT support, which suggests there is large potential for organizational performance increases when this group is supported by mobile IT.

The key guidelines for the (Re-)Design task are to:

- Match the technical design of mobile IT solutions with employees' expectations for usability and performance.

- Ensure the security of mobile operating platforms and devices (corporate and personal)—for example, by offering possibilities to virtualize mobile devices in a way that separates business and private applications.

- Focus on unified communication and collaboration, and on business process management scenarios to generate competitive organizational performance.

Mobile IT Use Process

The key guidelines for the Adoption task are to:

- Address security, access to confidential corporate systems and mobile device management (taking account of the BYOD mindset).

- Track successful adoption, perform pre-tests, consider follow-up requests of users and provide incentives as needed (e.g., home-office policies when using mobile devices).

Competitive Process

The key guidelines for the Controlling task are to:

- Determine enterprise-specific key performance indicators to measure the success of mobile services.

- Conduct surveys to gather user feedback to identify problems at an early stage (perhaps directly via a mobile application).

The key guideline during the Evaluation task is to:

- Benchmark competitors and incorporate best practices as mobile technologies evolve.

Concluding Comments

We investigated the integration of mobile devices into enterprises and developed a lifecycle framework with management tasks and activities that will help organizations to transform into a mobile enterprise with the potential to increase competitive organizational performance. Based on the data we collected both from CIOs and IT managers and from road workers, we have focused on how business value can be created when enabling employees with mobile devices to access enterprise systems. However, since individual adoption of mobile services is voluntary and requires self-organization, increased organizational performance can only be achieved if employees are motivated to adopt mobile solutions in line with an organization's corporate strategy. Moreover, the innovation rate of mobile technologies has been remarkable and, as usual in IT, CIOs must be prepared to respond to new technologies and to mobile IT management opportunities and trends.
Appendix: Research Methods

This study is primarily based on online survey data collected from 192 CIOs and IT managers in German companies in January 2012. The survey included 19 main questions and 33 sub-questions (some open questions, others answered on a five-point Likert scale). We asked about the current status of mobile enterprise activities, the expected business value, the technological issues (e.g., usability and system integration) and the design of the transformation process.

As shown in the table below, most of the respondents were top- or middle-level managers and 44% of them worked in companies with more than 200 employees.

To identify the most important challenges and goals for the mobile enterprise, we analyzed the responses to identify the most frequent and highly prioritized answers. Based on these results, we identified relevant management tasks and activities, and derived recommendations for CIOs.

Demographics of the Participating Road Workers (n=40)

<table>
<thead>
<tr>
<th>Management Level</th>
<th>CIO: 12.5%</th>
<th>Project manager: 30%</th>
<th>Consultant: 57.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Finance consultancy: 20%</td>
<td>IT-business consultancy: 80%</td>
<td></td>
</tr>
<tr>
<td>Company Size</td>
<td>More than 200 employees: 60%</td>
<td>50-200 employees: 25%</td>
<td>0-50 employees: 15%</td>
</tr>
<tr>
<td>Amount of Work Time Spent on the Road</td>
<td>&gt;75%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additionally, because we anticipated that the CIOs and IT managers would have only a limited knowledge of the needs and demands of a mobile workforce, in February 2012 we collected empirical data about the communication behavior of 40 road workers (see table above). To collect this data and to better understand the communication behavior of road workers, we developed a standardized form for the participants to describe a communication session. We provided each participant with a paper-based pocketbook (containing 50 forms) to document every mobile communication session over a two- or three-day period at the moment it occurred. We received detailed information for about 420 communication sessions initiated by the 40 road workers. Each form collected information about the reason, context (location), urgency, content, mobile device and media channel of the session. It included what kind of information the road worker needed or was attempting to share, as well as what kind of applications and devices were used in various contexts (e.g., meetings, car, train, plane).
The road workers were employed by German subsidiaries of consultancies or IT industry businesses (e.g., Accenture, Computer Sciences Corporation and IBM). All of them were predominantly engaged in typical project-based businesses. We analyzed the data using descriptive statistical analysis methods (frequencies, correlation, cross-tabulation).

In line with the model of mobile IT business value creation shown in Figure 1, we primarily used the survey data from CIOs and IT managers to draw conclusions about The Mobile IT Conversion Process, The Mobile IT Use Process and The Competitive Process. We used the road worker communication behavior analysis to enrich the conclusions for The Mobile IT Use Process.

The overall research methodology is depicted in the figure below.

**Summary of Research Methods Used**

**Model: Mobile IT Business Value**
1. Conversion Process
2. Use Process
3. Competitive Process

**Empirical Work**
1. Survey Data collected from CIOs and IT Managers
2. Analysis of “Road Worker’s” Communication Sessions

Conclusions for Conversion Process

Conclusions for Use Process

Conclusions for Competitive Process

Recommendations for CIOs: Management Tasks

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