The Mobility Paradigm in Government Theory and Practice:
A Strategic Framework

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Abstract : *Except for space exploration, disaster management, law enforcement, homeland security, and the military, government has traditionally not been found at the forefront of using the newest technologies available. Information systems and services in the public sector have been no exception to the rule. With the advent of electronic Government, however, the gap between private-sector and government information and transaction services appears to be narrowing in terms of availability, quality, and sophistication. Mobile applications it has been speculated may have the caliber of accelerating this trend. This paper presents a phase model and a framework of strategic choice, which adds to the academic knowledge in the field of organizational development and transformation induced by mobile technology diffusion. It also helps inform practitioners and the strategic decision-making process when exploring and employing the mobility paradigm within electronic Government.*

Keywords: mobile technology diffusion, fully mobile wirelessly connected (FMWC), mobile application classes, backend integration, business process change, organizational transformation, business-centric orientation, information-centric orientation.

1. Introduction

The pervasive organizational adaptation of new base technologies has always taken extended periods of time after their inception (Forrester, 1975; Scholl & Belardo, 2001). In recent years, with the Internet and wireless connectivity, two originally independent base technologies have begun to rapidly merge. Unlike other technology fusions in the past, this technology merger appears to exert an immediate impact on the complex transformation process known under digital government, which is also referred to as electronic Government (e-Government, e-Gov).

Within this context of digital government mobile government, as some refer to the use of mobile devices and applications over wireless networks, opens new dimensions to and avenues towards that vision. In government theory and practice, however, it is little understood so far what needs to be considered when embarking on the mobility paradigm in government. Within their digital government initiatives, few governments, if any, have developed or are in the process of executing a strategic plan aimed at incorporating the mobile dimension. In this paper, key issues of incorporating the mobility paradigm into an existing e-Gov strategy and its further development are outlined. The paper develops a framework for systematically addressing those issues and for enabling officials to make informed strategic choices within the overall digital government strategy.

2. The Use of Mobile Technology in Government—Where is it Headed?

In the context of information technology diffusion, in general (Gibson & Nolan, 1974; Nolan, 1979; Scholl & Belardo, 2001), as well as in electronic Government, in particular (Fountain, 2001;

Layne & Lee, 2001; Turban & King, 2003), various stage/phase and growth models have been presented, which in essence all converge to a three-phase model (see figure 2):

In the first phase existing processes and applications are represented or reproduced by means of the new technology and method. In e-Government, web-based information publishing, web-enabled transactions based on existing backend systems, and unifying portals for one-stop access are typical for this phase. Low-hanging fruits are harvested in this phase, experience with the new technology and its various uses is gained both at the provider and user sites, and the basic utility of the new delivery mode is established.

In the second phase, changes to process and underlying structure occur, since the new delivery mode has been found functionally attractive, economically superior, and more convenient. Two forces take an effect in the same direction: (1) a (demand-related) push and (technical and organizational feasibility-related) pull towards more service functionality, integration, and interoperation of applications and databases at the backend, which cannot be attained without certain changes to the underlying processes and structures. The more these changes involve core processes, the more complex they become along technical, organizational, informational, and social lines.
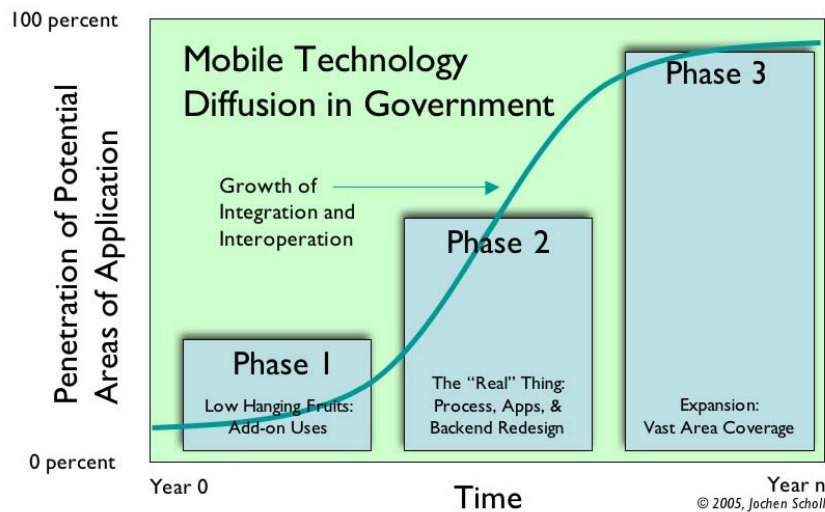
Figure 1 A Diffusion Model of Mobile Technology in Government

During the third phase the basic integration and interoperation of core processes as well as backend applications and databases along with completely new uses and applications grow to such an extent that the new technology along with its process and organizational underpinnings reaches a critical mass, increasingly becoming an ever more preferred mode of delivery, which ultimately renders secondary or even obliterates other modes of delivery. In a feedback fashion, new organizational structures and social networks emerge within which the new technology uses are arranged and embedded, that is, technology diffusion cannot be divorced from co-emerging new organizational and social structures, and vice versa. As pointed out before, the diffusion model presented here is, in fact, a fusion of similar models introduced by the same and other authors before, however, it deliberately dispenses with unnecessary details or with single-factor emphasis (e.g., technology).

Like in other situations of technology diffusion, so also for mobile technology there have been precursor phases, which are omitted from this model. In fact, various formats of mobile technology (in its analog versions) have been around for decades. Also, digital formats have been used for some time. However, it is only by the turn into the 21st century that fully mobile, wirelessly connected applications and their front-end device and backbone infrastructures have reached a

degree of universality, robustness, basic integration, and sophistication that other than very dedicated and specific uses become possible, which mark this model's time origin (year=0, equivalent to the year 2000).

In the wider context of electronic Government, mobile applications it can be argued pertain to all four stages of Layne and Lee's frequently cited 4-stage model of e-Gov development (Layne & Lee, 2001). However, truly mobile and novel applications may require higher degrees of integration both vertically and horizontally than stationary e-Government applications. While the diffusion model provides context and an understanding of direction and phases of the transformation process, it does not lend itself to any analytical foundation for strategic choice and decision-making with regard to mobile applications, and how those might fit into the overall strategic scheme. In the following sections, those foundations are developed and linked to the diffusion model.

3. How Do Mobile Applications Fit into the Overall E-Government Strategy?

Digital or electronic government holds the promise of agile, lean, accountable, and citizen-centric government operations, which are responsive, fast, effective, efficient, and sufficiently integrated (Aldrich *et al.*, 2002; Bush, 2002; Osborne & Gaebler, 1992; Relyea, 2002; Savas, 1982). Recent studies find evidence for the rapid expansion of web-based informational and transactional G2B (government-to-business) and G2C (government-to-citizen) services (for example, cf., (C. H. Kaylor, 2005)), which are based on interoperating backend systems. While these new Web-based government services offer both businesses and citizens a new level of immediacy, effectiveness, and convenience in the mode of service delivery, they still require a stationary connection as well as a stationary access device. The same may hold true for current G2G (government-to-government) applications, although studies on G2G applications are less frequent (cf., (Scholl, 2005a)).

With the merger of the two base technologies of the Internet and of wireless connectivity, and, also with the advent of versatile and robust mobile devices geared for universal uses, a new class of applications, services, and information flows in government have become a possibility. These new applications serve nomadic users and hosts and expand the reach of those services (Capra *et al.*, 2002). Since they potentially also reshape the very nature of government services and operations, once fully developed and backend-integrated, these new classes of applications and information flows may require no less than the fundamental rethinking of the information and transaction landscape in electronic Government.

Mobile applications fall into two broad classes: (1) information and transaction support for traditional types of work in the field and the back office, and (2) information and transaction support for *novel* types of work in the field and the back office. As Gorlenko and Merrick point out, fully mobile wirelessly connected (FMWC) applications can further be distinguished with regard to their mobile suitability as essential, adapted, or unsuitable (Gorlenko & Merrick, 2003).

Mobile applications in e-Government, hence, provide six distinct situations, which need the attention of planners and decision-makers:

(1) An *existing type* of field- or back-office work may be effectively *enhanced and reorganized* when supported by a FMWC application; for example, a police officer in search of an address, from which an emergency call originated, may be automatically guided by audio-visual clues provided by a handheld device while she is moving in her car or on foot towards the target address; an operation of this type requires significant backend data and application integration as well as backend process changes. Such uses may become characteristic beginning in the second phase of mobile technology diffusion in government.
(2) An *existing type* of field- or back-office may be supported by an originally stationary application whose use is *extended to the mobile environment*; for example, a fireguard

receiving audio-visual information from the EPA toxic storage database when approaching on foot a building which was set afire; the backend data and application integration effort for enabling such mobile service may be modest, since it interfaces a mobile device with an existing application in an incremental fashion. Such uses may serve as main targets in the first phase of mobile technology diffusion in government.

(3) An *existing typ*e of field- or back-office may be *unsuitable* for the utilization of a FMWC application; for example, a social worker taking notes on paper in a noisy, ill-lit, and filthy environment, which current handheld technology cannot cope with; in such cases the technological development of mobile devices may be monitored for improvements that overcome the device/environment-related limitations.

(4) A *novel type* of field- or back-office *supported by an essential FMWC application*; for example, a fieldworker visiting elderly citizens for providing comprehensive information and a wide range of onsite services such as online form filling etc.; as in case (1), an operation of this type requires significant backend data and application integration as well as backend process changes. Such uses may become characteristic from the second phase of mobile technology diffusion in government and onward.

(5) A *novel type* field- or back-office *supported by an adapted FMWC application*; for example, an inspector issuing a permit to a business onsite immediately after the inspection has been completed; as in case (2), the backend data and application integration effort for enabling such mobile service may be modest, since it interfaces a mobile device with an existing application in an incremental fashion. Such uses may serve as main targets in the first phase of mobile technology diffusion in government.

(6) A *novel type* of field- or back-office work which *cannot be utilized* in every environmental or social context; for example, onsite services, which cannot be activated due to privacy concerns (avoiding serving somebody before a crowd of observing and listening bystanders). As in case (3), the technological development of mobile devices may be monitored for improvements that overcome the device/environment-related limitations.

Mobile Government Applications	Essential FMWC Applications	Adapted FMWC Applications	Unsuitable FMWC Applications
Existing Type of Field or Back-Office Work	Enhance/ Reorganize Existing Workflows	Extend the Use of Existing Workflows	Existing Workflows not Supportable by FMWC
Novel Type of Field or Back-Office Work	Create/ Organize Novel Workflows	Extend the Use of Novel Workflows	Novel Workflows not Supportable by FMWC

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Figure 2 The Two-Dimensional Model of Mobile Government Applications

In summary, *adapted FMWC applications* are expected to prevail in the first phase of the mobile technology in government, while *essential FMWC applications* move into the picture beginning to dominate the second and third phase. The sophistication of both mobile and stationary applications can be expected to rise over time, so will the complexity of the technical backend integration and organizational process redesign increase. From today's perspective, also when compared to the patterns of diffusion of other base technologies (Forrester, 1975; Scholl & Belardo, 2001), the introduction of and full adjustment to the mobility paradigm in government will most probably span over several decades, in which quite a number of new generations of ever more powerful

mobile technology platforms must be expected to emerge. E-Government strategies, hence, have to account for a high rate of change and novelty with regard to the technologies involved.

4. Specific Challenges

As in electronic commerce, so in e-Government, FMWC information and transaction services for nomadic users pose a number of serious technological, organizational, social, and managerial challenges. Among the technology challenges range the sudden loss of connectivity, the fluctuation of bandwidth, battery power loss, rapid changes in location, varying device capability, asynchronicity of task initiation and outcome, data and context sharing to name a few (Capra et al., 2002). Organizational and technical hurdles occur when combining, integrating, and interoperating traditional stationary/fixed network-based applications with FMWC services. Moreover, mobile applications apparently need integration regarding their most pervasive modes of voice and data. However, so far, according to senior government executives, for example, in Washington's Puget Sound region, whose governments continue to rank as one of the most advanced e-Government sites in the US (Ho, 2002; C. Kaylor *et al.*, 2001; C. H. Kaylor, 2005), the integration of voice and data at application or database level is non-existent (Scholl, 2004). Yet, voice messages may need to be preserved in both voice and text formats for further uses. Also, text-to-voice conversions may add significant value to mobile applications.

In general, when integrating and interoperating mobile applications with backend systems, also serious performance, integrity, and security issues may result from such efforts (Capra et al., 2002). As a consequence of implementing applications and uses under the mobility paradigm, also social and organizational tensions may arise due to abrupt changes in workplace and field relationships.

5. Elements of a Strategic Approach to Bringing FMWC to e-Government

When confronting IT-related investment decisions, government leadership it has been proposed can choose between three strategic approaches, labeled as *modest*, *moderate*, and *elaborate* (Dawes *et al.*, 2004). Each of those three approaches bears certain opportunities and risks. While the modest approach "involves a minimum investment in effort, time, and resources, " the moderate approach would include "advanced features or options and a wider range of internal and external information sources" (p. 117). Finally, according to the authors, the elaborate approach encompasses even more advanced features, etc., "for the most ambitious project," which addresses the organization's need (ibid.). When this framework is applied as a guide to investing in FMWC technology in government, the fourth option of "wait and see" appears as an obvious and valid choice, which is observably (and, in some cases, intentionally) employed by quite a number of governments. The strategic choices regarding FMWC technology investments in government, hence, are the following: (1) wait and see, (2) modest backend integration of FMWC applications, (3) moderate backend and voice/data integration of FMWC applications, and (4) elaborate backend, voice/data, inter-application integration of FMWC applications. In the following the specific challenges, opportunities, threats, potential benefits, and trade-offs of these approaches are discussed.

5.1. The Wait-and-See Approach
The strategic approach of "wait-and-see", "wu wei" (Chinese for going with the flow), or of "doing nothing" has been observed in public administration for a long time (cf., (Donaldson, 1999)). Also, in private firms, practitioners have reportedly been using the approach (Whitemyer, 2002). In the strategic management literature, the approach has also been studied under the label of laggards or "late movers" (Lee et al., 2000; Shamsie *et al.*, 2004). Among the specific challenges and threats in the wait-and-see approach to FMWC adoption and integration (1) stakeholder dissatisfaction, (2) delayed learning-by-doing, (3) missed opportunities for service-level, functional, and cost improvement, and (4) public criticism may rank highest. A government, which does not move

ahead in terms of FMWC adoption and integration, while neighboring jurisdictions demonstrate significant service-level, cost, and functional improvements, will most probably confront an increasing dissatisfaction on part of its various internal and external stakeholders. Also, delaying the learning process will lead to less informed decision-making and diminished attractiveness of that particular jurisdiction as a location of choice. To the extent that FMWC applications elsewhere demonstrably provide significant service-level, functional, and cost improvements, the wait-and-see approach can become wasteful and costly, which will finally draw increasing public pressures and criticism. On the positive side, no action and the deliberate postponement of commitment to particular architectures and platforms in times of rapid changes in FMWC base technologies it can be argued is a strategically sound approach. A cautious wait-and-see strategy does not preclude environmental scanning and FMWC component evaluation. Decision-makers should be able to clearly identify and continuously check a set of indicators, which would help determine whether or not the decision point for changing from the no-action approach into one of the three action approaches has been reached or passed.

5.2. The Modest Backend Integration Approach to FMWC Applications
Unlike the wait-and-see approach, the modest backend integration approach to FMWC applications although limited in effort, resources, and time allotted involves the frontend and backend components, The most likely areas of application are those of *adapted FMWC applications* where existing stationary applications or even novel backend applications, are extended to include FMWC uses. From a perspective of balancing risk against opportunity, this approach might turn out to become the most popular. While the organization employing it embarks on the FMWC learning curve in both its technical and non-technical aspects, the risk remains contained, while the FMWC principle is incrementally introduced and implemented. This evolutionary approach provides leeway for making mistakes at acceptable cost levels while striving for gains in experience, service level, function, and cost. The backend integration is estimated to be technically less complex, since the backend system uses are (only) extended, but not modified at greater extent. The effect of information flows from and to nomadic users can be studied and understood from a perspective of a known background including the most likely insidious security problems which will undoubtedly emerge (for example, such as packet sniffing, code breaking, among others). The attractiveness of the modest approach lies in its limited commitment of resources, time, and efforts, on the one hand, and its advancements in learning and FMWC practice, on the other hand. Compared with wait-and-see approach it adds the element of own action and learning as well as the proof of concept to stakeholders at a relatively low risk. Situations emerging from this approach remain manageable, since real crises appear to be unlikely, by and large.

5.3. The Moderate Backend and Voice/data Integration of FMWC Applications
Under the third approach the government agency would commit considerably more effort, resources, and time to FMWC application and backend integration than in the modest approach. Clearly, the risk of failure increases significantly with this approach. However, some agencies may find themselves in desperate need for more effective and efficient as well as completely novel FMWC applications such as in the cases of law enforcement, the military, or homeland security, where the nature of the mission itself and the rapidly increasing threat of hazards may preclude any no-action or modest approaches in the first place. Government agencies with those scopes of duty are among the traditional, long-time users of (mostly analog), however, generally stand-alone, that is, not back-end integrated, mobile technologies. Those agencies already endue a deep understanding of the mobile paradigm including the necessity of voice/data, frontend/backend, as well as application integration. However, both application integration and backend integration on the moderate level are more complex than on the modest level, which, on the other hand, holds the potential of reaping the benefits of more effective and efficient FMWC uses. The moderate approach may already induce significant process changes at the backend, which can lead to additional organizational challenges (cf., (Scholl, 2005a)). This approach requires a high degree of readiness for technological and organizational change. It also bears a higher risk of failure due to

the greatly increased complexity. An increasing number of novel FMWC applications and uses are likely to emerge in the moderate approach when compared with the modest approach, which will mostly focus on readying existing applications for mobile uses.

5.4. The Elaborate Backend and Voice/data Integration of FMWC Applications

When using the elaborate approach the government agency commits significant effort, resources, and time to the integration of FMWC applications. This approach is most probably used by agencies that have successfully completed either the modest or moderate approach before such that experience and confidence could be accumulated. Also, this approach will most likely be observed more frequently in the third phase of FMWC diffusion than in any other phase. In the elaborate approach, the integration of voice and data as well as FMWC application to the backend is comprehensive and effective leading to a high degree of pervasiveness of FMWC uses. The complexity along technological and organizational lines is even greater than in the moderate approach, however, due to the experience gained through previous projects, it is more manageable and controllable. Fully integrated FMWC applications, once they become available on a level of critical mass, represent both the indicator and the enabler of significant process change. The more core processes (in terms of an agency's core mission) are affected in this way, the greater is the transformational change (in terms of redesigning the routines and procedures of operation). It is also likely that in the elaborate approach more truly novel FMWC applications will emerge than in the modest and moderate approaches (see also proposition #5 below). While the risk of the elaborate approach is contained through increased experience, the elaborate approach remains the riskiest, particularly, if used in the two earlier phases of the mobile technology diffusion in government. In those earlier phases not only experience is in short supply, but also the technology elements are less stable and less standardized, both of which increase the risk of failure.

6. The Assumed Mix of Approaches Over the Diffusion Phases

The differences between and similarities of management in the public and private sectors have been discussed in numerous publications over the past few decades. Understanding those helps predict the likely mix of approaches over the mobile technology diffusion phases in government. While managerial tools and methods used in the two sectors are similar (Boyne, 2002; Bozeman & Bretschneider, 1986), the internal structures and external environments are fairly different (Perry & Rainey, 1988; Rainey *et al.*, 1976). The same holds true for the transactions between agency and environment (ibid.). In their information-technology related decision-making, public managers follow different drivers and, hence, different priorities than their private-sector counterparts (Ward & Mitchell, 2004). Due to resource constraints, short budgetary cycles, political pressures, constitutional barriers, checks and balances, and public scrutiny (among other influences) the decision-making process is slow, fragmented, and risk averse (Bozeman & Bretschneider, 1986; Perry & Rainey, 1988; Rainey et al., 1976). For the diffusion of mobile technology in government it follows that the adoption process will advance more slowly than in the private sector. Also, risk aversion will dominate over seizing opportunities unless excruciating needs (for example, homeland security, fight against terror, etc.) suggest otherwise. This leads to the following four propositions (see also figure 3):

Proposition #1: No-action and modest approaches/strategies will be found more frequently in the first phase of mobile technology diffusion in government than moderate or elaborate approaches/strategies.
Proposition #2: Moderate and elaborate approaches/strategies will be found more frequently in the third phase of mobile technology diffusion in government than no-action or modest approaches/strategies.
Proposition #3: Modest and moderate approaches/strategies will be found more frequently in the second phase of mobile technology diffusion in government than no-action or elaborate approaches/strategies.

Proposition #4: Mobile technology diffusion in government will lag behind mobile technology
diffusion in the private sector.

Proposition #5: Essential FMWC uses and applications will occur with increasing frequency the
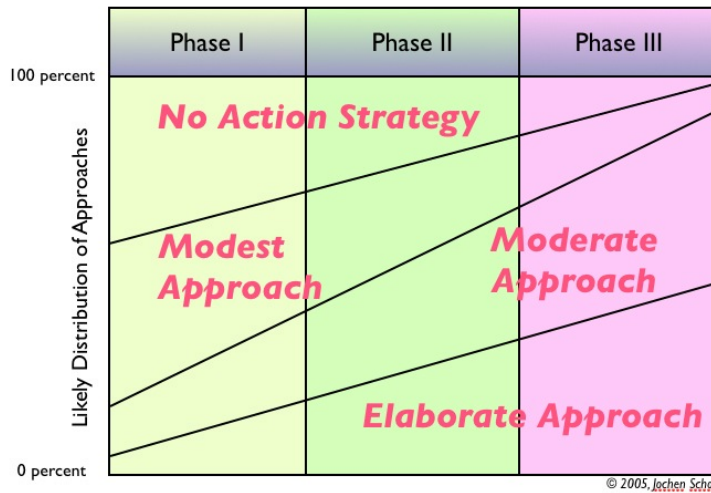later the phase of the diffusion process.

Figure 3 Approach/Strategy Mix Across FMWC Diffusion Phases

In summary, through electronic Government as well as through initiatives such as the National
Performance Review and the New Public Management agenda, the public sector been geared
towards increased agility and accountability (cf., (Beachboard & McClure, 1996; Gow & Dufour,
2000; Hood, 1995)). However, this has not changed the systemic and intentional division of
powers and the resulting fragmentation, risk aversion, and slower pace of decision-making. As a
consequence, mobile technology diffusion in government cannot be expected to present an
exception and most likely will also exhibit a slower pace than found in the private sector.

7. How Could Strategic Execution Plans Look Like?

Since resources remain limited regardless of the approach taken, government agencies need to
choose wisely among the FMWC projects they want to engage in. Vendor and other external
pressures have reportedly led to technology-driven approaches in the past, mostly leading to
unsatisfactory or even counterproductive outcomes (cf., (Keil *et al.*, 1998; Mahoney & Lederer,
1999; Sumner, 1999)), an information-/user-need centric approach appears more suitable (Taylor,
1986). Taylor's information value grid helps identify each potential FMWC service. The criteria of
(a) ease of use, (b) noise reduction, (c) quality, (d) adaptability, (e) time savings, and (f) cost
savings need to be determined. Per each criterion, tangible values added and value-added
activities/features have to be specified. For example, how easy is the physical access to the desired
information, how good are the search results in terms of reliability and currency, and how flexible
is the application?

The information/user-centric orientation shields the various approaches to implementing FMWC
services and uses against domination and direction from a narrow and lop-sided technology
perspective. The execution plan it has been suggested should address four dimensions of strategic
concern: (1) the business motives and business needs for an FMWC services, (2) the strategic
objectives the FMWC serves, (3) the focal areas of business, in which the mobile paradigm is
applied, and (4) the specific stakes and the particular stakeholders, who can influence or be
influenced by the implementation of an FMWC service (Scholl, 2005b), which leads to

Proposition #6: Business-/information- and user-need-oriented execution of the strategic
approaches will more frequently lead to successful FMWC diffusion than the
execution of strategic approaches guided by technology orientation.

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While avoiding waste of scarce resources is a constant concern in the business of government, a certain amount of resources should be targeted towards creating essential or breakthrough government-specific FMWC services. Still today, Sony's invention of the Walkman serves as an excellent example for envisioning and creating a mobile application, which exploited the capabilities of the underlying technology and found an immediate and wide acceptance. As suggested before, the amount of experimentation leading to essential FMWC uses and applications is expected to increase depending on the extent of the approach. FMWC services, which are similarly innovative and appealing, may be found by experimenting with mobile technologies within old and new contexts. The execution principles proposed here, hence, emphasizes the business-/information- and user-need-oriented strategic approach without losing sight for creative invention emanating from a technology-driven perspective

8. Conclusion

This paper contributes to the understanding of mobile technology diffusion in government by identifying and assessing the influential forces and the direction in this process. It presents a parsimonious phase model of the diffusion process, identifies the various classes of FMWC applications and uses, discusses specific challenges in the implementation process, presents a framework of alternative strategic approaches to FMWC diffusion, and maps the FMWC application classes to the strategic approaches as well as to the diffusion stages. By doing so, it develops an understanding of phase-related strategic choices and presents testable propositions regarding the assumed distribution of approaches over the phases. Finally, it proposes a business-/information- and user-need-oriented principle to guide the various strategic approaches under consideration, which may also be of utility to practitioners in the field.

Mobile technology in government, and particularly, fully integrated FMWC applications, the paper argues, have a long way to go to become pervasive beyond areas of greatest need such as the military, law enforcement, and homeland security. While the impact of FMWC applications on reshaping organizational structure and processes may be significant in the long run, those changes and transformations may not become widely visible in the earlier two phases. Understanding the strategic choices in the various diffusion phases helps develop a roadmap in FMWC-related government practice, and also helps prevent solely technology-driven departures.

Future research will trace the mobile technology diffusion in government along the lines presented in this paper. Of particular interest will be the impact of mobile applications on the advancement of the overall e-Government agenda and regarding the (measurable) degree of organizational transformation it may be able to bring about.

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