2008

Forming a Practice Perspective for Agility in Information Systems

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Abstract

This paper focuses on agility in information systems, and how the IT function can enable this capability. IS theory and a best practice framework on agility are compared, and gaps are identified. A goal of the research is to reconcile the IS theoretical and practice perspectives. We illustrate that the cybernetic framework of Beer's Viable System Model can be used to reconcile gaps between theory and practice, drawing on the cybernetic notion of control. The paper reports on a research project, where the findings from an applicability check with experienced IS practitioners are discussed, and a mailed survey to test the research propositions is outlined. From a relevancy perspective, the paper illustrates how theory can inform a high-ranking issue of IT management concern. Better agility outcomes from an extended best practice framework are anticipated.

Keywords

Agility, Information Systems, IT function, Viable System Model, COBIT

INTRODUCTION

Many in IS practice appear to subscribe to a common concept of agility. The concept consists of: recognition of a business environment that fluctuates quicker than conventional planning cycles; the need to sense environmental fluctuations; the need to respond using existing information systems; and organizational readiness to effect the sensing and response (Luftman and McLean 2004). Gartner defines agility "as an organization's ability to sense environmental change and respond efficiently and effectively to that change" (Newman and Logan 2006).

Agility in information systems is a topic of recent interest in IT practice. Strategic agility was ranked first in a survey of 28 senior IT executives presented with a list of 53 issues (Ives and Mandviwalla 2004). Agility was ranked fifth amongst 22 management concerns in a survey of 128 respondents from the Society of Information Management, representing a broad IT practitioner body (Luftman and McLean 2004). The survey's authors noted that a faster business pace demands IT organizations respond quickly and effectively. IT activities that used to be measured in years are now measured in months, and the ability to sense and respond has become critical.

This paper extends the theory on agility in information systems, where the IS literature currently focuses on "what" agility is, and "does" the IT function enable the capability. The paper explains "why" the IT function can enable agility. In doing so, the paper reconciles the IS theoretical literature with the practice perspective of "how" to enable agility. This reconciliation is the result of providing a testable theory of agility that both explains and predicts (Gregor 2006). To address this problem, the research question of the paper is:

Why can the IT function enable agility in existing information systems?

Reconciling the IS theoretical and the practice perspectives is relevant to both domains: to address an area of further research identified in the IS literature; and to inform practitioners on how better to enable the IT function for this important capability. This reconciliation contributes to the relevancy of IS research to practice that has long been an issue in the academic community (Rosemann and Vessey 2008). The information systems in question are IT-conducted business initiatives (Weill et al. 2002). The IT function is the IT personnel and their work processes that complement the IT.

The paper will first review the IS theoretical literature and the practice perspectives on agility. A practice perspective is provided by the claimed best practice of Control Objectives for Information and related Technologies (COBIT). Gaps between the IS theoretical and practice perspectives are identified. The research method of conceptual and empirical study to reconcile the perspectives is explained, and a cybernetics approach justified. The paper will claim a theoretical contribution, where a cybernetic model is found applicable to the IT function and to answer the research question. A mailed survey to test the research propositions is in-progress and described. The anticipated research implication is to extend the best practice framework to better enable agility.

THEORETICAL AND PRACTICE PERSPECTIVES ON AGILITY

This section reviews the current theoretical and practice perspectives on agility in information systems. First, the IS literature on agility is reviewed and classified into a taxonomy of theory to assess how far the theoretical perspective extends. Second, the current IS practice perspective to design and action the IT function for agility is derived from a claimed best practice framework. This section concludes by identifying the gaps between theoretical and practice perspectives on agility.

Theoretical Perspectives on Agility in Information Systems

Agility of information systems and its effect on organizational performance has recently received much attention in IS research (Piccoli and Ives 2005; Sambamurthy et al. 2003; Weill et al. 2002). IS research discuss a new era where a firm's performance depends on the IS capability to effect agility, and less on identifying strategic IT-enabled initiatives (Galliers 2006; Peppard and Ward 2004). This IS capability has inter-related competencies, that is a basic model for agility in information systems. Firstly, the IT function's fusion of business and technical knowledge to sense the environment and to generate IT-enabled options for future needs (Sambamurthy et al. 2003). Second is a competency to sense the current use of information systems. This is a process of the IT function to monitor and improve the value realized from the existing systems (Overby et al. 2006).

Gregor (2006) provides a taxonomy of five IS theory types. This taxonomy is used to reconcile the contributions from the IS theoretical and practice perspectives on agility. The first type is theory for analysis, which does not extend beyond analysis and description. Analytic theory does not specify causal relationships and makes no predictions. The second type is theory for explanation, which does not intend to predict with any accuracy and has no testable propositions. Third is theory for prediction that provides testable propositions but do not have well-justified causal explanations. The fourth type is theory for explanation and prediction that has testable propositions and causal explanations. Last is theory for design and action that have explicit prescriptions for constructing an IT artefact.

Gregor (2006) draws interrelationships on how these theory types inform each other. She notes that theories of analysis are needed to develop the other theory types by providing clear definition of constructs. Gregor also emphasizes that theory for design and action may have a strong interrelation with theory for explanation and prediction, but can be developed without such theory based on observations of what has worked in practice.

A survey of the IS literature concerned with agility and the IT function suggests most of the contributions have been theories of analysis for defining concepts, or theories of explanation with no intent to predict with any accuracy. Theories of analysis on agility in the IS literature include the following. Agarwal and Sambamurthy (2002) state that IT now plays a more prominent role in corporate agility. Desouza (2006) signifies agile organizations and agile information systems as the same thing. Lyytinen and Rose (2006) view an agility outcome of the IT function from an organizational learning perspective, and considers exploration and exploitation of innovative processes. Osborn (1998) analyses an agility paradox to be resolved by strategy, control and systems. Peppard and Ward (2004) present attributes of an IS capability for agility. Weill et al. (2002) correlate strategic agility and IT-infrastructure capability. Some of these papers can arguably be categorized as theories of explanation, based on varying claims of moderate predictive accuracy.

Theories of explanation on agility in the IS literature include Fink and Neumann (2007) positively correlate IT personnel capabilities and IT infrastructure capability, and IT infrastructure capability and IT-dependent organizational agility. Galliers (2006) suggests a strategizing framework for agile information systems. Overby et al. (2006) define enterprise agility and explore the underlying capabilities, explain the enabling role of IT, and propose scoring agility based on unspecified measures of sensing and responding. Sambamurthy et al. (2003) define IT competencies to enable digital options which afford agility. Van Oosterhout et al. (2006) define the change factors requiring agility, and identify IT as both an enabler and inhibitor of agility. These papers have no testable propositions, and none can be claimed as theories of explanation and prediction.

What is missing from the IS theoretical perspective on agility is a theory explanation and design that has testable propositions and causal explanations. Such theories have a strong interrelation with theory for design and action required by the IS practice perspective (Gregor 2006).

Practice Perspectives on Agility in Information Systems

The IS practice perspective on how the IT function can enable agility has been deduced from a claimed 'best practice' framework. COBIT is arguably the most appropriate control framework available to align information systems and business goals, and is increasingly being used by a diverse range of organizations throughout the world (Ridley et al. 2004). COBIT practices represent the consensus of experts (IT Governance Institute 2007), and the control framework this study deduced as the dominant design and action theory for agility from the IS

practitioner perspective. This deduction recognizes that a design and action theory can build on idiographic studies of what worked in the past, or known predictive relationships that are not fully understood (Gregor 2006).

The COBIT framework of best practice was created by the Information Systems Audit and Control Association and the IT Governance Institute in 1992. The COBIT framework consists of 34 high-level control objectives, each with a set of detailed objectives, key performance indicators, key goal indicators and a maturity model. COBIT provides managers, auditors and users with a set of accepted measures and practices to assist them to develop appropriate governance and control in the IT function (IT Governance Institute 2007).

Within the COBIT framework is a goal of creating IT agility. COBIT defines agility as responding to changing business requirements from the customer perspective, and managing business change from an internal perspective. This definition reflects COBIT dependence on received business requirements and strategy (IT Governance Institute 2007). Thus, a theory of how to design and action agility is explicit in the COBIT framework.

The COBIT goal of *Create IT agility* (IT Goal 5) is linked to four measurable control objectives. First, control over the IT process of *Define the information architecture* enables IT to be agile in responding to business requirements, to provide reliable and consistent information, and to seamlessly integrate applications into business processes. Second, control over the IT process of *Define the IT processes, organization and relationships* enables IT to be agile in responding to the business strategy, whilst complying with governance requirements, and providing defined and competent points of contact. The final control objectives linked to the COBIT goal to create IT agility are *Manage IT human resources* and *Acquire and maintain technology infrastructure*. These two control objectives aim for an infrastructure that enables the processing of the business applications.

Gaps between IS Theoretical and Practice Perspectives on Agility

Comparing the IS theoretical perspective on agility, gleaned from the research literature, with the IS practice perspective on how to create agility, deduced from COBIT best practice, has highlighted four noteworthy gaps.

The first gap between the IS theoretical and practice perspectives is differences in the *concept of agility*. The COBIT definition of agility is narrower than the IS theoretical perspective, as it is based on the IT function responding to received business requirements and strategy. The IS theoretical perspective observes that deliberate alignment of information systems with a stated business strategy has had limited success (Galliers 2006). The IS theoretical perspective on agility has information systems being subject to less long-term planning strategies, and more to constant adaptation (Desouza 2006; Peppard and Ward 2004). The COBIT definition of agility is also narrower than some other IS practice perspectives (Luftman and McLean 2004; Newman and Logan 2006), which include the IT function sensing and responding directly to the business environment.

The second gap is the capability for the IT function to *sense future needs directly from the environment*. The IS theoretical perspective emphasizes this forecasting capability (Desouza 2006; Overby et al. 2006; Sambamurthy et al. 2003). In the IS practice perspective, the capability to sense environmental change is noted by Gartner (Newman and Logan 2006), but the COBIT goal of Create IT agility is not linked to any measurable process for this capability. That COBIT is silent on the IT function directly sensing future needs from the environment is probably the result of the COBIT concept of agility being based on responding to a received business strategy.

The third gap between the IS perspectives is concerned with *maintaining digital options* that can be readily implemented. Digital options are a portfolio of initial investments without an obligation for full investment. Informed by strategic foresight and systemic insight, the IT function makes an initial IT investment, which remains open until an opportunity arrives, at which time the IT function makes the remaining IT investment to capture the opportunity. This capability is put forward in the IS research literature on agility (Overby et al. 2006; Sambamurthy et al. 2003; Weill et al. 2002). From the IS practice perspective, the theory deduced from the COBIT enabling factors to create IT agility, is silent on this capability.

Last, the IT function *sensing current use of the information systems* is not included in the IS practice perspective on agility. There are several references to this capability in IS theoretical literature which discuss systemic insight (Sambamurthy et al. 2003), effective use processes (Peppard and Ward 2004); and the assessment of unexpected consequences that were experienced in existing activity (Galliers 2006). The IS practice perspective is silent on this capability, as deduced from stated COBIT enablers to create IT agility.

METHODOLOGY

The review of the IS theoretical and practice perspectives on agility has identified gaps in the concept of agility, and a lack of an explanation of a mechanism to sense and respond to environmental fluctuations. This section first discusses a control mechanism for sensing and responding from the cybernetic framework of Beer's Viable System Model (VSM) (Beer 1970). The VSM is conceptually found to apply to the IT function, and bridge the

gaps between the two perspectives on agility. The cybernetic application was applicability checked with an IT consultancy (Rosemann and Vessey 2008). Next, the propositions of the cybernetic application and the applicability check are quantitatively tested by a mailed survey, which is work in-progress. The research process is depicted in Figure 1.

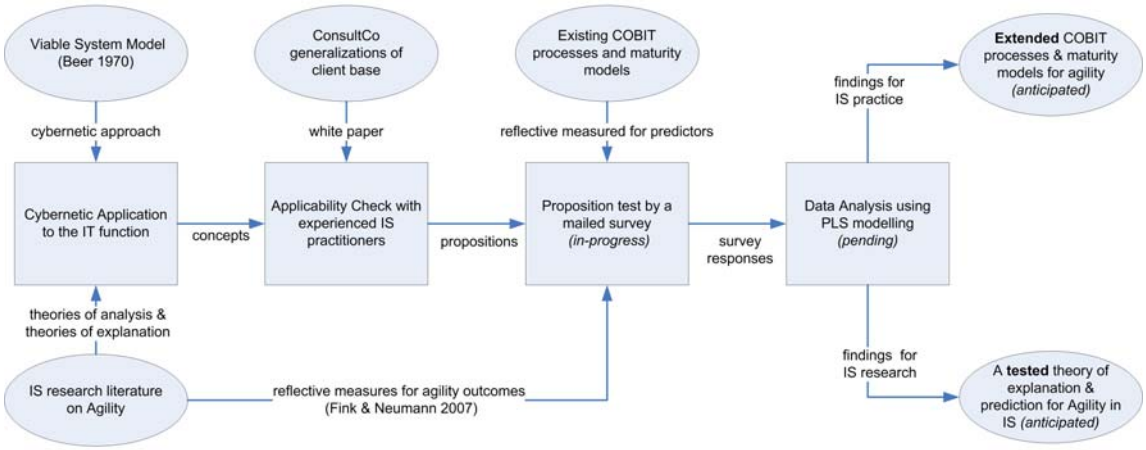

Figure 1: Process of the Research Project into Agility in Information Systems

Cybernetic Approach

The research approach was to draw theoretical parallels between the IS research into agility in information systems, and an established model of cybernetics. A cybernetic model is applicable for a number of reasons. First, the business issue of agility for sensing and responding to perturbations in the environment (Overby et al. 2006) is the fundamental problem of adaptation addressed by cybernetics (Ashby 1956).

Second, is the concept that agility of information systems requires a requisite knowledge base to manage information received from the environment, and to enable adaptations of existing IT and work processes (Desouza 2006). This concept is consistent with the cybernetic theorem of managing environmental perturbations by maintaining a model of operations. The model can be less complex than the operating process, but must be of requisite variety to control the process (Conant and Ashby 1970).

Third, strategic agility is viewed as emerging from the options of leveraging the existing information systems and the adaptability of the IT function (Desouza 2006; Galliers 2006; Peppard and Ward 2004). This IS research concept is aligned to the concept of autopoiesis (Maturana and Varela 1980; Varela 1992). An autopoietic system is where identity arises from structure, self-aware of the system's identity in a dynamic environment, and self-producing to maintain identity.

Last, the IS competencies for agility of externally-focused future planning, and an internally-focused effective use process (Desouza 2006; Galliers 2006; Peppard and Ward 2004) equates to a dynamic that is addressed by the meta-system of the cybernetic Viable System Model (Beer 1970).

The validity of a cybernetic framework for an explaining and predicting theory, to reconcile the IS theoretical and practice perspectives, is supported by Gregor (2006). Gregor states a commonality of cybernetics with general system theory. General system theory provides a high level way of thinking about information systems. Systems are seen as being in a continuous state of exchange with their environment and other systems, and modelled with concepts of input, throughput, output, feedback, boundary and environment. Gregor suggests general systems theory and cybernetics as examples of 'grand theories' for explaining and predicting.

The Cybernetic Application to the IT function

This section describes the Viable System Model (Beer 1970), and equates the IT function to the meta-system of the model. The unit of analysis is the IT function. The VSM is conceptually found to provide a control mechanism for sensing and responding to environmental fluctuations, and answers the research question: why can the IT function enable agility in information systems?

The VSM is the cybernetic framework used by the research to explain why the IT function can enable agility in existing information systems. The VSM proposes that any viable system is made up of five necessary and sufficient subsystems, which are interactively involved in maintaining the system's identity within a fluctuating environment. Viability is the property of a system to maintain its identity separate from others, despite the components of the system adapting in basic structure and function over time. This research used the terms

Applications, *Integration*, *Delivery*, *Intelligence* and *Policy* to describe the five subsystems of the VSM for an IS research audience and a focus on information systems. An adoption of localized names for Beer's subsystems is a liberty often taken by interpreters of the VSM.

The information systems in scope are IT-conducted business initiatives (Weill et al. 2002). An information system is considered to be composed of: the IT of the implemented electronic processes and networks; the stakeholders of the business initiatives conducted by the IT; and the IT function. The IT function is the IT personnel and their work processes that complement the IT. In applying the VSM to this model, *Applications* and *Integration* as a whole constitute the IT and the stakeholders that compose the identity of the information system.

Applications occur in many instances in a viable system. Each *Application* is an independent operation, and their coordinated behaviour composes the identity of the viable system. These are instantiations of electronic processes and networks that are used to enable business initiatives, and the business stakeholders in those initiatives. The instantiations of the IT can be a portfolio of SCM, CRM and ERP packages or bespoke/legacy systems. *Applications* benefit from extensive resources from large organizations in return for performing at prescribed service levels, within the legal obligations and corporate rules.

The function of *Integration* is to damp oscillations that will arise between both the meta-system and *Applications* and amongst the instances of *Applications* in the viable system. This can be instantiations of System Integration software to stabilize applications and the transduction of code-sets. Examples of integration software include Data Warehousing, ERP and Enterprise Applications Integration (Markus 2000). An IT support group is often involved to dampen fluctuations that cannot be handled electronically. Applications and integration compose the information system, which is subject to the meta-system of the IT function.

The *Delivery*, *Intelligence* and *Policy* meta-system of the information systems is the IT function. *Delivery* is responsible for the direct "inside and now" control of *Applications*. *Delivery* is often the accountability of the Application Management Office, which includes: a disciplined approach to delivering IT-enabled business initiatives beyond the usual view of "project completion"; a single point of ownership for application support; and a single point of contact for operational support. Deliverables of the Application Management Office include the measurements of service levels; problem management; and capacity and security.

Intelligence spends most of its time looking outside the system and to the future. *Intelligence* is necessary for the viable system to anticipate change and adjust *Applications* to fit a dynamic environment. In many organizations this is the accountability of the Strategy and Enterprise Architecture office. The accountabilities of the office include: to align business and IT strategies; monitor benefit realization; translate strategy to operational programs; prioritize initiatives for delivery; and one-stop communication for strategy stakeholders. Deliverables of the office include: identified IT trends and opportunities; approved current and target enterprise architectures; and transition roadmaps. The *Intelligence* attribute of building probabilistic models to forecast events and how *Applications* will react to those events, is consistent with discussion of the IS agility as a portfolio of digital options that are readily implemented (Overby et al. 2006; Weill et al. 2002).

Policy is needed to set the overall goals of the system, and to constrain the possibilities of adaptive behaviour provided when *Intelligence* is coupled with *Delivery*. In many enterprises this role is that of a steering committee, with representation by the IT function. The policy component is configured by the IT governance model specifying decision rights and accountabilities for important IT decisions. The aim is to encourage desirable behaviours in the use of IT. Weill (2004) conducted an international survey of more than 250 organizations and found a wide variety of IT governance arrangements for "decision rights". These decision rights included: high-level statements about how IT is used in the business, policies and rules for the use of IT; and IT project approvals and justification techniques. These "decision rights" of the surveyed IT governance arrangements are consistent with the *Policy* attributes found in Beer (1970).

Applicability Check with experienced IS practitioners

Rosemann and Vessey (2008) propose IS researchers do an applicability check of findings with practitioners to improve the relevance of their research to practice. A check of the cybernetic application of this study was done with an IT consultancy, referred to by the pseudonym ConsultCo. The level of analysis of the applicability check was generalized observations of the client base of ConsultCo by managers and consultants of the strategy and enterprise architecture practice. ConsultCo has approximately 300 active clients on the eastern seaboard of Australia, which includes a broad cross section of industries and types of organizations.

The observations from ConsultCo were recorded in a white paper of 4,500 words, where a ConsultCo manager and this researcher are co-authors. The white paper describes ConsultCo's current thinking on the topic of agility, and on the question of how an IT function can leverage the existing information systems for emerging opportunities. Specifically, the participating members of ConsultCo identified enabling factors for an IT

function to leverage the existing information systems, and intervening factors in the IT function's enablement of agility.

The white paper was developed through electronic exchange between the authors with an occasional meeting. The white paper does not explicitly discuss any theoretical model being developed on the topic of agility. This paper's author provided definitions of the factors identified by ConsultCo in light of concepts of this study, i.e. the VSM meta-system mapped to the IT function.

The applicability check method was Delphi-like, with the white paper being the research object. This method of concept framework development begins with identification of a set of concepts and followed by further classification and development of those concepts (Okoli and Pawlowski 2004). The applicability check was done in five stages. The first stage was to identify the factors of interest in a brainstorming session. This was an hour-long meeting with the author of this paper, and a ConsultCo senior manager and a manager of the strategy and enterprise architecture practice. The identified factors determine the relevance of agility in information systems to an organization, and enable the IT function to leverage the information systems for emerging opportunities.

The second stage of the applicability check was the definition of factors. This included the introduction of the attributes of Beer's VSM by this paper's author. This resulted in the first draft of the white paper. This discourse was conducted mostly electronically. The third stage was to understand the causal relationships between factors. This involved recording a ConsultCo manager's observations of factors' relationships to outcomes based on generalizations from the client base. This resulted in the second draft of the white paper.

The fourth stage was to generate propositions. This was the result of discourse between this author and a manager of ConsultCo, and conducted electronically. This resulted in the second and third drafts of the white paper. The final stage was further development of the factors and propositions by the reflections of twelve other consultants of ConsultCo. Their observations were included in the final version of the paper.

The applicability check reflects an endorsement of the VSM meta-system applicability to the IT function. With regard to *Delivery* applicability to the IT function, ConsultCo observed that *Delivery* must have a solid understanding of what is required to achieve agility and the dimensions of agility required in the future for the organization. The *Delivery* function needs to plan agility into the processes to develop systems and the technical solutions devised.

With regard to *Intelligence*, it was clear in ConsultCo's observations that agility comes via desire and planning. The degrees of freedom required needs to be planned across the people, processes, technology and culture of organizations. The role of the *Intelligence* function, in understanding the dimensions of change needed, is critical to actually achieving an agile IT environment.

ConsultCo has observed that *Policy* has a material effect on the agility of the organization, during policy planning, framing and enforcement. ConsultCo has observed two facets of the *Policy* effect. One is the support for agility by the nature and styles of its policies; and the other is the support by the way it adapts the actual policies to changing circumstance.

Importantly, the applicability check proposes that for some IT governance models, the inherent risks of the model may be mitigated by the IT function enabling agility. On the other hand, ConsultCo suggests the IT Monarchy and Feudal governance models (Weill 2004) may compromise the IT function in the enablement of agility.

The recorded observations from ConsultCo represent their current thinking on agility, and how an IT function can leverage the existing information systems for emerging opportunities. The applicability check reflected an endorsement of the VSM meta-system application to the IT function. Three propositions were raised in the applicability check. First, the IT function is more likely to leverage existing information systems with an investment into the IT function capabilities prescribed by the VSM meta-system. The second proposition is the agility of information systems can be indicated by maturity levels of industry best practice achieved in the IT function. Last, ConsultCo proposes that different models of the IT governance, at the whole-of-organization level, can drive or confound the enablement of agility by the IT function.

Proposition Testing

A mailed survey of the ConsultCo's client base is to be conducted with the aims of descriptive research and theory testing. First, the survey will provide a snapshot of the client base as to the maturity of their IT function to enable agility in existing information systems. The snapshot will be in September 2008. Second, the survey will test the correlation of constructs of the maturity of the IT function, and the likelihood of agility outcomes. Causality between these constructs is proposed in the cybernetic application, where Beer's VSM meta-system is

applied to the IT function, and the applicability check with ConsultCo. Descriptive research and theory testing are valid uses of the survey research method (Galliers 1991).

The research instrument is a four-page, mailed questionnaire printed as a side-flip booklet. The questionnaire has 48 questions in a Likert format, and can be completed in 15 minutes. The covering letter co-brands the survey as that of ConsultCo and the research institution of this author. It is made clear that the individual responses to the questionnaires are not shared with ConsultCo. Respondents will be given two weeks to complete the questionnaire, after which non-respondents are sent a follow-up letter and another copy of the questionnaire. The only incentive for respondents to complete the survey is to receive a summary of the survey findings.

The questionnaire was piloted amongst the 16 consultants employed by ConsultCo. They were surveyed on ConsultCo in-house information systems, and their responses treated confidentially by the researchers. The pilot respondents were later interviewed as a group to comment on the efficacy of completing the survey.

The survey target population is the entire client base of ConsultCo. Client organisations range from major banks to small "not for profit" support organizations. The framing of the survey aimed to mail the same questionnaire to two individuals in each client organization: an IT manager and a business stakeholder of the information systems. These individuals are known contacts of ConsultCo, and 506 surveys were mailed in September 2008.

Survey Validity

The validity of the survey results is subject to a number of biases. These include those of the research instrument, the representativeness of the target population to other settings, the survey coverage and measurements, non-respondents, and common method variances. This section briefly addresses these biases.

First, the instrument bias of the questionnaire is that the responses are based on the perceptions of the respondents, and not formative measurements of the constructs that make up the tested propositions. Second, the survey results will be subject to coverage errors, by not allowing all members of the client base of ConsultCo to have an equal chance of participating in the survey. This might occur due to data errors in the ConsultCo client data base. Third, measurement error is the result of poor wording in the questionnaire that causes inaccurate or un-interpretable answers. The bias of measurement errors will be mitigated by the pilot survey.

The representativeness of survey results to other organizations will be subject to any bias in the client base of ConsultCo. Small-Medium Enterprises are less likely to be clients, as are organizations in orderly or stable business environments are less likely than those in turbulent environments. These types of organizations are likely to be under-represented in the survey. This selection bias does not exclude large organizations in turbulent business environments, which are of particular interest to the research.

A bias may arise from a high non-response rate, where non-respondents hide a significant capability for agility. Given the high ranking of agility as an issue amongst senior IT executives (Luftman & McLean, 2004), it is unlikely that non-respondents have a high capability of agility in information systems. Non-responses are unlikely to bias the survey findings, by significantly under-reporting organizations with a high agility.

Finally, common method variance (CMV) is an issue for survey-based findings (Malhotra et al. 2006). CMV can occur when a respondent, responsible for an independent variable, biases the measurement of the dependent variable. To mitigate CMV, the framing of respondents from ConsultCo client organizations will survey IT professionals to measure the IT function maturity, and business representatives to measure agility outcomes.

Latent Constructs and their Reflective Measures

The Likert-format questions of the mailed survey constitute the reflective measures for the latent constructs. The latent constructs are suggested by the propositions (*P1 P2* and *P3*) from the cybernetic application and the applicability check. The following tables define the measures for: the three predictors of *Policy, Intelligence* and *Delivery processes of the IT function*; the segmentation by the *IT governance archetype*; and the dependent construct of *Agility Outcomes of the IT function*.

The reflective measures for the constructs of *Policy*, *Intelligence* and *Delivery processes of the IT function* are selected from existing COBIT control objectives, which equate with the attributes of the VSM meta-system described in the cybernetic application. The reflective measures for these constructs are in Tables 1, 2 and 3 respectively. These measures use the COBIT maturity levels of *non-existent*; *initial*; *repeatable*; *defined*; *managed* and *optimized* (IT Governance Institute 2007). Maturity levels as ordinal measures in regression analysis have been used in extant IS research (e.g. Sledgianowski et al. 2006).

Table 1. Measures for the *Policy processes of the IT function* (predictor) on a 6-point maturity scale

To develop & maintain a set of policies to support IT strategy.

To establish & maintain an optimal co-ordination, communication & liaison structure within the IT function.
To create a strategic plan that defines how IT goals will contribute to the company's strategic objectives.

Table 2. Measures for the *Intelligence processes of the IT function* (predictor) on a 6-point maturity scale

To define the IT procedures, organization & relationships for compliance with governance requirements.*
To monitor the business sector, industry, technology, infrastructure, legal & regulatory environment trends.
To define & implement procedures to ensure the integrity & consistency of all data stored in electronic form.
To establish & maintain an information architecture to enable applications development & decision-support.*
To analyse existing & emerging technologies, & plan which technological direction to realise the IT strategy.
To develop a feasibility study that examines the possibility of implementing alternative courses of action.

Table 3. Measures for the *Delivery processes of the IT function* (predictor) on a 6-point maturity scale

To manage IT human resources.*
To acquire and maintain technology infrastructure.*
To acquire and maintain applications in line with IT strategy and IT architecture.
To continuously monitor specified service level performance & report in a format meaningful to stakeholders.
To report service desk activity to enable management to measure service performance and to identify trends.
To monitor IT performance to make sure that things are done in line with the set directions & policies.

The application of the VSM suggests an extension of the best practice framework to better reflect how the IT function can enable agility. The degree of extension is indicated by the fact that only four of the above measures are COBIT control objectives currently linked to the COBIT goal of *Create IT agility* (IT Governance Institute 2007). The four control objectives are denoted with an asterisk.

Fink and Neumann (2007) define a construct of *IT-dependent strategic agility*, with reference to Weill et al. (2002) and Sambamurthy et al. (2003). The same measures are used in this research for the construct of *Agility Outcomes of the IT function* in Table 4. This reuse affords comparisons with the earlier research.

Table 4. Measures for *Agility Outcomes of the IT function* (endogenous) on a 5-point agreement scale

IT shared across the company enhances competitiveness or creates strategic advantage
IT shared across the company enables the company to catch up with competitors
IT shared across the company aligns well with stated organisational goals
IT shared across the company helps establish useful linkages with other organizations
IT shared across the company enables the company to respond more quickly to change
IT shared across the company enables faster retrieval or delivery of information or reports
IT shared across the company allows other applications to be developed faster

That the IT governance may drive or confound the enablement of agility by the IT function is proposed in the applicability check. The predictive relationships will be segmented by the nominal categories in Table 5. These categories are based on the IT governance archetypes of Weill (2004).

Table 5. Segmentation by *IT governance archetype*

Which best describes the group that makes the strategic business /IT decisions for the company?		
□ Corporate-level business executives	□ Corporate-level IT executives	□ Business unit leaders
□ IT executives & one business group	□ Corporate executives & business unit leaders	

DATA ANALYSIS

The analysis of the responses from the mailed survey will use partial-least-squares (PLS) modelling. The three predictor constructs are measured by the maturity of the IT function processes. The processes are defined by the VSM meta-system of *Policy*, *Intelligence* and *Delivery,* and linked to particular COBIT control objectives as reflective measures. The endogenous latent construct is the *Agility Outcomes of the IT function*. The *IT governance archetype* segments the overall maturity of the IT function when correlated with the *Agility Outcomes of the IT function*. This constitutes the basic structural model for the PLS analysis.

The basic structural model is suggested by the propositions from the cybernetic application and the applicability check. Applying the survey responses to the basic structural model may allow us to refine a powerful structural equation. This is done by removing measures with low weightings, and latent constructs with insignificant path coefficients. An R-square of 0.70 for *Agility Outcomes of the IT function* indicates a good fit (Gefen et al. 2000).

CONCLUSION

We demonstrated in this paper that the IS theoretical and practice perspectives on agility are reconcilable through cybernetics. By applying cybernetic principles to the problem area we address the "why" behind the "how to do" frameworks of the IS practice perspective of enabling agility. The paper answered the research question, "why" the IT function can enable agility in information systems by explaining a necessary and sufficient control structure for the IT function. Beer's Viable System Model was used for the control structure. The cybernetic framework complements the definition of agility and the basic model of the capability from the existing IS theoretical perspectives. The VSM application provided a testable theory of agility that explains and predicts (Gregor 2006), which was missing from the IS theoretical perspectives and required to inform IS practice to plan and action agility. This testability is described by the quantitative survey and PLS data analysis.

The anticipated contribution of the research in-progress is to bring a cybernetic approach to agility with insights to pose additional inquiries. Cybernetics positions the IT function as a meta-system of the existing information systems. The paper proposed that enabling the agility of the information systems is dependent on the maturity of the IT function. COBIT was discussed to measure IT function maturity to enable agility. Shortcomings of the existing COBIT framework are identified, and extensions to measure the control objectives pursuant of agility suggested. This addresses the need for an index of sensing and responding suggested by Overby et al. (2006).

For IT practitioners, agility in existing information systems affords near-horizon adaptations being implemented. To leverage existing IT investments, we focused on how the IT function can sense and respond rapidly to emerging opportunities. The research in-progress suggests that agility in information systems is leveraged with an investment into the IT function maturity, rather than investing resources into agile IT infrastructure alone.

The research fills a gap identified in IS literature. The IT strategy literature review of Piccoli and Ives (2005) identifies gaps in the strategic agility perspective, and suggests an agility perspective of IT-dependent initiatives is a source of research opportunities. Fink and Neumann (2007) suggest future research to identify the mechanisms underlying the strategic consequences of shared IT personnel and IT infrastructure capabilities that afford agility. The theory of explanation and prediction for agility in information system extended by this study identifies the VSM as a plausible mechanism.

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