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Toward a Deeper Understanding of Drivers and Enablers of Tranformational e-Government: A Multilevel Perspective

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McMaster eBusiness Research Centre (MeRC)
DeGroote School of Business

MeRC Working Paper No. 30

June 2009

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ABSTRACT

The objective of this paper is to contribute to a deeper understanding of drivers and enablers of transformational e-government by examining its multilevel nature. Notwithstanding the contributions of research to date, our knowledge of transformational e-government remains fragmented: prior studies have attended to only a subset of pertinent drivers and enablers. To redress this lack, we draw on the extant literature to identify six dimensions representing twenty-nine attributes that collectively represent a comprehensive view of drivers and enablers of transformational e-government. We undertook a multilevel empirical investigation using both qualitative and qualitative data to assess all six dimensions: external environment, information technology (IT) strategy, internal context, IT infrastructure, IT governance, and competent people. Our findings show that all six dimensions must be simultaneously aligned to achieve transformational e-government. The multilevel perspective advanced in this article offers rich opportunities for theoretical and empirical insights to better understand the drivers and enablers of transformational e-government.

Keywords: e-Government; t-Government; implementation; transformation; drivers; enablers; IT governance; alignment; business process change

INTRODUCTION

The transformation to an e-government operating model has become an important challenge for public sectors around the world (Ke and Wei, 2004). Transformational e-government has been defined as "the use of information and communication technologies in public administrations combined with organisational change and new skills in order to improve public services" (Commission of the European Communities, 2003, p.7). An e-government operating model involves coordinating service delivery across organisational boundaries and is explicitly associated with a highly integrated back-office (Devadoss *et al*, 2002; Layne and Lee, 2001; West, 2004). To this end, governments have generally acquired enterprise information systems such as ERP (enterprise resource planning). Nonetheless, prior published literature contends that governments have failed in their quest to implement a highly integrated e-government operating model (e.g., Huang, 2007; La Porte *et al*, 2001; Lee *et al*, 2005; Moon, 2002; West, 2004). Notwithstanding the contributions of research to date, our knowledge of the antecedents of transformational e-government remains fragmented.

Transformational e-government is a complex, multi-faceted phenomenon. Many of the business processes and information systems that organisations have developed over time constitute obstacles to transforming to a new operating model (Ross *et al.*, 2006). Thus, organisational transformation requires demanding changes to core processes and information systems. To manage this change, e-government transformation should develop over time along the information technology (IT) maturity lifecycle. Ross *et al* (2006) have proposed four stages of the transformation lifecycle as follows. At Stage 1 ("Business Silos"), organisations implement IT solutions to address the immediate needs of individual business units without regard for future capabilities. These one-off solutions, however, create a legacy of heterogeneous systems. Technical solutions to bridge systems become so complex that a change in one system can precipitate a geometric series of changes (or errors) in other systems. Eventually, the need for reduced maintenance costs and higher data integrity forces organisations to evolve to the second stage. At Stage 2 ("Standardised Technology"), organisations have implemented technology standards to consolidate heterogeneous systems. Technology standardisation, however, does not overcome the problem of data embedded in individual applications. Completion of Stage 2 positions organisations for the transformation to the third stage. At Stage 3 ("Optimised Core"), organisations have shifted from local applications and shared infrastructure to shared data and enterprise systems that have digitised a set of predictable core processes. To do so, third stage organisations have implemented a high degree of business process standardisation and integration in support of a highly integrated e-government operating model. Organisational change is felt most profoundly at the third stage, as business knowledge workers must adapt their business processes to implement enterprise standard processes. At Stage 4 of the transformation lifecycle ("Business Modularity"), management collectively refines and increasingly modularises the processes that were digitised in the third stage.

Thus, not until government organisations have completed the first three stages of transformation have they implemented the changes necessary to coordinate service delivery across organisational boundaries supported by a highly integrated back-office in support of an e-government operating model. The success or failure of implementing the necessary changes depends on six multifaceted dimensions that constitute IT drivers and enablers (Gil-Garcia *et al*,

2007; Liang *et al*, 2007; Nance, 1996; Xue *et al*, 2008). Driver dimensions – external environment, strategy, and internal context – trigger the necessary changes. Enabler dimensions – IT infrastructure, IT Governance, and people – facilitate the changes. Thus, meaningful research of transformational e-government must incorporate multiple levels of analysis at the individual, group and organisational levels. Multi-level research requires both quantitative and qualitative methods (Orlikowski and Robey, 1991). However, prior studies of e-government have not simultaneously analysed the six dimensions of IT drivers and enablers at multiple levels using multiple methods. Consequently, they have disregarded either the historical paths that led to the present state of e-government transformation, or present attributes that represent antecedent conditions to transformation. Thus, the specific reasons for transformational e-government success or failure remain unclear. To address this shortcoming, the objective of this research is to apply multi-level investigation incorporating both qualitative and quantitative analysis to assess IT drivers and enablers in support of a well-integrated e-government back-office (i.e., completing Stage 3 of IT maturity).

The rest of this paper is structured as follows. First, the theoretical foundation for our research is presented followed by the methodology employed. Next, a triangulated analysis is presented, followed by a discussion of the findings. Implications of our findings for researchers and practitioners in the quest to understand how governments can realise the operational benefits of transformational e-government close the paper.

THEORETICAL FOUNDATION

An e-government operating model involves coordinated service delivery across organisational boundaries supported by a highly integrated back-office (Devadoss *et al*, 2002; Layne and Lee, 2001; West, 2004). The transformation toward such an operating model should follow the four-stage lifecycle outlined in the introduction. Not until government organisations have completed the first three stages of transformation have they implemented the technology and process changes necessary to coordinate service delivery across organisational boundaries supported by a highly integrated back-office. Furthermore, trying to skip maturity levels is counterproductive because each level is a necessary foundation from which to achieve the next level (Paulk *et al*, 1993; Ross *et al*, 2006). Processes without a proper foundation fail under stress and provide no basis for future improvement.

Implementation of IT and IT-related organisational change is contingent upon a number of drivers and enablers (Nance, 1996). A driver is a need, event or circumstance that triggers a project or initiative designed to bring about desired transformational changes. An enabler is a mechanism that facilitates the desired transformational changes. Driver dimensions consist of (1) external environment, (2) strategy, and (3) internal context (Gil-Garcia *et al*, 2007; Liang *et al*, 2007; Xue *et al*, 2008). Enabler dimensions consist of (1) IT infrastructure, (2) IT Governance, and (3) people. Attributes of these dimensions are presented next.

Drivers. Pressures from the *external environment* drive organisational change. Environmental attributes for e-government include (1) political/legal/regulatory pressures and (2) per-capita economic conditions (e.g., Gil-Garcia *et al*, 2007; Heeks and Stanforth, 2007; Otjacques *et al*, 2007; Xue *et al*, 2008).

Strategy specifies the intended means to achieve specified objectives within the organisation's environment. Attributes of the strategy driver include the degree of: (1) services that overlap different business units, (2) data centralisation, (3) enterprise process integration and standardisation, (4) centralisation of process ownership, (5) corporate management, and (6) IT management (e.g., Ross *et al*, 2006; Weill, 2004; Xue *et al*, 2008).

Attributes of the *internal context* driver include (1) the organisational structure, (2) patterns of IT funding, and (3) the degree to which corporate vision emphasizes IT (e.g., Liang *et al*, 2007; Ross *et al*, 2006; Xue *et al*, 2008). In order to enforce organisational transformation at each stage of the lifecycle, IT management must be endowed with the authority to mandate IT-related behaviours by controlling IT funding (Ross *et al*, 2006). Standardising shared data and core business processes involves taking control over business process design from local business unit leaders, which is a hard sell. Therefore, corporate vision must shift from a local view of data and applications to an enterprise view before executive management will empower IT management with the necessary authority to mandate Stage 3 business process changes. Otherwise, if top management acquires enterprise systems without being fully committed to implementation across the organisation, they have failed to initiate the need and circumstance that drives the necessary operational changes (Nance, 1996; Ross *et al*, 2006).

Enablers. *IT Infrastructure* is an enabler that facilitates new types and patterns of communication and workflows in support of strategy implementation (Nance, 1996; Ross *et al*, 2006). At Stage 2, IT infrastructure has evolved from localised systems to a shared technology infrastructure (Ross *et al*, 2006). At Stage 3, IT infrastructure has evolved to enterprise-standard systems, applications and data. E-government literature specifies that a high degree of information technology integration is also necessary to enable transformational e-government (e.g., Devadoss *et al*, 2002; Layne and Lee, 2001; West, 2004). Specifically, the IT infrastructure should include Enterprise Resource Planning (ERP) to manage accounting, finance, human resources and operations, Supply Chain Management (SCM) to improve the cost and accuracy of procurement from suppliers, Customer Relationship Management (CRM) to manage interactions with constituents, and a one-stop Internet portal that provides integrated service delivery to citizens (e.g., Ke and Wei, 2004; Lee *et al*, 2005; Ross *et al*, 2006; West, 2004). Furthermore, the length of time that ERP has been implemented is theorised to impact the degree to which ERP is adopted by users in their daily operations (Liang *et al*, 2007; Xue *et al*, 2008).

IT Governance is an enabler that affects outcomes of IT investments, and it is affected in turn by internal and external drivers (Xue *et al*, 2008). IT Governance emerges from the pattern of decision rights and accountabilities enacted for strategic IT decisions (Weill, 2004; Xue *et al*, 2008). To align IT implementation with strategic objectives, IT Governance must link business and IT strategy through a formal process in which senior managers collaborate to develop business and IT strategy at the same time in the same process (King and Teo, 1997; Ross *et al*, 2006; Segars and Grover, 1998). To collaborate effectively, executives require a strategic understanding of the role of IT, the dependency of the business on IT, and the issues faced by IT (Reich and Benbasat, 2000; Ross *et al*, 2006). Executives must also communicate clear roles and responsibilities to organisational knowledge workers for exploiting IT in operations, and they must delegate to knowledge workers the necessary authority to carry out their responsibilities

(Ross *et al*, 2006). Process ownership should shift from IT to business managers and processes should be documented in a central repository. Furthermore, the pattern of accountability allocations should follow best-practiced standards. For example, the COBIT (Control Objectives for Information and related Technology) IT governance framework specifies the executive, business unit, IT, and audit/compliance stakeholders that should have accountability for planning and organising business-IT initiatives, acquisition and implementation, delivery and support, and monitoring business-IT performance (IT Governance Institute and the Office of Government Commerce, 2005).

People (i.e., stakeholders) are the cornerstone of transformation towards completing Stage 3 of the IT lifecycle: IT and business knowledge workers must learn together how to articulate the company's operating model and how to identify the IT capabilities required to implement their operating model (Ross *et al*, 2006). The ability for stakeholders involved in IT Governance to align business and IT strategy is dependent on the level of shared knowledge between business and IT knowledge workers (Alavi and Leidner, 2001; Cohen and Levinthal, 1990; Preston *et al*, 2008; Reich and Benbasat, 2000). On the one hand, the IT-related knowledge and experience of business knowledge workers determine their competence to collaborate on strategic IT decisions (Bassellier *et al*, 2003). On the other, the business-related knowledge and communication skills of IT knowledge workers determine their competence to collaborate with business managers on strategic IT decisions (Bassellier and Benbasat, 2004).

PRIOR E-GOVERNMENT LITERATURE

The dimensions and attributes defined in the preceding literature review are summarised in Appendix A and the coverage of each attribute in representative operational studies of e-government is noted. Prior studies of e-government have not simultaneously analysed the six dimensions of IT drivers and enablers at multiple levels using multiple methods. For example, prior studies of e-government Internet portals have overlooked attributes of transformation brought about by human action over time (e.g., Huang, 2007; Ke and Wei, 2004; La Porte *et al*, 2001; Moon, 2002; West, 2004). In addition, studies of enterprise information systems implementations have overlooked quantitative methods when applying qualitative case study methods (e.g., Devadoss *et al*, 2002; Heeks and Stanforth, 2007; Silva and Hirschheim, 2007; Tan and Pan, 2003). In their quest, prior studies have disregarded either the historical paths that led to the present state of e-government transformation, or present attributes that represent antecedent conditions to transformation (Orlikowski and Robey, 1991; Sabherwal and Robey, 1995). Thus, the specific reasons for implementation success or failure remain unclear. In order to assess IT drivers and enablers in support of a well-integrated e-government back-office (i.e., achieving Stage 3 of IT maturity), we adopted a multi-level investigation incorporating both qualitative and quantitative analysis.

METHODOLOGY

The objective of this research is to apply multi-level investigation incorporating both qualitative and quantitative analysis to assess IT drivers and enablers in support of a well-integrated e-government back-office (i.e., completing Stage 3 of IT maturity). To this end, we undertook a multi-level empirical investigation to address the conceptual and methodological limitations of

prior operational studies of e-government. First, we identified six dimensions and 29 attributes of IT drivers and enablers (see Appendix A for details) grounded in theory (Liang *et al*, 2007). Next, both quantitative and qualitative data pertaining to the state of these 29 attributes were collected from four e-government sites to facilitate multi-level analysis (Orlikowski and Robey, 1991).

Research sites were selected to maximise variation and allow comparisons (Guba and Lincoln, 1989). Similarities and variations pertain to three characteristics of e-government environments: (1) jurisdiction, (2) form of government, and (3) economy. We used an IT association members' list to select six municipalities for data collection. These six sites were selected within the same provincial jurisdiction in order to control for some of the environmental context. Next, one of the authors contacted the IT director in each municipality to explain the objective of the study and to ask for their participation. In return, they were promised a copy of the final report. A letter was also sent to each IT director to detail the procedures for collecting the pertinent data. Out of the six municipalities approached, four participated fully in the research and two abstained due to lack of time to coordinate knowledge workers for the data collection.

Two methods were used to enable triangulation of results and improve internal validity: face-to-face interviews and two structured online questionnaires (Dubé and Paré, 2003; Irani and Love, 2001). Face-to-face interviews based on a semi-structured questionnaire enabled us to obtain detailed insight about specific issues. Each interview, conducted by two of the authors, lasted from 90 to 120 minutes and was taped with the consent of the interviewee. This enabled us to use the transcripts of the interviews for further analysis. We also asked sites to invite knowledge workers (both business and IT knowledge workers) to respond to a web-based structured questionnaire related to knowledge workers' IT- and business-related competence levels, respectively. Each survey took approximately 10-15 minutes to complete. Our subjects consisted of four IT directors, 112 business knowledge workers and 79 IT knowledge workers.

We collected data on attributes 1-27 (see Appendix A) from IT directors during face-to-face interviews using the semi-structured questionnaire presented in Appendix B. Two of the authors conducted all of the face-to-face interviews together to enhance creative potential of the study benefiting from complementary insights. Furthermore, participation of multiple investigators in assessing the collected data was instrumental to enhance confidence in the findings (Eisenhardt, 1989). We also collected data on the level of IT-related competence of business knowledge workers (i.e., attribute 28) and the business-related competence of IT knowledge workers (i.e., attribute 29) by means of two online structured questionnaires (see Appendices C and D) adapted from Bassellier *et al,* (2003) and Bassellier and Benbasat (2004) respectively.

The two structured questionnaires were first assessed for their reliability and validity. An overall analysis was performed on the underlying theoretical models proposed in the literature (Bassellier *et al*, 2003; Bassellier and Benbasat, 2004).

This research used the same latent constructs as the above two models to capture the level of IT-related competence of business knowledge workers and the business-related competence of IT knowledge workers. Partial Least Squares (PLS) method (Chin, 1998) was used for the data analysis. PLS was considered a suitable tool since it works well with relatively small samples

(Chin and Newsted, 1999; Karahanna *et al*, 1999). Furthermore, PLS makes no assumptions about the distribution of the sample data (Jöreskog and Wold, 1982; Karahanna *et al*, 1999). The analysis was performed on each of the two theoretical models using the software PLS Graph 3.0 with bootstrap by following the guidelines of Gefen and Straub (2005). Supplementary data was provided by reliability and correlation analyses conducted using SPSS 16.0.

A visual inspection of the data collected through the two online surveys did not reveal any uncommon patterns. Thus, all 112 cases recorded in the business knowledge worker online questionnaire and 79 cases recorded in the IT knowledge worker online questionnaire were considered valid for subsequent analysis. A first run of PLS revealed acceptable loads for all items of the constructs in the theoretical models except for one item in the business questionnaire and two items in the IT questionnaire (distinguished by asterisks (*) in Appendices C and D). These two items were removed from subsequent analysis. With the two items removed, once again we assessed the two questionnaires by means of PLS. Results indicated that all constructs had high reliability and convergent validity since the Cronbach's alpha, composite reliability and Average Variance Extracted (AVE) provided by PLS were above the recommended thresholds of 0.7, 0.7, and 0.5, respectively (Jarvenpaa *et al*, 2004). This conclusion is substantiated by the high factor loadings (above 0.7), and high item-to-total correlations.

To test for discriminant validity of the questionnaires, we computed the square root of the Average Variance Extracted for each construct in contrast to the correlations between the constructs (Gefen and Straub, 2005). We found that the square root of AVE for each construct was larger than the correlations with other constructs (reflecting the variance shared with these). Therefore, we can conclude that there is appropriate discriminant validity of the constructs (Igbaria *et al*, 1996; Compeau *et al*, 1999). In conclusion, from the preceding analyses, we were satisfied with the reliability and construct validity for both structured questionnaires.

We analysed the collected data in two stages (Eisenhardt, 1989). Individual attributes were analysed in a within-case search for patterns. Cross-case analysis was then conducted by comparing cases in pairs to identify the subtle similarities and differences between each pair. This process allowed the unique patterns of each case to emerge before creating generalised systemic patterns across cases. Qualitative analysis was triangulated with quantitative analysis in order to facilitate multi-level analysis in the same study (Orlikowski and Robey, 1991). Furthermore, variances in present attributes were analysed simultaneously with processual data in the form of stage theory in order to explain the present state of transformation (Sabherwal and Robey, 1995). Thus, the chain of evidence developed through within-case and cross-case analysis enabled us to accurately capture the dimensions of transformational e-government. Results of analyses are discussed next.

ANALYSIS

During face-to-face interviews, all four IT directors described the stage of IT maturity of their respective organisations using the stage matrix presented in Appendix B and adapted from Ross *et al,* (2006). The stage matrix defines patterns of seven organisational characteristics at four different stages over time. The characteristics that best match the IT directors' descriptions of their sites for each IT maturity characteristic are presented in Figure 1. All four sites have

completed technical implementation of an industry-standard ERP system such as SAP or PeopleSoft. Thus, all four sites have enterprise systems IT capability, one of seven Stage 3 IT maturity characteristics. However, sites differ substantially with respect to the other six characteristics: (1) business objectives, (2) funding priorities, (3) key IT management capabilities, (4) stakeholders who define applications, (5) key IT Governance issues, and (6) the strategic implications of IT. For example, Site 1 has not evolved past Stage 1 with respect to these six IT maturity characteristics, while Site 4 has matured to but not completed Stage 3 in six of seven IT maturity characteristics. The analysis also shows that Sites 2 and 3 have matured more in the characteristic of funding enterprise applications, than they have matured in other characteristics such as engaging senior management in defining application requirements. To understand the conditions that led to the present stage of IT maturity, we analysed the six dimensions of drivers and enablers as follows.

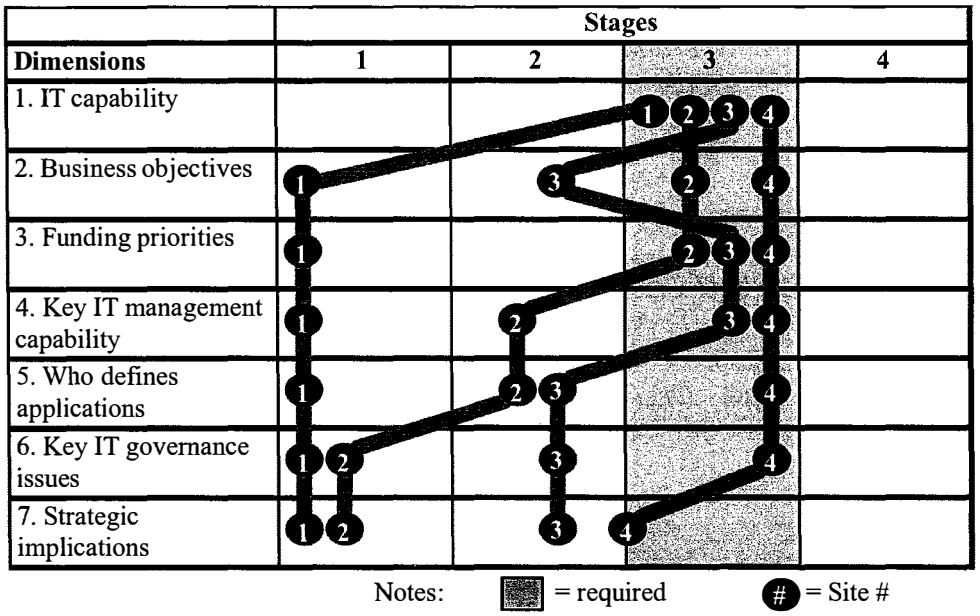


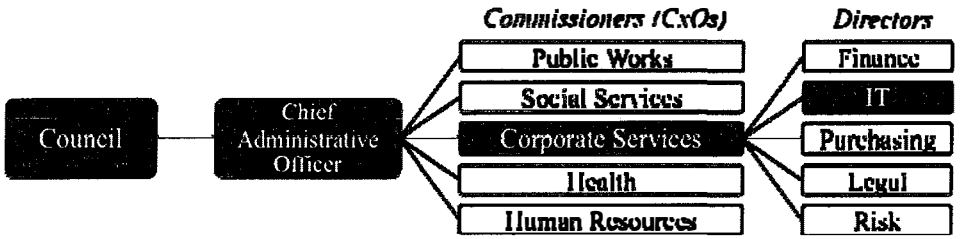
Figure 1 – Stage of IT Maturity

Drivers

Table 1 depicts a summary of data collected from our semi-structured face-to-face interviews. Our analysis of data for each of the three drivers follows.

Table 1 - Drivers

Dimensions/Attributes	*Measure(s)*	***Site 1***	***Site 2***	***Site 3***	***Site 4***
External Environment					
- Political, legal, regulatory	*Form of government*	Municipal/ Regional	Municipal/ Regional	Municipal/ Regional	Municipal/ Regional
	Jurisdiction	Ontario, Canada	Ontario, Canada	Ontario, Canada	Ontario, Canada
- Economy & Population	*Revenues/ Citizen*	$2,341	$2,103	$2,104	$2,103
IT Strategy					
- Intended Strategy	*Operating Model matrix*	Unification	Unification	Unification	Unification
- Implementation		Diversification	Diversification	Unification	Unification
Internal Context					
- IT Funding					
IT-controlled/Citizen		$17	$23	$26	$31
Business Unit-controlled/Citizen		$72	$25	$11	$ 3
- Corp. Vision for IT	*Nil-Strong*	Nil	In Development	Strong	Strong
- Organisational Structure	*Org. Chart*				



External Environment – With respect to the *political/legal/regulatory* attribute, all sites are local forms of government (i.e., municipal/regional) within the jurisdiction of the province of Ontario, Canada. To analyse *economy* and *population* attributes, we calculated revenues per capita for each site by dividing local government revenues from audited 2006 financial reports by the number of citizens served by the local governments (see Table 1). We found no significant difference among the sites concerning their revenue per citizen. Therefore, in this research, we have controlled for effects on e-government transformation attributable to external environment.

Strategy – When presented with the Operating Model Matrix (Appendix B), IT directors unanimously confirmed that their desired e-government operating model is a "Unification" model. To achieve a Unification operating model, the *intended strategy* of all four sites in this research, organisational units should be tightly integrated around a standardised set of processes.

This involves (1) service delivery coordinated across departmental boundaries, (2) highly integrated business processes, (3) highly standardised business processes, (4) centralised process ownership, (5) centralised data, (6) centralised corporate management, and (7) centralised IT management (Ross *et al*, 2006). However, when asked to describe the present state of *implementation* using the same matrix, IT directors described substantially different degrees of business process standardisation and business process integration. Most business processes are not standardised or integrated across business units at Sites 1 and 2, business process standardisation and integration are partially implemented at Site 3, and core business processes are largely standardised and integrated via the ERP system at Site 4. Thus, implementation at each site has transformed to a different degree along the business process standardisation versus integration axes of the Operating Model matrix depicted in Figure 2, even though all sites share the same intended Unification strategy. Therefore, we conclude that tightly integrating organisational units around a standardised set of processes is a necessary but not sufficient condition for implementing a complete Unification strategy in support of transformational e-government. The reason that sites have not fully implemented their intended strategy is that the supporting dimensions are not properly aligned, as follows.

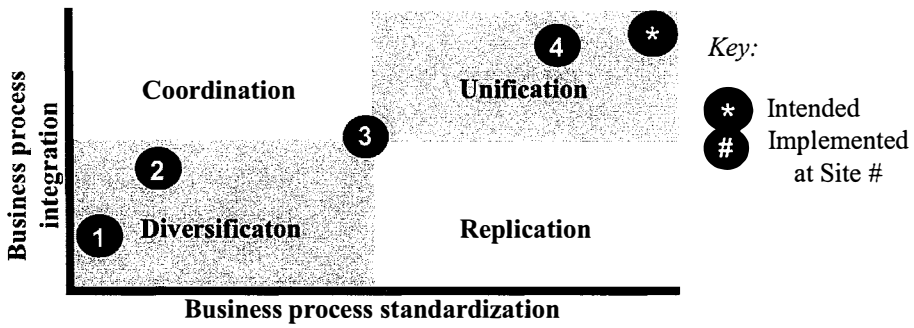


Figure 2 – IT Strategy: Intended versus Implemented

Internal context – All four organisations share a hierarchical *organisational structure* with a similar organisational chart (see Table 1). Thus, general organisational structure was consistent between sites. The characteristics of *corporate vision* were qualified in face-to-face interviews. The IT director for Site 1 stated that a corporate vision with a clear role for IT "has been non-existent". The IT director for Site 2 described corporate vision as recognising the role of IT but the corporate strategy to operationalise the vision and mission were "in development". In contrast, the IT directors for both Site 3 and Site 4 described their organisations as having a "strong corporate vision for IT". It is noteworthy that the different strengths of corporate vision are reflected in the different degrees of *IT funding* centralisation at each respective site. To assess IT funding centralisation, we indexed IT funding data at each site by the respective population of citizens they serve to mitigate the effect of size differences (see Table 1). We found that Site 1 has highly decentralised IT funding: it vests control of the lowest amount of IT funding (i.e., $17/citizen) through their central IT department amongst the four sites, and it vests control of the largest amount of IT funding (i.e., $72/citizen) through individual business units. In contrast, Site 4 benefits from the most centralised IT funding through its IT department. It is also prudent to

note that the degree of centralised IT funding is reflected in the stage of e-government transformation among the four sites (see Table 1 and Figure 1). Within the context of Unification strategy, IT management with centralised control of IT funding has significant potential to help drive change by mandating IT-related behaviours. Decentralised funding, in contrast, marginalises the IT unit into a mechanistic supporting role instead of a transformational driver role (Preston *et al*, 2008). However, while Site 4 IT funding is more centralised than Site 1, the former has not completed Stage 3 maturity. Therefore, we conclude that a strong corporate vision for IT and the endowment of IT management with the authority to control IT funding are necessary but not sufficient conditions to complete Stage 3 maturity in support of transformational e-government.

Enablers

Table 2 summarises data collected from semi-structured face-to-face interviews as well as the two online structured questionnaires. Our analysis of data for each of the three enablers is presented next.

Table 2 - Enablers

Dimensions & Attributes	*Measure(s)*	***Site 1***	***Site 2***	***Site 3***	***Site 4***
IT Infrastructure					
- ERP - *Financials*	*Brand*	PeopleSoft	SAP	PeopleSoft	SAP
	Time with	10 years	11 years	10 years	14 years
- *HR*	*Implemented*	√	√	√	√
- *Operations*	*Implemented*				√
- SCM - *Procurement*	*Implemented*	√	√	√	√
- Enterprise CRM	*Implemented*				√
- Citizen Portal	*Implemented*	√	√	√	√
- Legacy systems	*Quantity*	320	80	260	150
- *Integration of*	*Low-High*	Low	Low	Low	Low
IT Governance					
- Executive understanding	*Low-High*	Low	Low	Medium	Medium
- Degree of Collaboration	"	Low	Low	Medium	High
- Process for strategy linkage (alignment)?	"	Low	Low	High	High
- Roles, responsibilities communicated, authority delegated?	"	Low	Low	High	Medium
- Degree that Process owners are Business managers	"	Low	Low	High	High
- Processes Documented	"	Low	Low	High	High

People

Competence

Between Groups ANOVA

	F	*Sig.*
- IT knowledge workers	3.161	0.029*
- Business knowledge workers	0.962	0.413

Tukey HSD Multiple Comparisons

Site	*vs. Site*	*Mean Difference*	*Std. Error*	*Lower Bound* **	*Upper Bound* **	*Sig.*
1	2	0.141	0.168	-0.301	0.584	0.835
	3	-0.394	0.185	-0.881	0.093	0.154
	4	-0.098	0.165	-0.532	0.336	0.935
2	1	-0.141	0.168	-0.584	0.301	0.835
	3	-.535*	0.177	-1.002	-0.069	0.018*
	4	-0.239	0.156	-0.650	0.172	0.426
3	1	0.394	0.185	-0.093	0.881	0.154
	2	-.535*	0.177	0.069	1.002	0.018*
	4	0.296	0.174	-0.162	0.755	0.331
4	1	0.098	0.165	-0.336	0.532	0.935
	2	0.239	0.156	-0.172	0.650	0.426
	3	-0.296	0.174	-0.755	0.162	0.331

* The mean difference is significant at the 0.05 level.

** 95% Confidence Interval

IT infrastructure – All four sites implemented an industry-standard *ERP* system including *financial, HR* and *procurement* modules at least ten years ago (see Table 2). All four sites have also implemented an *Internet portal* for citizens. Nonetheless, varying numbers of *legacy systems* are still operational at all four sites. Our analysis of data shows that the degree to which IT infrastructure has been implemented to standardise and integrate business processes in Stage 3 of maturity differs among the four sites. For example, Site 1, which deviates farthest from Stage 3 of IT maturity, has the highest number of non-integrated legacy systems in operation amongst

the four sites. In contrast, Site 4, which deviates the least from Stage 3 of IT maturity, has adopted standardised operational practices in their ERP system in place of many legacy systems that managed operations in the past. For example, Site 4 has adopted an industry-standard *enterprise CRM* extension to ERP to manage interactions with citizens. As a result, these transformed business processes are automatically integrated and standardised within a homogenous enterprise system. However, Site 3 has also replaced many legacy systems with ERP but has not achieved the same degree of transformation. Therefore, we conclude that a standardised, integrated enterprise IT infrastructure is a necessary but not sufficient condition to complete Stage 3 of maturity in support of transformational e-government.

IT Governance – IT Governance as an enabler of Stage 3 of maturity should be highly collaborative and cooperative at all stakeholder levels. We found that Sites 3 and 4 are enabled by high level *executive understanding* of the strategic role of IT, the dependency of the business on IT, and the implementation issues faced by IT. With greater understanding comes improved *collaboration* and *formal processes for linking and aligning* business and IT strategy. Senior management better communicates to all knowledge workers their *roles and responsibilities* for strategically exploiting IT, and they enable knowledge workers with the *authority* to carry out their responsibilities. Thus, business knowledge workers take *ownership of business process* integration and standardisation, and business processes become *documented.* Conversely, we found the state of the above enabling IT Governance attributes to be low at Sites 1 and 2.

Each IT director described IT Governance at their respective site in terms of which stakeholders had *accountability* for important IT decisions. Figure 3 presents the best-practiced COBIT framework for accountability allocations among the stakeholders (shown as grey cells). The accountability allocations defined by each IT director for their respective site are also presented in Figure 3 (shown by respective site number in each cell). We found that allocation of stakeholder accountability differs among the four sites. As well, all four sites deviate from the COBIT best practices framework. For example, COBIT recommends that executive, business unit, IT and audit/compliance managers should be accountable for ensuring that IT strategy is understood by employees and that IT costs are optimised. However, the IT directors of all four sites acknowledged that only the IT department is responsible for these important decisions. This misalignment is problematic because decisions governed solely by the IT department would be less aligned with business needs that are overlooked by or unknown to the IT department (Xue *et al*, 2008). Some sites also engage stakeholders in decisions deemed unnecessary by COBIT. For example, audit/compliance managers with little technical IT expertise at Site 1 are accountable for determining IT system needs. Reinventing governance practices rather than aligning with recommended best practices impedes transformation. Therefore, we conclude that implementing highly collaborative, cooperative governance at all stakeholder levels and following best-practiced allocation of accountabilities for important IT decisions are necessary but not sufficient conditions to complete Stage 3 of maturity in support of transformational e-government.

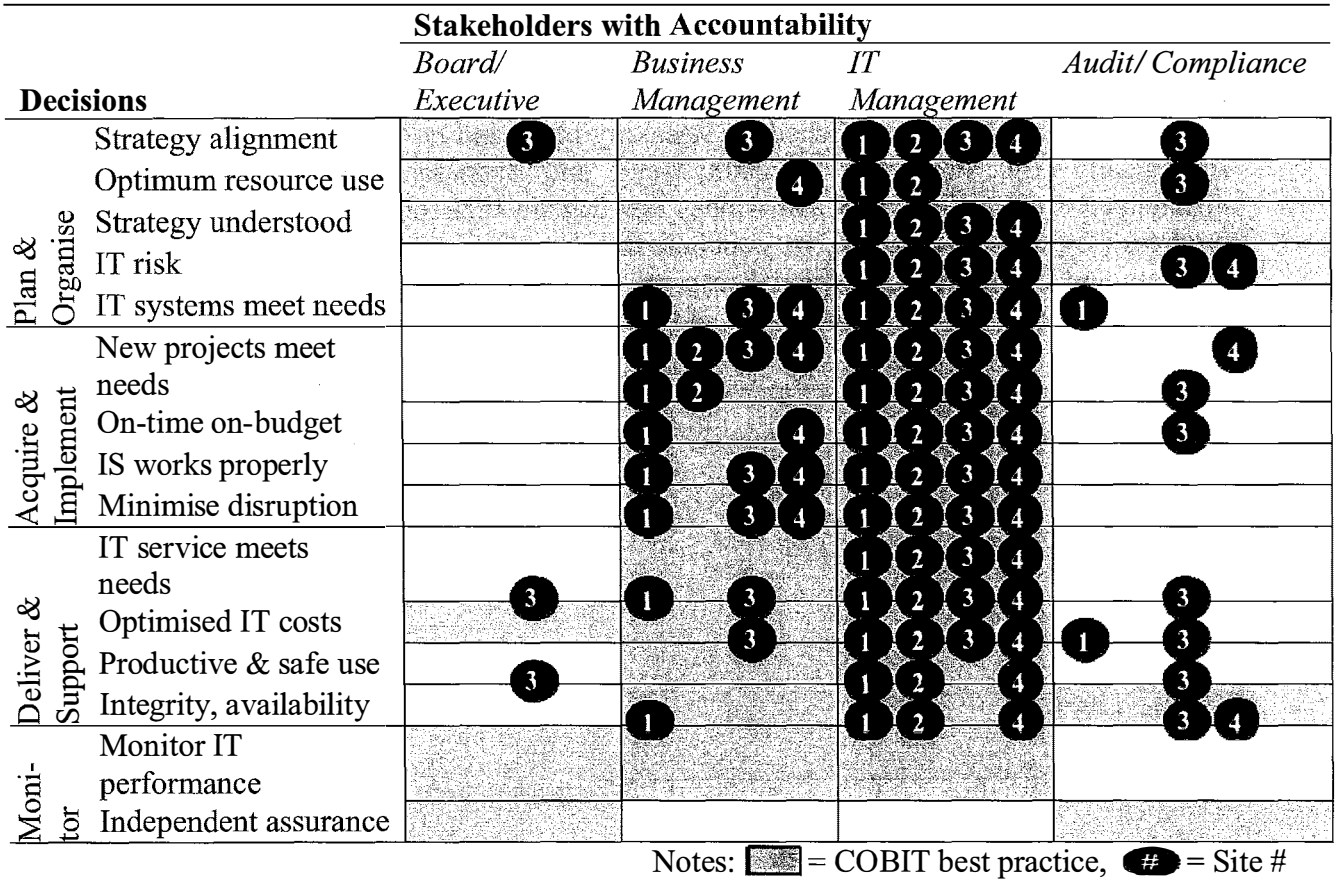


Figure 3 - Mapping Stakeholder Accountabilities versus COBIT best practices

People – Business and IT knowledge workers should be able to collaborate effectively to achieve implementation of a Unification operating model. This entails business knowledge workers having basic IT-related competence, and IT knowledge workers having business-related competence knowledge of business issues. We used two structured questionnaires to assess competence for the two groups at each site. Analysis of Variance (ANOVA) was used to compare the competence of business and IT knowledge workers respectively among the four sites to find possible differences. The result of the ANOVA test for the IT-related competence of business knowledge workers showed no significant difference exists between sites ($F = 0.96$, $p = 0.41$). However, the ANOVA test showed a significant difference ($F = 3.16$, $p = 0.03$) between the four sites for the business-related competence of IT knowledge workers. The mean competence of IT knowledge workers at each site is presented in a standard error plot in Figure 4, which illustrates that the mean competence of IT knowledge workers is highest at Site 3 and lowest at Site 2. Next, we used Tukey test to assess the significance of difference for the business knowledge of IT knowledge workers between pairs of sites. The Tukey test showed that there was no significant difference between sites 1, 3 and 4 ($p > 0.15$), but there was a significant difference between Sites 2 and 3 (mean difference = 0.53, $p = 0.02$). This finding indicates that IT knowledge workers at Site 2 have a significantly lower business-related knowledge than their peers do at Site 3. This result substantiates our finding from face-to-face interviews that IT knowledge workers at Sites 1, 3 and 4 went through an intense experience of a technical

implementation of their ERP system. Site 2, however, chose to adopt a pre-configured SAP ERP system that was already implemented at another government site. Thus, IT knowledge workers at Site 2 did not gain the same intense learning experience from implementation as their peers at the other three sites, which exhibited better understanding of their organisational business processes. While the literature has established the necessity of IT and business competence to leverage IT strategically (e.g., Preston *et al*, 2008; Reich and Benbasat, 2000), the lack of significant difference between Sites 1, 3 and 4 does not explain their different states of implementation progress (Figure 2). Therefore, we conclude that IT-related and business-related competence of business and IT knowledge workers' respectively are necessary but not sufficient conditions to complete Stage 3 of maturity in support of transformational e-government.

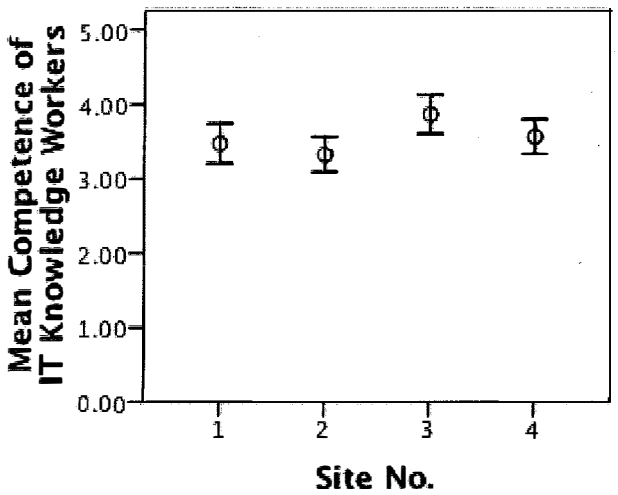


Figure 4 – Standard Error plot of the Mean Competence of IT Knowledge Workers

DISCUSSION

This study highlights the fact that achieving transformational e-government is a complex, multi-faceted phenomenon. Transformation progresses through stages of IT maturity and government organisations need to complete the first three stages before they have the conditions necessary to support transformational e-government. Furthermore, organisations cannot skip maturity stages; they must develop maturity along the stages of the lifecycle over time. In this study, we used multi-level analysis and found that technically none of the four sites has completed Stage 3 and none of the sites has fully implemented their intended operating model. The reason that government organisations find it so difficult to implement their intended operating model is that they have not aligned all six dimensions of implementation drivers and enablers discussed next.

An organisation's stage of implementation is driven by a Unification strategy intended to achieve a highly standardised and integrated operating model within the context of the organisation's external environment. However, the degree to which a Unification strategy is actually implemented differs substantially among government organisations because they deviate from Stage 3 conditions in the following dimensions. The internal context is a driver dimension of implementation. It is vital that internal context includes a strong corporate vision for IT.

Corporate vision reflects strength of leadership, and corporate leaders should centralise control of IT funding through their IT department. Centralised IT funding is necessary to empower IT management to drive business process changes that leverage a standardised, integrated enterprise IT infrastructure – an enabler dimension. IT governance – another enabler dimension – should be highly cooperative and collaborative at all stakeholder levels in order to develop executive understanding of IT, align business and IT strategy, and properly convey the authority and accountability for stakeholders to leverage enterprise IT in business operations. To work collaboratively, business knowledge workers should have a basic competence with respect to IT, and IT knowledge workers should have a basic understanding of business processes. However, excelling along any driver or enabler dimension alone is not sufficient to complete Stage 3 of maturity. Only the simultaneous alignment of all six dimensions is sufficient.

Simultaneous comparison of all six dimensions amongst the four sites shows that government can complete Stage 3 of maturity only when organisations align all six dimensions with the state-of-the-art. For example, Site 4 has matured the most of the four sites in the study, but has not completed Stage 3 because *most but not all* attributes of the six dimensions are aligned according to recommendation: executives have only moderate understanding of IT, they do not consistently communicate roles and delegate authority for exploiting IT to knowledge workers, and numerous legacy systems with little integration remain in operation. Therefore, we conclude that simultaneous alignment of all six dimensions with Stage 3 requirements is the necessary and sufficient condition to complete Stage 3 of maturity in support of transformational e-government. To this end, transformational government requires that, within their environmental context, government organizations simultaneously implement (1) a highly standardised, integrated operating strategy, (2) strong corporate vision and leadership that empowers IT management with centralised IT funding control, (3) a highly standardised, integrated enterprise IT infrastructure, (4) highly cooperative and collaborative IT governance at all stakeholder levels that follows best-practiced allocation of accountabilities, and that they (5) develop the competence of both business and IT knowledge workers to Stage 3 of IT maturity. These findings hold important implications for researchers and practitioners as follows.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This study contributes a much deeper understanding of the issues that affect the success or failure of IT strategy implementation in support of transformational e-government. One major contribution for researchers and practitioners is the empirical validation of six dimensions – external environment, IT strategy, internal context, IT infrastructure, IT governance, and competent people – that must be simultaneously aligned according to the recommendations of literature before organisations have the necessary and sufficient conditions to complete Stage 3 of maturity in support of transformational e-government. Progress is constrained if any of these dimensions are not aligned.

We believe as others do that IT implementation is a dynamic phenomenon along a continuum (e.g., Paulk *et al*, 1993; Ross *et al*, 2000, 2006; Tan and Pan, 2003) that cannot be adequately studied through one-dimensional lenses or conceptualised in dichotomous terms of success or failure (Heeks and Stanforth, 2007; Orlikowski and Robey, 1991; Sabherwal and Robey, 1995). Instead, organisations develop requisite capabilities over time and our results show that

organisations may be at different stages of maturity on different dimensions during their evolution. Therefore, reliance on quantitative measures that capture a snapshot in time without qualitative context can lead us to erroneous conclusions. Our findings emphasize the need for triangulation of multiple methods when studying transformational e-government.

The implication for practitioners is that the net effect of organisations' efforts to transform represents the cumulative learning that organisations acquire over time through cycles of taking action, assessing the outcomes and recalibrating (Ross *et al*, 2000). We know that, within the context of multinational corporations, operational performance is increasingly dependent upon the ease and speed with which valuable knowledge such as best-practiced business processes are disseminated across local organisations (Gupta and Govindarajan, 1991; Hedlund, 1986). However, in multinational corporations a central headquarters plays a vital role in disseminating such knowledge to local organisations. Likewise, it is vital that local government organisations have a rich medium for sharing knowledge in the form of a higher level of government with vested interests in local government performance, or a common industry association that provides strong vision and leadership. Such a proposition requires validation in future research. Through the application of theory-based conceptual lenses and multi-level methodologies, researchers and practitioners alike can gain deeper understanding in the quest to realise the operational benefits of transformational e-government.

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APPENDIX A

Table 3 - Research Methods of Drivers and Enablers in e-Government Literature

		E-government Studies																	
Dimensions and Attributes	***Present Study***	*Center for Digital Gov't 2006*	*Cordella 2007*	*Devadoss et al. 2002*	*Gil-Garcia et al. 2007*	*Heeks and Stanforth 2007*	*Huang 2007*	*Irani et al. 2005*	*Ke and Wei 2004*	*La Porte et al. 2001*	*Lam 2004*	*Layne and Lee 2001*	*Lee et al. 2005*	*Moon 2002*	*Otjacques et al. 2007*	*Silva and Hirschheim 2007*	*Strejcek and Theil 2002*	*Tan and Pan 2003*	*West 2004*
DRIVERS																			
External Environment																			
1 Political, legal, regulatory	b		b	b	a	b				a		b	b	a	b	b	b	b	a
2 Economy, population	a						a			a			b	a		b	b		a
Strategy														a				b	
3 Boundary-spanning service	b	a	b		a	b	a				b								
4 Data centralisation	b			b	a							b			b				
5 Process integration	b		b	b		b	a	b	b		b	b				b	b	b	
6 Process standardisation	b	a	b		a			b	b					a					
7 Process ownership	b																		
8 Centralised management	b		b																
9 Centralised IT mgmt	b				a				b										
Internal Context																			
10 Organisational Structure	b		b		a			b								b			
11 IT Funding	ab	a			a	b		b	b	a				a					a
12 Corporate Vision for IT	ab	a			a	b		b	b		b			a		b	b		

ENABLERS																				
IT Infrastructure					a															
13 ERP	a			b		b					b	b	b					b		
14 SCM/Procurement/EDI	a			b									b	a	b	b	b	b		
15 CRM	a								b		b		b			b		b		
16 Portal	a	a	b	b			a		b	a		b	b	a				b	a	
17 Legacy systems/integration	ab	a			a	b					b	b			b					
IT Governance																				
18 Executive understanding	ab				a	b		b								b				
19 Degree of Collaboration	ab			b	a	b		b										b		
20 Process for strategy linkage (alignment)	ab	a				b		b												
21 Roles, authority	ab					b														
22 Process Ownership	ab																			
23 Processes Documented	ab																			
Stakeholder Accountability					a	b										b				
24 Planning & Organising	ab	a		b		b		b	b									b		
25 Acquire & Implement	ab	a		b		b		b												
26 Deliver & Support	ab			b																
27 Monitor Performance	ab							b								b				
People																				
28 Business actor knowledge	a			b	a	b		b								b	b	b		
29 IT actor knowledge	a			b	a	b			b					a		b	b	b		

Note - Research methodology type employed in study: a Quantitative b Qualitative ab Both

APPENDIX B

Semi-Structured questionnaire used for the face-to-face interviews with IT directors

Describe the External Environment of the Organisation

1. Define your political/legal/regulatory environment [Controlled]
    a. Form of Government [Municipal/Regional – Local Government]
    b. Jurisdiction [Ontario, Canada]

2. What is the size of your business? [Controlled]
    a. Gross annual revenues ($MM): _____
    b. Population (Number of citizens): _____

Describe your Strategy and state of Implementation

3. Which of the four Operating Models (below) best describes
    a. your organisational operating strategy requirements [Qualitative]; and
    b. your current enterprise IT implementation? [Qualitative]

Operating Models Matrix

Business process integration		
	High	**Coordination** • Shared customers, products, or suppliers • Impact on other business unit transactions • Operationally unique business units or functions • Autonomous business management • Business unit control over business process design • Shared customer/supplier/product data • Consensus processes for designing IT infrastructure services; IT application decisions made in business units
		Unification • Customer and suppliers may be local or global • Globally integrated business processes often with support of enterprise systems • Business units with similar or overlapping operations • Centralised management often applying function/process/business unit matrices • High-level process owners design standardised processes • Centrally mandated databases • IT decisions made centrally

	Low	**Diversification** • Few, if any, shared customers or suppliers • Independent transactions • Operationally unique business units • Autonomous business management • Business unit control over business process design • Few data standards across business units • Most IT decisions made within business units	**Replication** • Few, if any, shard customers • Independent transactions aggregated at a high level • Operationally similar business units • Autonomous business unit leaders with limited discretion over processes • Centralised (or federal) control over business process design • Standardised data definitions but data locally owned with some aggregation at corporate • Centrally mandated IT services
		Low	High
		Business process standardisation	

(Adapted from Ross *et al.*, 2006)

Stage of IT Maturity

4. For the following seven factors, circle all of the descriptions that characterise your organisation to a high degree. [Qualitative]

Stage Matrix

Stage:	**1**	**2**	**3**	**4**
4.1. IT capability	Local IT applications	Shared technical platforms	Companywide standardised processes or data	Plug-and-play business process modules
4.2. Business objectives	ROI of local business initiatives	Reduced IT costs	Cost and quality of business operations	Speed to market; strategic agility
4.3. Funding priorities	Individual applications	Shared infrastructure services	Enterprise applications	Reusable business process components
4.4. Key management capability	Technology-enabled change management	Design and update of standards; funding shared services	Core enterprise process definition and measurement	Management of reusable business processes
4.5. Who defines applications	Local business leaders	IT and business unit leaders	Senior management and process leaders	IT, business, and industry leaders

4.6. Key IT governance issues	Measuring and communicating value	Establishing local/regional/ global responsibilities	Aligning project priorities with architecture objectives	Defining, sourcing, and funding business modules
4.7. Strategic implications	Local/functional optimisation	IT efficiency	Business operational efficiency	Strategic agility

(Adapted from Ross *et al.*, 2006)

Describe the Internal Context of the Organisation

5. What is your municipality's organisational structure? What is your IT department organisational structure? [Qualitative]
6. What are your annual IT budgets ($MM): IT Direct budget ____, All IT spending _____ [Quantitative]
7. What are the vision and mission statements of your organisation? What is the business strategy to reach these objectives? To what degree do they recognise the role of IT? Rate Strong, Weak or Nil and explain. [Qualitative]

Describe the IT Infrastructure

8. ERP system(s)
    a. Have you implemented an ERP system for financial/accounting control? [Quantitative]
    b. If so, which ERP system(s) do you use? [Qualitative]
    c. If so, in what year did your organisation acquire this ERP system? [Quantitative]
    d. Have you implemented the human resources (HR) module? [Quantitative]
    e. Have you implemented ERP for operational functions such as work orders and workflows? [Quantitative]
    f. Have you implemented the procurement module? [Quantitative]
    g. Have you implemented enterprise Customer Relationship Management (CRM) for this ERP system? [Quantitative]
9. Do you have an Internet Portal for citizens?
10. How many legacy applications provide data that support reporting and decision-making? Explain. [Quantitative and Qualitative]
    a. To what extent are these non-ERP applications integrated, requiring no or minimal manual intervention? Rate High, Medium or Low. [Quantitative]

Describe your IT Governance

11. Do all executives have a sound understanding of strategic IT issues, such as dependence on IT, and technology insights and capabilities? Rate High, Medium or Low and Explain. [Quantitative and Qualitative]
12. Is there collaboration between IT, business process managers, finance and auditors? Rate High, Medium or Low and Explain. [Quantitative and Qualitative]
13. To what degree do you have processes in place for clear and active linkage amongst the organisational strategy, the portfolio of IT-enabled investment programs that execute the strategy, the individual investment programs, and the business and IT projects that make up the programs? Rate High, Medium or Low and Explain. [Quantitative and Qualitative]

14. To what degree does senior management define and communicate roles and responsibilities for all personnel in the enterprise in relation to the portfolio of IT-enabled business investment programs, individual investment programs, and other IT assets and services to allow sufficient authority to execute the roles and responsibilities assigned? Rate High, Medium or Low and Explain. [Quantitative and Qualitative]
15. To what degree are business process managers accountable for control, documentation and testing, not the internal Audit or IT? Rate High, Medium or Low and Explain. [Quantitative and Qualitative]
16. Are all business processes well documented and stored in a central repository? Rate High, Medium or Low and Explain. [Quantitative and Qualitative]
17. Which best characterise your organisation's approach to governance, risk, and compliance management? Please select one response below and explain. [Quantitative and Qualitative]
    a. Centralised
    b. Business unit specific
    c. Hybrid (both centralised and business unit)
    d. Informal/Ad Hoc approach
18. Place a checkmark in the column for all Stakeholders that have Accountability for the following important decisions and explain [Quantitative and Qualitative]:

Stakeholder Accountability Matrix

Decisions	*Stakeholders*			
	Board/ Executive	*Business Management*	*IT Management*	*Audit/ Compliance*
Plan and Organise				
- Are IT and the business strategy in alignment?				
- Is the enterprise achieving optimum use of its resources?				
- Does everyone in the organisation understand the IT objectives?				
- Are IT risks understood and managed?				
- Is the quality of IT systems appropriate for business needs?				
Acquire and Implement				
- Are new projects likely to deliver solutions that meet business needs?				
- Are new projects likely to deliver on time and within budget?				
- Will the new systems work properly when implemented?				
- Will changes be made without upsetting the current business operation?				
Deliver and Support				
- Are IT services being delivered in line with business requirements and priorities?				
- Are IT costs optimised?				
- Is the workforce able to use the IT systems productively and safely?				
- Are adequate confidentiality, integrity and availability in place?				
Monitor				
- Can IT's performance be measured, and can problems be detected before it is too late?				
- Is independent assurance needed to ensure that critical areas are operating as intended?				

(Source: IT Governance Institute and the Office of Government Commerce, 2005)

APPENDIX C – Structured Questionnaire for collecting data regarding: the IT-related competence of Business knowledge workers

(Adapted from Bassellier *et al.*, 2003)

Item	*Dimensions/Question*	*Scale*
T1*	What is your general knowledge of personal computer?	a
T2	What is your general knowledge of client-server?	a
T3	What is your general knowledge of LAN (Local Area Network)?	a
T4	What is your general knowledge of imagery technology?	a
T5	What is your general knowledge of multimedia?	a
A2	What is your general knowledge of WWW?	a
A3	What is your general knowledge of electronic data interchange?	a
A4	What is your general knowledge of e-commerce?	a
A5	What is your general knowledge of Groupware?	a
S1	What is your general knowledge of traditional system development life cycle?	a
S2	What is your general knowledge of end-user computing?	a
S3	What is your general knowledge of prototyping?	a
S4	What is your general knowledge of outsourcing?	a
S6	What is your general knowledge of project management practices?	a
M2	Indicate your level of knowledge about the current IT applications (including software, data) assets of your business unit?	b
M3	How informed are you about the IT budget in your business unit?	b
M4	How informed are you about the IT strategies in your business unit?	b
M5	How informed are you about the IT policies in your business unit?	b
M6	How informed are you about the IT vision statements in your business unit?	b
N1	How knowledgeable are you about IT or business people to contact within your organisation as source of information about IT?	c
N2	How knowledgeable are you about IT or business people to contact outside your organisation as source of information about IT?	c
N3	How knowledgeable are you about secondary sources of knowledge as source of information about IT?	c
P1	How often have you participated in and/or led in initiating new IT projects?	d
P2	How often have you participated in and/or led in identifying the cost and benefits of IT projects before they are developed; preparation of business cases?	d
P3	How often have you participated in and/or led in managing information systems projects?	d
P4	How often have you participated in and/or led in developing information systems?	d
G1	How often have you participated in and/or led in creating an IT vision statement regarding how IT contributes to business value and strategy?	d
G2	How often have you participated in and/or led in developing IT strategy?	d
G3	How often have you participated in and/or led in creating IT policies?	d
G4	How often have you participated in and/or led in setting IT budgets?	d
IN1	To what extent do you intend to create or strengthen partnership/alliances with IT people within your organisation?	e
IN2	To what extent do you intend to support/promote the use of IT in your division?	e

Scale

a. 1. never heard of–3. know about them in general–5. understand their value to the organisation
b. 1. uninformed–5. very well informed
c. 1. not at all knowledgeable–5. extremely knowledgeable
d. 1. never–5. many times
e. 1. very little extent–5. very great extent

Note: * indicates an item with low reliability that was removed from subsequent analysis.

APPENDIX D – Structured Questionnaire used for collecting data regarding: the business-related competence of IT knowledge workers
(Adapted from Bassellier and Benbasat, 2004)

Dimension	*Variable*	*Question*
Organisational overview	OVR1	Rate your level of knowledge of the organisation's external environment (e.g., government, competitors, suppliers, and customers)
	OVR2	Rate your level of knowledge of the goals and objectives of the organisation as a whole
	OVR3	Rate your level of knowledge of the core capabilities of the organisation
	OVR4	Rate your level of knowledge of the key factors that must go right for the organisation to succeed
Organisational units	UNT1	Rate your level of knowledge of the main challenges that different divisions in the organisation face in achieving their objectives
	UNT2	Rate your level of knowledge of the language (e.g., key concepts, jargon, etc.) of the different divisions in the organisation.
	UNT3	How well do you understand the work processes of the different divisions in your organisation?
	UNT4	Rate your level of knowledge of the connections and interdependencies between the various divisions in the organisation
Organisational responsibility	RES1	To what extent do you take actions to stay informed about business developments not directly related to IT?
	RES2 *	How much do you participate in business activities that are *not* directly related to IT?
	RES3	To what extent are you concerned by the overall performance of your business organisation?
	RES4	To what extent does your work have an impact on the performance of the organisation?
IT-business integration	ITG1	How experienced are you at recognising potential ways to exploit new business opportunities using IT?
	ITG2	How experienced are you at analyzing business problems in order to identify IT-based solutions (understand situations, getting the "big picture", identifying underlying root problems, etc.)?
	ITG3	How experienced are you at evaluating the organisational impacts of IT solutions?
	ITG4	Rate your level of knowledge of the alignment between business goals and information systems goals in the organisation as a whole
	ITG5	Rate your level of knowledge of the way IT contributes to the value of the organisation

Knowledge Networking	NET1 *	If you have a business question or problem that you cannot solve alone, how confident are you about finding the right person to contact in your organisation?
	NET2	If you have a business question or problem that you cannot solve alone, how confident are you about finding the right contacts outside your organisation (consultants, vendors)?
	NET3	If you have a business question or problem that you cannot solve alone, how confident are you about finding other relevant sources of business information including Internet site, magazines, trade journals, and conferences?
Interpersonal communication	COM1	In general, how effective do you think you are at communicating with people at different levels of the organisation (e.g., with your subordinates, peers, superiors)?
	COM2	How effective are you at working in a team environment?
	COM3	How well can you communicate about IT matters in non-technical language and within a business context to non-IT specialists?
Leadership	LEA1	In general, how effective do you think you are at managing projects (planning, managing resources, evaluating, etc.)?
	LEA2	In general, how effective do you think you are at acting in a leader-ship role (e.g., establishing direction, directing people, motivating and inspiring, etc.)
	LEA3	Rate your level of knowledge of the existing practices for the management of change in the organisation
	LEA4	Rate your level of knowledge of the risk management practices that can be applied in the organisation
Intention to Develop Partnerships	INT1	To what extent are you willing to commit to the sharing of responsibilities with your business clients for the development and implementation of future projects?
	INT2	How comfortable would you be to getting involved with your business clients in projects that may require more innovative technologies, with the risk it may imply?
	INT3	In the future, to what extent do you intend to develop strong partnerships with business clients?

Scale: All Items measured using 5-point Likert-type scale.
Note: * indicates an item with low reliability that was removed from subsequent analysis.

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