Beyond Normal Competencies: Understanding Organisational Designs to Develop and Sustain IT-Related Capabilities

Acklesh Prasad
Queensland University of Technology
acklesh.prasad@qut.edu.au

Peter Green
University of Queensland
p.green@business.uq.edu.au

Jon Heales
University of Queensland
j.heales@business.uq.edu.au

ABSTRACT

Information technology (IT) is an important resource in organisations. Organisations leverage their IT resources with their IT-related capabilities to achieve, and sustain their competitive position. However, IT resources are dynamic, and evolve continually. Furthermore, competitive pressures and turbulent economic conditions mean that organisations continually invest in these dynamic IT resources. These situations mean that organisations need to sustain their IT-related competencies to leverage opportunities offered by the new IT resources. Research about ways to develop new, and sustain existing, IT-related capabilities is limited. A possible reason for the lack of research in this area is the lack of validated measurement items of theoretical constructs necessary to investigate ways to create new, and sustain, existing, IT-related competencies and capabilities. In this study, we suggest an environment in which organisations could build new, and sustain their existing IT-related capabilities. We report on the resources and processes that establish this environment. We also report on the development of valid measures of the elements of this environment. Analysis of pilot test data revealed that the measurement items purport to measure what they intended to measure. This study's outcome is useful in extending our understanding of IT-related competence development to secure sustainable IT-related business value from the IT resources.

Keywords: Business value, sustainable IT-related capabilities, resource-based view, dynamic capabilities, instrument development

INTRODUCTION

This study suggests how organisations could develop new, and sustain their existing, IT-related capabilities. IT-related capabilities are competences that leverage organisations' IT resources. This study is important because competitive pressures and forces compel organisations to make continuous investment in IT resources. However, organisations will need to identify ways to leverage these resources differently (Powell and Dent-Micallef, 1997). This situation is because IT resources are readily available, and any commodity-related advantage would quickly erode upon its acquisition by

competitors. As a result, organisations continually face the challenge of finding ways to leverage unique business value from their IT resources.

Our review of the extant literature highlights that various suggestions are provided on the impetus for continued investment in IT resources. There is also ample research that suggests organisations' IT-related capabilities that leverage the IT resources obtain competitive advantage (see for example, Jeffers, Muhamma and Nault, 2008; Melville, Kraemer and Gurbaxani, 2004; Oh, Ng and Teo, 2007). These IT-related capabilities include top management commitment, shared organisational knowledge, and an agile and flexible IT infrastructure (Wade and Hulland, 2004). IT resources develop continually. That is, these resources will continually present new opportunities to organisations to strengthen their competitive position. This situation, and the existence of a turbulent business environment, (Pavlou and El Sawy, 2006) mean that organisations need to find ways to continuously develop new, and update their existing, competencies to sustain their IT-related competitive advantage. Research to extend knowledge to leverage the IT resources by developing and sustaining these capabilities is limited.

We present an environment, which is a unique combination of various resources on which competencies could be developed and maintained. We also present a detailed description of the process of establishing reliable measures of the elements of this environment. We adopt a resource-centric view, the dynamic capabilities framework (Teece, 2007), and suggest that organisations need to organise their resources internally and identify the synergies between these resources. The synergies between these resources create a higher-level resource. A higher-level resource (environment) is the outcome of combination of appropriate levels of related resources, and its value to organisations is more than the sum of the value of the individual resources. This higher-level resource is dynamic because it would have the capacity to reorganise itself through the ability to absorb and incorporate environmental changes. This situation means that the potential of this higher-level resource to drive competitive advantage for an organisation is greater than the sum of the individual resources (Grant, 2008). This environment is important because the evolving nature of the IT resources requires continuous development of competencies. Organisations can develop new, and sustain their existing, IT-related capabilities on this dynamic higher-level resource.

We suggest four common (lower-level) resources needed to establish this higher-level organisational resource (i.e., the dynamic IT-deployment environment). These resources include a decentralised organisational design relating to task allocation, which accords more authority to users to interact with the business processes (Bresnahan, Brynjolfsson and Hitt, 2002; Brynjolfsson and Hitt, 1998), and an organisational design that promotes teamwork (Bresnahan et al., 2002; Brynjolfsson and Hitt, 1998). It also includes a congruent incentive system where the workers compensations align to the work design structures (Osterman, 1994), and a lateral IT governance structure that has representation of the various levels of management (Doll and Torkzadeh, 1987; Karimi, Bhattacherjee, Gupta and Somers, 2000; Prasad, Green and Heales, 2012; Prasad, Heales and Green, 2010).

In this paper, we describe how these four resources synergise to form the dynamic IT-deployment environment. We then discuss the development of the measurement items for these resources. This exercise is important because future research on sustaining IT-related competencies is contingent upon robust measurement items for suggested factors. The suggested lower-level factors have been subject to research in various disciplines, and some form of measures for these factors already exist. The competence development research, however, is a new setting with different target contacts and organisations. This situation warrants a thorough consideration on development of reliable measures for the constructs. Developing and validating reliable measurement instruments for theoretical concepts is important if we want to obtain appropriate empirical evidence to test our theories.

In information systems (IS) research, a number of instruments that consider exploratory concepts of underlying theories lack reliability and validity (Moore and Benbasat, 1991; Straub, 1989). Proper validation of measurement items is an important phase in IS empirical research. We developed a pool of measures for the factors, and our extensive validation process resulted in five measures of organisation design related to task allocation, three measures for organisation design related to teamwork, five measures for incentive system, and seven measures for lateral IT governance structure. A field-based pilot test and subsequent assessment of the measurement properties of pilot test data showed that measures display normal properties and tend to measure what they intended to measure. This outcome presents a tool that could help organisations develop new, and sustain existing, IT-related capabilities. It also paves the way to investigate avenues for sustaining various IT-related capabilities within this environment.

The rest of this paper progresses as follows. The next section introduces the main concepts of dynamic capabilities theory, and explains how the four suggested resources co-create a dynamic capability of a dynamic IT-deployment environment. Following this section, we provide a detailed discussion on the procedure used to develop the measurement items of the components of this environment. This work includes a discussion on the confirmatory field study and associated statistical analysis used to establish the validity and reliability of the measures. The paper concludes with a discussion of key issues, summary of the contributions, limitations, and directions for future research.

THEORETICAL FRAMEWORK

The resource-centric perspective (Barney, 1991; Mata, Fuerst and Barney, 1995; Teece, 2007; Teece, Pisano and Shuen, 1997) views an organisation as a product of various resources. The resource-centric perspective suggests that some organisational resources are common across organisations, while others are heterogeneous (Barney, 1991; Mata et al., 1995; Wade and Hulland, 2004). The resource-centric perspective asserts that organisations could leverage their heterogeneous resources to attain and sustain their competitive position. This situation is because organisations are able to achieve different and (better) outputs with their heterogeneous resources. In relation to IT resources, they are termed the IT-related capabilities. One resource-centric perspective, the resource-based view (RBV), suggests various IT-related capabilities for organisations. This perspective suggests that organisations need to have these IT-related capabilities to achieve superior IT-driven performance. However, the RBV does not suggest ways to sustain these IT-related capabilities. Sustainable IT-related capabilities are renewed competencies that leverage homogenous IT resources. Sustainable IT-related capabilities have become important in today's environment where organisations have dynamic IT resources at their disposal.

Organisations require continuous reorganisation of their resources to leverage opportunities and manage threats (Coase, 1937; Milgrom and Roberts, 1990; Teece, 2007). Initial, *ad-hoc*, reorganisations (Barua, Kriebel and Mukhopadhyay, 1995; Barua, Lee and Whinston, 1996; Edgeworth, 1881; Milgrom, Roberts and March, 1995) will not provide a dynamic and sustainable new environment. This situation is because such organisation is basic, and it would be easily imitated by other organisations. Organisations would be able to develop and sustain competencies through dynamic and deeper-level reorganisation of their resources. That is, organisations need to move away from reorganisation as an activity pattern (Milgrom and Roberts, 1990) to a more systematic reorganisation of resources.

The dynamic capabilities framework (Teece, 2007; Teece et al., 1997) suggests a systematic and coordinated reorganisation of organisational resources upon which organisations can build and sustain

their key competencies. The dynamic capabilities perspective asserts that common organisational factors on their own cannot increment the IT-related capabilities. However, a tactical reorganisation of organisational resources can co-create higher-level dynamic resources that can help organisations sustain their IT-related capabilities. In fact, these higher-level resources themselves could be organisations' unique competencies. These higher-level resources would be dynamic because they are difficult-to-imitate combinations of organisational, functional and technological skills (Teece, 2007). Organisations could use this foundation to build, maintain and enhance their distinctive and difficult to imitate advantages (Teece et al., 1997).

Organisations will be able to achieve these higher-level resources through their innovative responses. These responses include appropriately adapting, integrating, and reconfiguring internal and external organisational skills, resources, and functional competencies (Teece et al., 1997). Organisations' past choices influence domains of competence, and at any given time, they must follow a certain trajectory of competence development (Teece et al., 1997). Further, the dynamic capability perspective suggests that organisations can organise better certain types of economic activities internally (Coase, 1937). Competencies and capabilities resulting from organising and getting things done internally is the key component in sustaining performance advantages (Coase, 1937). This outcome is possible because internal organisation takes place in a more multilateral fashion, with patterns of behaviour and learning orchestrated in a much more decentralised fashion (Teece et al., 1997). Processes, paths, and positions are factors that can help determine a firm's distinctive competence and dynamic capabilities. These competencies and capabilities embed in organisational processes of one kind or another. The shared innovative changes between these processes explain the essence of organisations' dynamic capabilities and competitive advantage (Teece et al., 1997). We adopt these theoretical perspectives to suggest four factors, and the synergy of these factors would form a higher-level resource, the dynamic IT-deployment environment. We discuss these factors in the next section and suggest how the synergy between them creates the higher-level resource of a dynamic IT-deployment environment.

DEVELOPMENT OF A DYNAMIC IT-DEPLOYMENT ENVIRONMENT

In this section, we discuss how four resources - a decentralised organisational design relating to task allocation, a decentralised organisational design relating to teamwork, a congruent incentive system, and a lateral IT governance structure - form a dynamic IT-deployment environment. Such environments are essential in ensuring organisations' ability to renew their IT-related competencies to leverage their IT resources.

A Lateral IT Governance Structure

In this subsection, we discuss how a lateral IT governance structure in the form of an IT steering committee contributes to the development of a dynamic IT-deployment environment. The lateral concept in this structure relates to its agility, and its ability to recognise synergy in the knowledge of different levels of management. IT Governance, at an abstract level, is a subset discipline of Corporate Governance, and focuses on ways to manage information and IT assets (Weill and Ross, 2004). IT governance frameworks and structures specify the decision rights and accountability frameworks to encourage effective management of IT resources (Weill and Ross, 2004). IT governance includes foundational mechanisms in the form of leadership, and organisational structures and processes that ensure organisations' IT objectives align to their strategic objectives (IT Governance Institute, 2007). This required alignment means that the governance of IT resources embraces planning, organising, and controlling of IT activities. The IT governance structures have shown to serve various IT-related purposes in organisations (see for example, Brown, 1997; Xue, Liang and Boulton, 2008). These structures are categorised as centralised, decentralised, or federal

(Sambamurthy and Zmud, 1999); or business monarchy, IT monarchy, Feudal, IT duopoly, and anarchy (Weill and Ross, 2004). These structures facilitate the establishment of critical functions for making IT decisions. The most prominent of these functions is a lateral IT governance structure, mainly in the form of an IT steering committee (Karimi et al., 2000; Van Grembergen, De Haes and Guldentops, 2004).

A lateral IT governance structure embraces operational, tactical, and strategic IT and business unit management (Karimi et al., 2000). The key role of this structure is the setting of policies and organisation-wide coordination of IT resources (Karimi et al., 2000). The committee is entrusted with the task of linking IT strategy with business strategy by setting the strategic direction, matching corporate concerns with technological potential, and building commitment to policies (IT Governance Institute, 2007; Nolan, 1982). Chaired by a top executive, the committee meets periodically to discuss IT direction, approve and rank projects, review performance, formulate or approve technology policies, determine resource levels, and recommend major initiatives (Earl, 1993). A successful IT governance vehicle requires communication amongst all parties based on constructive relationships (Bowen, Chung and Rohde, 2007; Johnson and Lederer, 2005). This aspect is an essential characteristic in the constitution of this IT governance structure. This structure is a key vehicle to understanding organisations' current IT-related competencies, and forge ways to increment these competencies.

A Decentralised Organisation Design related to Task Allocation

In this subsection, we discuss how a decentralised organisational design relating to allocation of tasks contributes to the development of a dynamic IT-deployment environment. The concept of organisational design relates to decision-making and authority establishing mechanisms in particular organisational settings. The human resources are one of organisations' key resources. Effective human resource management (HRM) practices can develop new organisational competencies and differentiate them from their competitors (Huselid, 1995). While human resources are easily tradable, an effective and agile human resource cohort is difficult to mimic. This situation is because effective HRM systems are ones that simultaneously exploit the potential for complementarities and synergies among the HRM practices (Becker and Gerhart, 1996; Huselid, 1995).

Organisations' human resources can provide significant business value at business process and firm levels. This outcome is possible because the human resources facilitate the fit of various resources, including the IT resources, to the business processes. This means human resources provide unique capabilities to organisations. Good HRM practices would ensure that these competencies are sustained (Wright and McMahan, 1992). Thus, the extent to which an organisation can sustain its HRM-related advantages is contingent upon how it capitalises on its value-generating human resources.

However, organisations frequently do not leverage the maximum value from their human resources. This situation is because employees often perform below their maximum potential (Baily, 1993). Organisational efforts to elicit discretionary effort from employees can provide returns in excess of any relevant costs (Baily, 1993). Good human resources practices would influence employee skills and motivation. Such practices include presence of organisational structures and designs that provide employees with the ability to control how they perform their roles (Baily, 1993). This situation best relates to a decentralised organisation design. Organisational designs that involve the specification of decision rights, performance evaluation systems, and compensation systems, can help in achieving better outcomes from employees (Brickly, Smith and Zimmerman, 1996; Hitt and Brynjolfsson, 1997; Jensen and Meckling, 1992).

Organisations possess and use many different types of information. People, however, have a finite ability to process and communicate this information (Hitt and Brynjolfsson, 1997). When communication is costly and centralised, and decision makers have an infinite capacity to digest information, a centralized organisational structure will economize on communication costs (Hitt and Brynjolfsson, 1997). Such a structure, however, places a heavy burden on central decision makers. Further, knowledge can be general or specific (Hayek, 1945). Specific knowledge is difficult to convey, and it is more costly to transfer (Jensen and Meckling, 1992). This situation arises because the specific feature of knowledge is that individuals know more than they can state (Polanyi, 1962; Polanyi, 1966). As people have limited capacity to process information, highly specific information is likely to reside at the lower levels of organisation (Hitt and Brynjolfsson, 1997). To take advantage of this specific knowledge, decision rights should be collated with necessary knowledge (Jensen and Meckling, 1992). An organisational structure, where actors with specific knowledge have decision rights, will ensure appropriate leverage and wider communication of that unique specific knowledge. This outcome is analogous to a decentralised organisational structure.

A decentralised organisational structure puts the knowledge and the people together. Performance is broadly associated with a work system that includes a decentralised decision making authority (Brynjolfsson and Hitt, 1997). The contribution of a highly motivated workforce will be limited if jobs are structured, or programmed in such a way that employees do not have the opportunity to use their skills to refine the way they perform their tasks (Baily, 1993). This design is relevant in today's IT-intensive organisational setting, and is an important catalyst in forming a dynamic IT-deployment environment.

A Team-Work Based Decentralised Organisational Design

In this subsection, we discuss how a decentralised organisational design relating to teamwork contributes to the development of a dynamic IT-deployment environment. The concept of teamwork relates to organisations' human resources ability to share their knowledge and understanding in performing various set tasks. Today's IT-backed collaborative tools like the social network platforms, and shared IT infrastructures, provide an ideal opportunity for organisations' human resources to work efficiently in teams. Collaborative IT tools facilitate a move away from traditional hierarchy towards an open organisation, and promotes a team-based structure (Powell, Lovallo and Caringal, 2006). IT tools such as e-mail, social media, and conferencing facilitate coordination within and across business units. A decentralised organisational design that ties decision rights and knowledge together would promote an environment that encourages employees to interact and adopt a team-based approach. As work-based technologies become more common, organisational performance becomes increasingly affected by organisations' capacity to manage the team-based approach (Nolan and Croson, 1995). HRM practices that encourage participation amongst employees, and allow them to improve how they perform their work, can also contribute to sustained performance (Huselid, 1995). Such HRM initiatives include cross-functional teams, job rotation, and quality circles (Huselid, 1995).

The task allocation and the teamwork aspects of a decentralised organisational design are critical to ensure a better fit of an organisation's processes and their human resources. These aspects provide human resources with greater autonomy with their task, and a greater freedom to manage the fit of the technology to their managed business processes. Thus, a decentralised organisational structure nurtures an environment that allows participation amongst employees to improve on how they perform their tasks. The aspects of a decentralised organisational design for task allocation, and an environment that promotes sharing of skills and knowledge are human resource related organisational design issues capable of establishing a dynamic IT-deployment environment on which organisations could develop new or better their IT-related competencies.

A Congruent Incentive System

In this subsection, we discuss how a congruent incentive system contributes to the development of a dynamic IT-deployment environment. An incentive system is a structure to reward performance and motivate employees on individual and/or group levels. A decentralised organisational design that embraces localised task allocation and promotes teamwork encourages better a use of operational level knowledge in organisations. However, such a system can also exacerbate agency problems (Jensen and Meckling, 1992). In the absence of appropriate incentive systems, workers do not necessarily use their decision-making authority in the best interest of the organisation (Hitt and Brynjolfsson, 1997). Appropriate incentive systems align workers goals to those of the organisation. Workers seek appropriate compensation for their willingness to share knowledge. Effective sharing and leveraging of specific knowledge is only possible when an organisation appropriately rewards the efforts of its employees.

Systematic changes and considerations in work practices are important for improving the work environment, and subsequently, organisations' productivity (Ichniowski, Shaw and Prennushi, 1997). That is, organisations work policies should be part of a coherent incentive system and not developed in isolation (Baker, Gibbons and Murphy, 2002; Holmstrom, 1999; Kandel and Lazear, 1992; Milgrom and Roberts, 1990; Milgrom et al., 1995). Incentive systems based on objective performance measures can increase the effectiveness of related policies, including a shared work environment (Baker et al., 2002). Teamwork will also make group-based incentives more effective when firms provide workers with greater autonomy (Kandel and Lazear, 1992). Team environments are more effective when organisations adopt a set of complementary practices, including employment security, flexible job assignments, skills training, and communication procedures (Milgrom et al., 1995).

The Development of the Dynamic IT-Deployment Environment

In this subsection, we discuss how the above four factors and resources combine through their synergy to develop a dynamic IT-deployment environment. There is synergy between organisational design relating to task allocation and teamwork and reward systems. The resultant environment of this synergy is appropriate to engage in effective decision-making relating to the adoption and use of the IT resources. The fourth component, a lateral IT governance structure, which adopts and sets directions for use of IT resources, is an ideal vehicle that transmits the knowledge on the fit of IT resources and IT-related know to the decision makers. The suggested dynamic IT-deployment environment recognises the importance of the users of technology from the outset, and attempts to present an environment where they would feel motivated to apply and share their knowledge to fit the acquired IT resources to the business processes. In this environment, there will be recursive learning and sharing of ideas and thoughts. The product of these recursions will be a rich pool of IT-related specific knowledge. The suggested lateral IT governance structure will communicate this rich specific IT-related knowledge to the decision makers. The IT deployment benefits and challenges experienced at the IT-deployment level is made known at the decision making level.

Operational-level managements are custodians of information on IT deployment benefits and challenges experienced at the IT-deployment level. This situation arises because they represent the workforce. This specific information filters up to the top-level decision-makers when the operational level managers become part of the lateral IT governance structure. Sharing of this information through the lateral IT governance structure of the IT steering committee will improve the decision-makers understanding on the use of the IT resources by the organisation. The resultant decision-making will accommodate the concerns of the workforce at the operational level of IT resource consumption. This achievement would mean that the workforce would be motivated and they would demand more value from their IT resources. The result of this coordination has a dual purpose, and it is recursive. First, the decision makers will have the current information set to use and make IT-

related decisions that are most important for their an organisation at that point in time. Second, such IT-related decisions result in the workforce having access to IT resources that are most relevant for the effective and efficient operation of the business processes. The recursive process of learning and sharing of information within this dynamic IT-deployment environment is a unique dynamic capability on which organisations could continue to make unique use of their acquired IT resources. Figure 1 conceptualises the development of a dynamic IT-deployment environment.

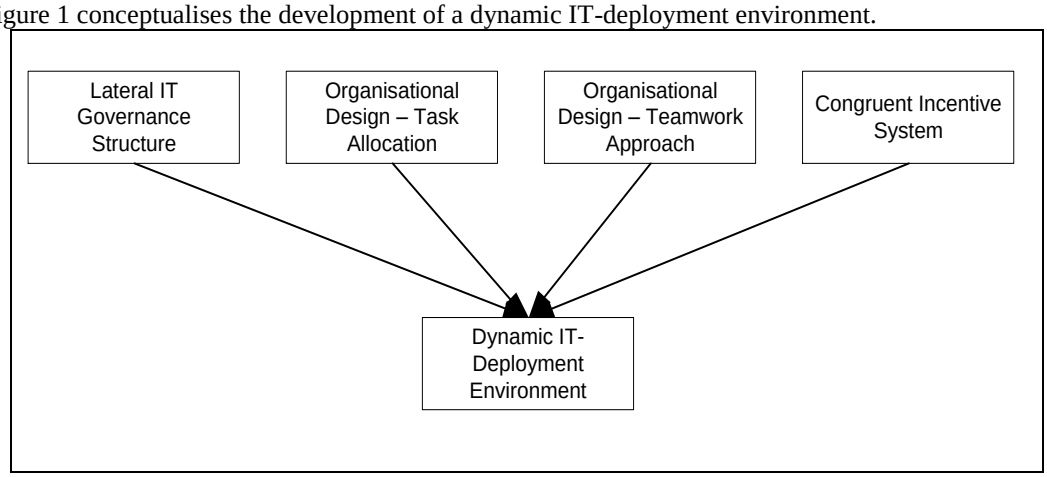

Figure 1. Conceptualisation of the IT-Deployment Platform

INSTRUMENT DEVELOPMENT APPROACH

The rest of this paper discusses our approach to developing and validating a set of measurement items for the components of the dynamic IT-deployment environment. Figure 2 describes the various stages of this process, which incorporates and extends the methodological procedures first described by Davies (1989) and Moore and Benbasat (1991). Davies (1989) and Moore and Benbasat (1991) present detailed descriptions on instrument validation, which include measurement item creation, measurement item identification, final measurement item selection and refinement using judges and experts, and a field test. This process of instrument development ensures that the measurement items are robust, yet general enough for application in various research environments.

Step 1: Item Creation

The dynamic capability perspective presents sound specifications on development of a higher-level dynamic capability of a dynamic IT-deployment environment. This study considers the perceptual measures of the organisational resources and factors that form the dynamic IT-deployment environment. As the first step, sets of potential measurement items for the constructs form a pool of candidate items. This process is necessary to ensure content validity (Moore and Benbasat, 1991). Examination of the business value and organisation studies literature, and consultation with industry partners and the academics led to the generation of a pool of candidate items. Ten items per construct can achieve reliability levels of at least 0.80 (Davis, 1989). Table 1 details the candidate measurement items, which are statements to which the respondents indicate their degree of agreement/disagreement on a Likert scale.

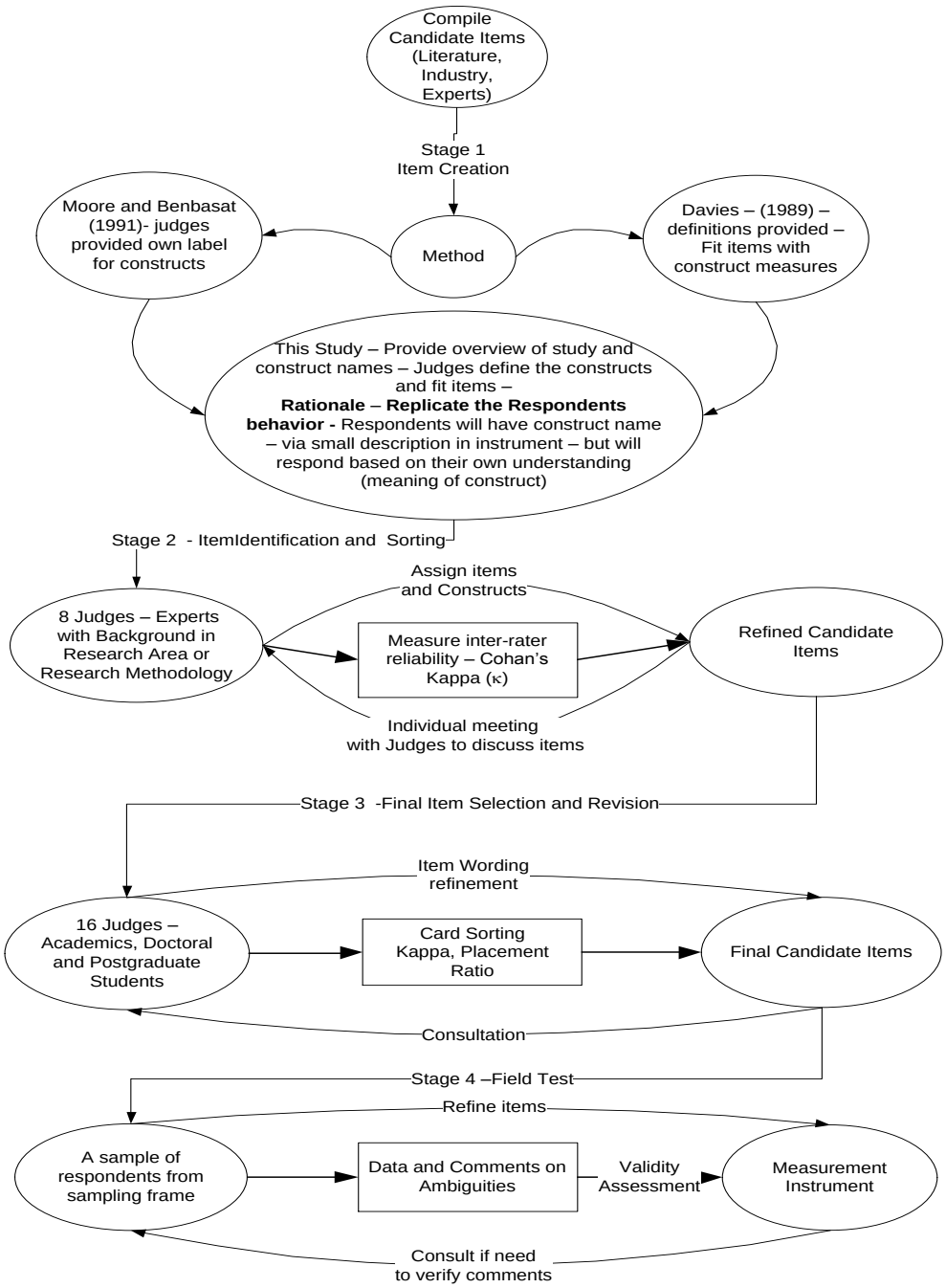

Figure 2. Instrument Development Stages

Lateral IT Governance Structure	
IG1	We have an IT governance structure that considers steering IT activities that are in line with the strategic direction of the organisation.
IG2	We have an IT governance structure that has greater control of the technology than IT specialists do.
IG3	We have an IT governance structure that makes resource allocation decisions in the areas of system development and/or recruitment for the IT function.
IG4	The IT steering committee increases visibility and/or for revamping of IT.
IG5	We have an IT governance structure that considers keeping and sustaining necessary reserved servers centrally.
IG6	We have an IT governance structure that considers IT coordinating requirements and practices.
IG7	We have an IT governance structure that solicits the support of top management for IT activities.
IG8	We have an IT governance structure that recognizes the contribution of operational-level managers.
IG9	We have an IT governance structure that relates well to other IT governance structures.
IG10	We have an IT governance structure that regularly evaluates its performance with the strategic objectives of the organisation
Organisational Design – Task Allocation	
OT1	The operational level management sets the pace of work.
OT2	The operational level management schedules production work.
OT3	The operational level management distributes this work among the workers.
OT4	The operational level management decides how to accomplish the tasks.
OT5	The operational level management deals with difficult situations in production.
OT6	The operational level management deals with customers in routine situations.
OT7	The operational level management deals with customers over problems or complaints.
OT8	The operational level management reschedules task.
OT9	The operational level management approves ad hoc tasks
OT10	The operational level management plans for future operations
Organisational Design – Teamwork Environment	
OE1	Our business units use self-managing teams effectively.
OE2	Our business units use employee involvement groups effectively.
OE4	Our business units use team building or group cohesion techniques effectively.
OE5	Our organisation promotes teamwork.
OE6	Our organisation promotes shared learning.
OE7	Our organisation holds regular team-building retreats.
OE8	Our organisation rotates work effectively
OE9	Our organisation holds regular social gatherings.
OE10	Our organisation promotes a consultative environment.
Congruent Reward System	
IC1	Our organisation has an equitable incentive based reward system.
IC2	Our organisation provides group incentives.
IC3	Our organisation has performance-based promotion.
IC4	Our organisation performs regular performance reviews.
IC5	Our organisation weights performance aspects effectively.
IC6	Our organisation conducts consultative performance reviews.
IC7	Our organisation conducts regular reviews of its incentive systems.
IC8	Our organisation promotes accelerated performance-based promotion.
IC9	Our organisation effectively links subordinate performances.
IC10	Our organisation adopts a consultative approach in determining incentives

Table 1. Construct Measurement Items

Stage 2: Item Identification and Sorting

The goal of this stage of measurement item development was to establish initial differences in content validity between the measurement items. Eight recognised IS academics (Judges) with expertise in organisation-related research assessed the correspondence between the pool of candidate items and the intended constructs. The judges performed this task using a validation document with candidate items (in no particular order) on the left side, and the constructs on the right side. This approach adopted a mix of steps from Davies (1989), and Moore and Benbasat (1991). Davies (1989) provided construct definitions and then asked the judges to rank the number of items in relation to their fit with construct definitions. The judges then sorted the items in the construct categories. Moore and Benbasat (1991) did not advise the judges of the underlying constructs. The judges provided their own labels for the constructs. In this study, we provided an overview of the study and the judges were to decide on the definition of the constructs in the relevant context of this study. The judges then related the measures to their defined constructs. This approach, while providing an initial set of categories (constructs), left it to the judges to assign a meaning to the construct and choose measures that best match the meaning. This approach depicts the situation that the potential respondents would encounter when completing the research instrument.

The conciseness of the research instrument means respondents have to rely on the brief descriptions to relate the measures to the context of the study. This stage of the instrument validation process depicts this environment. The judges placed tick(s) under the construct(s) to which they felt the measurement item best related. Interviews with the judges upon the evaluation of the validation document allowed them to discuss any potential conflicts and issues they had with the measures. The interviews were informal, aimed at obtaining detailed feedback on various aspects of the validation document. Table 2 presents the overall percentage correspondence between the measurement items and the constructs by the judges. Table 3 presents the percentage of correspondence between each item and the constructs. Each judge corresponded more than 70% of the items with the constructs. Judges individual item correspondence to constructs ranged from 25% to 100%.

Judge	Percentage Agreement
1	70.69%
2	87.93%
3	79.31%
4	79.31%
5	93.10%
6	81.03%
7	84.48%
8	86.21%

Table 2. Overall Percentage Correspondence by Judges

These generic percentage calculations do not provide much information on the nature of agreement between the judges on the relationship between the candidate measurement items and the constructs. Cohen's Kappa (κ) (Cohen, 1960) for each pair of judges estimates their inter-rater reliability. The Kappa is a more robust measure than simple percentage agreement calculations because it accounts for the agreement occurring by chance (Cohen, 1960). The Cohen's Kappa measures the agreement between two raters, who each classify N items (40 in this study) into C (4 in this study) mutually exclusive categories. Table 4 provides the kappa (κ) scores for the pairs of judges. The kappa scores indicate that the inter-rater reliability for all except one pair of judges are within the full agreement

range ($\kappa = 0.60 – 0.80$) or within the almost perfect agreement ($\kappa = 0.81 – 1.00$). The excepted pair has a kappa of 0.570 (moderate agreement). The judges' correspondence evaluation responses and the outcome of their interviews formed the basis for selecting (eliminating) candidate items for the constructs. We exercised special care to ensure the remaining pool of items was representative of the constructs.

Item	%	Item	%	Item	%	Item	%
1	100	11	87.5	21	75	31	100
2	100	12	100	22	100	32	100
3	50	13	100	23	100	33	62.5
4	62.5	14	75	24	87.5	34	62.5
5	87.5	15	75	25	87	35	37.5
6	37.5	16	87.5	26	25	36	100
7	100	17	87.5	27	62.5	37	87.5
8	100	18	100	28	87.5	38	25
9	87.50	19	100	29	87.5	39	25
10	75	20	87.5	30	87.5	40	37.5

Table 3. Percentage Matching by Item (in no particular order)

Judge (J)	J 1	J 2	J 3	J 4	J 5	J 6	J 7	J 8
J 1	1							
J 2	0.611*							
J 3	0.570*	0.725*						
J 4	0.707*	0.726*	0.764*					
J 5	0.672*	0.768*	0.768*	0.730*				
J 6	0.613*	0.768*	0.728*	0.670*	0.731*			
J 7	0.666*	0.762*	0.820*	0.821*	0.786*	0.746*		
J 8	0.629*	0.785*	0.744*	0.705*	0.768*	0.729*	0.801*	1

Table 4. Kappa (κ) for the Pair of Judges (* $p < 0.001$)

Stage 3: Final Item Selection and Revision

The purpose of this stage of the instrument development process was to revise the reduced set of candidate items to a final set of measurement items. Moore and Benbasat (1991) and Davies (1989) suggest an index-card sorting test as an appropriate procedure for this step. Sixteen judges, including academics, and doctoral and postgraduate students participated in this process. The judges had varying levels of understanding on IT business value research and organisation studies to depict the pool of potential respondents in a normal field survey environment. Each index card contained a candidate item, and the judges sorted these cards into categories. Consecutively, four groups of judges of four members each performed this sorting exercise, with two groups knowing the categories in which the items are to be sorted (Moore and Benbasat, 1991). This situation meant that in two rounds the judges independently made up categories for the items. The judges also provided a 'degree of fit' in the rounds with the categories provided. Item revisions at the end of each round ensured improved

reliability at the end to achieve an acceptable Kappa level of 0.70 (Straub, Rai and Klein, 2004). Table 5 presents Kappa scores of each round and placement ratio summary (Moore and Benbasat, 1991).

The results vary between the 'construct' and 'no construct' rounds. The Kappa in both groups improved from the first to the second round. A Kappa of 0.87 at the end of the fourth round indicated that the Judges achieved almost perfect agreement (Cohen, 1960). It is advisable to end the sorting process after reaching Kappa in this range (Straub, Boudreau and Gefen, 2004). Inspection and refinement of the measurement items at the end of each round resulted in better placement ratios and improvement in pairs of Judges' agreements. Table 6 presents the final list of measurement items for the constructs.

	Round 1 (No Construct)	Round 2 (Construct)	Round 3 (No Construct)	Round 4 (Construct)
Placement Ratio Outcome				
Lateral IT Governance Structure	80%	100%	89%	100%
Organisation Design – Task Allocation	55%	91%	63%	96%
Organisation Design – Teamwork	46%	80%	58%	88%
Congruent Reward Systems	59%	81%	68%	89%
Kappa Analysis				
Average Kappa between pairs of Judges	0.51	0.76	0.59	0.87

Table 5. Results of Index Card Sorting

The final stage of the instrument testing process involved the conduct of the field test. However, it was necessary to construct a sampling frame before the conduct of the field test. This process was necessary because a field test should involve a sample of potential respondents who would participate in future studies that may adopt these measures. This precaution will also indirectly ensure that the measurement constructs achieve wider applicability. We obtained details from the ORBIS database to develop an appropriate sampling frame. ORBIS is a global database, developed by Bureau van Dijk Electronic Publishing (BvDEP). We obtained the contact details of all Australian private and public companies. We considered the inter-company relationships to ensure that only a copy of the test instrument is send to the target contacts. The final list in the sampling frame consisted of 2493 potential respondents.

Stage 4: Field Test

Up until this stage, the instrument development process ensured selection of good candidate measurement items. The field test of the instrument ensures that the items measure what they intend to measure. The field test effectively seeks industry validation of the research instrument. Invitations were sent to 2493 contacts to participate in the field test. The sample for the field test included a diverse range of companies representing the major industries and sectors of economy. Data collection for the field test was through survey research. The field test used both mail and online surveys. For the online survey, we sent an email to the target contacts that contained a link to the survey URL. The administration of the field test was consistent with the guidelines suggested by Dillman (2007). The

administration process included initial delivery of the instrument package to potential respondents and two follow-ups. At the end of the final follow up, progressively, the field test survey secured two hundred and sixty eight (268) valid responses, giving a response rate of 10.75%.

We tested for the non-response bias with the first and the last thirty responses for all measures. The last thirty responses are a proxy for the non-respondents as their responses were received after one of two reminders. This test did not find any significant differences on any of the variables. We also tested for bias associated with mail and online responses and there were no significant differences. There were no issues of missing data.

Lateral IT Governance Structure (IT Steering Committee)	
ITG1	In our organisation, we have an IT governance structure that makes IT-related resource allocation decisions relating to system development and recruitment, and training.
ITG2	In our organisation, we have an IT governance structure that improves visibility of IT and revamps the IT practices.
ITG3	In our organisation, we have an IT governance structure that considers keeping and sustaining necessary reserved servers centrally.
ITG4	In our organisation, we have an IT governance structure that helps to facilitate the IT coordinating requirements and practices.
ITG5	In our organisation, we have an IT governance structure that solicits the support of top management for IT activities.
ITG6	In our organisation, we have an IT governance structure that recognizes the contribution of operational-level managers.
ITG7	In our organisation, we have an IT governance structure that relates well to other IT governance structures.
Organisation Design – Task Allocation	
OTM1	In our organisation, the operational level management sets the pace of work of their subordinates.
OTM2	In our organisation, the operational level management schedules work.
OTM3	In our organisation, the operational level management distributes work among the subordinates.
OTM4	In our organisation, the operational level management decides how to accomplish the tasks.
OTM5	In our organisation, the operational level management deals with difficult situations in production.
Organisation Design – Teamwork	
OTW1	In our organisation, the business units use self-managing teams effectively.
OTW2	In our organisation, the business units use employee involvement groups effectively.
OTW3	In our organisation, the business units use team-building or group cohesion techniques effectively.
Congruent Reward Systems	
CRS1	Our organisation has an equitable incentive based reward system.
CRS2	Our organisation provides group incentives.
CRS3	Our organisation has performance-based promotion.
CRS4	Our organisation performs regular performance reviews.
CRS5	Our organisation weights performance aspects effectively.

Table 6. Final IT-Deployment Platform Instrument

The first step of evaluating the measurement properties of field test data was to conduct an exploratory factor analysis (EFA). The EFA helps evaluate the initial construct validity and reliability. This evaluation provides some indication of the possible misinterpretations of the measurement items. The EFA examines the dimensions of the loading of the scale items to the measured constructs without imposing any clustering constraints or theoretical basis for clustering. The item correlations provide an initial indication of the association between the construct measurements. An evaluation of the correlations between the measurement items revealed that the correlations were mostly significant. This result meant the data satisfied prerequisites of the exploratory factor analysis. We used the statistical tool, SPSS to conduct the EFA. Table 7 (a) and (b) present the correlation matrix and the p-values of the measurement items.

Items	1	2	3	4
ITG1	0.89	0.14	0.02	0.03
ITG2	0.84	0.10	0.05	0.09
ITG3	0.83	0.05	0.05	0.04
ITG4	0.84	0.04	0.14	0.02
ITG5	0.87	0.02	0.15	0.13
ITG6	0.83	0.18	0.02	0.08
ITG7	0.94	0.08	0.25	0.04
OTM1	0.27	0.67	0.27	0.25
OTM2	0.14	0.87	0.29	0.02
OTM3	0.21	0.91	0.25	0.10
OTM4	0.07	0.86	0.37	0.07
OTM5	0.31	0.84	0.25	0.16
OTW1	0.28	0.39	0.67	0.17
OTW2	0.06	0.25	0.68	0.33
OTW3	0.02	0.32	0.77	0.30
CRS1	0.06	0.12	0.08	0.84
CRS2	0.22	0.06	0.04	0.91
CRS3	0.05	0.14	0.35	0.68
CRS4	0.22	0.22	0.02	0.90
CRS5	0.15	0.02	0.10	0.91

Table 8. EFA Results

	IG1	**IG2**	**IG3**	**IG4**	**IG4**	**IG6**	**IG7**	**OT1**	**OT2**	**OT3**	**OT4**	**OT5**	**OE1**	**OE2**	**OE3**	**IN1**	**IN2**	**IN3**	**IN4**
IG1	1.00																		
IG2	0.49	1.00																	
IG3	0.74	0.51	1.00																
IG4	0.78	0.50	0.76	1.00															
IG4	0.43	0.79	0.57	0.48	1.00														
IG6	0.80	0.52	0.68	0.61	0.48	1.00													
IG7	0.93	0.35	0.71	0.80	0.30	0.80	1.00												
OT1	0.20	0.01	0.24	0.28	0.09	0.07	0.26	1.00											
OT2	0.17	0.03	0.13	0.02	0.12	0.28	0.19	0.54	1.00										
OT3	0.35	0.26	0.26	0.18	0.04	0.27	0.24	0.42	0.80	1.00									
OT4	0.09	0.32	0.01	0.02	0.08	0.14	0.01	0.56	0.75	0.82	1.00								
OT5	0.39	0.17	0.26	0.27	0.09	0.35	0.36	0.49	0.67	0.82	0.61	1.00							
OE1	0.40	0.10	0.20	0.23	0.00	0.32	0.39	0.13	0.30	0.46	0.31	0.49	1.00						
OD2	0.05	0.09	0.21	0.01	0.19	0.04	0.03	0.48	0.33	0.42	0.26	0.51	0.28	1.00					
OD3	0.19	0.12	0.04	0.07	0.07	0.17	0.15	0.40	0.36	0.47	0.39	0.57	0.56	0.51	1.00				
IN1	0.09	0.09	0.13	0.03	0.05	0.01	0.01	0.22	0.08	0.18	0.05	0.02	0.22	0.20	0.30	1.00			
IN2	0.11	0.23	0.24	0.16	0.21	0.28	0.18	0.24	0.09	0.03	0.01	0.27	0.13	0.47	0.18	0.69	1.00		
IN3	0.23	0.30	0.15	0.06	0.24	0.21	0.17	0.32	0.08	0.07	0.14	0.19	0.14	0.50	0.32	0.39	0.56	1.00	
IN4	0.42	0.10	0.12	0.33	0.10	0.13	0.42	0.28	0.26	0.10	0.19	0.05	0.27	0.13	0.35	0.12	0.08	0.27	1.00
IN5	0.38	0.11	0.12	0.28	0.12	0.16	0.37	0.08	0.08	0.06	0.01	0.05	0.32	0.19	0.44	0.01	0.05	0.31	0.89

Note:IG1 to IG7 are 7 measures of IT Governance Structure, OT1 to OT5 are 5 measures of Organisational Design – Task Allocation, OE1 to OE3 are 3 measures of Organisational Design – Teamwork Environment, IN1 to IN5 are 5 measures of Congruent Reward System

Table 7(a). Correlation Matrix of Measurement Items

	IT-Deployment Environment Resources																		
	IG1	IG2	IG3	IG4	IG4	IG6	IG7	OT1	OT2	OT3	OT4	OT5	OE1	OE2	OE3	IN1	IN2	IN3	IN4
IG1	**																		
IG2	**	**																	
IG3	**	**	**																
IG4	**	**	**	**															
IG4	*	**	**	**	**														
IG6	**	**	**	**	**	**													
IG7	**	*	**	**	*	**	**												
OT1			*	*			*	**											
OT2						*		**	**										
OT3	*	*	*			*	*	*	**	**									
OT4		*						**	**	**	**								
OT5	*		*	*		*	*	**	**	**	**	**							
OE1	*					*	*		*	**	*	**	**						
OD2								**	*	*	*	**	*	**					
OD3								*	*	**	*	**	**	**	**				
IN1															*	**			
IN2			*			*		*				*		**		**	**		
IN3		*			*			*						**	*	*	**	**	
IN4	*			*			*	*	*				*		*			*	**
IN5	*			*			*						*		**			*	**

Note:IG1 to IG7 are 7 measures of IT Governance Structure, OT1 to OT5 are 5 measures of Organisational Design – Task, OE1 to OE3 are 3 measures of Organisational Design – Environment, IN1 to IN5 are 5 measures of Reward Systems *p< 0.05, **p<0.01

Table 7(b). P-Values of Item Correlation

Cronbach's alpha greater than or equal to 0.70 suggests the items are uni-dimensional (Hair, Anderson, Tatham and Black, 2008). Reliability refers to the internal consistency of a measurement instrument (Hair et al., 2008). Cronbach's alpha is the common measure for internal consistency and should be higher than 0.80 (Hulland, 1999). The test of composite reliability (CR) determines the proportion of measure variance attributable to the underlying trait (Hulland, 1999). Reliable scales have CR that is greater than 0.50 (Hair et al., 2008; Hulland, 1999). The test of convergent validity measures that constructs that theoretically should be related to each other are, in fact, observed to be related to each other (Campbell and Fiske, 1959; Hair et al., 2008). Indicator factor loadings above 0.60, construct composite reliabilities above 0.80, average variance extracted (AVE) above 0.50 ensures convergent validity (Hulland, 1999).

Table 9 provides factor loadings and their significance measured using the t-values. The item loading in this confirmatory approach is largely above the strict rule of thumb of 0.70 (Nunnally, 1978). Table 10 provides the quality measures for the constructs. All constructs have Cronbach's alpha above 0.70, and AVE above 0.50. The composite reliability for all constructs is above 0.80. Comparison of the square root of AVE and inter-construct correlations showed that the square root of AVE for each construct was higher than their inter-construct correlations. Table 11 presents this comparison. The values in bold in Table 11 is the square root of AVE of the construct. This outcome ensured the discriminant validity of the field test data.

Construct to Item	Loading	Standard Deviation	Standard Error	T-Stat
ITG1 ← ITG	0.89	0.04	0.04	20.12
ITG2 ← ITG	0.71	0.10	0.10	7.47
ITG3 ← ITG	0.84	0.05	0.05	16.47
ITG4 ← ITG	0.89	0.05	0.05	16.93
ITG5 ← ITG	0.73	0.07	0.07	10.06
ITG6 ← ITG	0.91	0.04	0.04	24.23
ITG7 ← ITG	0.90	0.04	0.04	22.00
OTM1 ← OTM	0.75	0.26	0.26	3.72
OTM2 ← OTM	0.71	0.35	0.35	3.46
OTM3 ← OTM	0.72	0.35	0.35	3.05
OTM4 ← OTM	0.82	0.39	0.39	2.09
OTM5 ← OTM	0.71	0.29	0.29	2.60
OTW1 ← OTW	0.72	0.21	0.21	3.41
OTW2 ← OTW	0.77	0.24	0.24	3.16
OTW3 ← OTW	0.78	0.27	0.27	4.94
CRS1 ← CRS	0.72	0.13	0.13	4.68
CRS2 ← CRS	0.73	0.15	0.15	4.72
CRS3 ← CRS	0.78	0.07	0.07	11.13
CRS4 ← CRS	0.86	0.06	0.06	13.36
CRS5 ← CRS	0.83	0.08	0.08	10.99

Table 9. Factor Loadings and Significance

Constructs	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha (CA)
Lateral IT Governance Structure	0.71	0.94	0.93
Organisation Design – Task Allocation	0.58	0.87	0.80
Organisation Design-Teamwork Environment	0.54	0.89	0.82
Congruent Reward Systems	0.72	0.93	0.90

Table 10. Quality Measures of Constructs

	ITG	OTM	OEW	CRS
Lateral IT Governance Structure	**0.84**			
Organisational Design – Task Allocation	0.46	**0.76**		
Organisational Design-Teamwork Environment	0.38	0.46	**0.73**	
Congruent Incentive Systems	0.49	0.55	0.58	**0.85**

Table 11. Square Root of AVE and Inter-Construct Correlations

DISCUSSION

Organisations need to consider continually ways to leverage their IT resources. IT resources play a significant role in enabling various transformations in organisations' business processes (Tallon, 2007; Tallon, 2010). That is, IT resources are seen as one of the key tools necessary to achieve competitive advantage. For these reasons, organisations continually adopt modern IT resources. However the strategic necessity hypothesis (Powell and Dent-Micallef, 1997) tells us that IT resources, *per se,* do not provide unique value to organisations. Rather, organisations' IT-related capabilities may uniquely leverage the IT resources, and this leveraging becomes a source of their competitive advantage. This situation means more attention is needed to research relating to identifying, developing, and sustaining organisations IT-related capabilities.

Organisations' initiatives of competence development needs to be unique (Grant, 2008; Teece, 2007) because competencies should be unique to organisations and they should not be easily imitated, substituted, or appropriated (Mata et al., 1995; Wade and Hulland, 2004). To achieve this situation, organisations need to develop unique environments on which to develop these IT-related competencies. While the elements of a unique environment may be known to other organisations, an organisation's ability to fit the elements together, and find a unique level of synergy between them would make their environment unique.

In this study, we describe an environment – a dynamic IT-deployment environment, which is a product of synergy between four common resources. These common resources relate to a decentralised organisational design relating to task allocation, a decentralised organisational design relating to promotion of teamwork, a congruent incentive system, and a lateral IT governance structure. We shared that these elements and resources have a level of synergy between each other, and understanding this synergy between the elements and resources results in the development of a dynamic IT-deployment environment. The essence of these environments is that they provide the necessary understanding and knowledge to the authorities, whose timing of decisions relating to the

IT resources determine their IT-related capabilities. Recall, IT-related capabilities relate to the management understanding of the fit and value of IT to their organisations (Ray, Muhamma and Barney, 2005; Wade and Hulland, 2004), which also determine the nature of organisations' IT infrastructures (Broadbent and Weill, 1997; Melville et al., 2004; Ray et al., 2005). A dynamic IT-deployment environment is the necessary catalyst that embeds this understanding of the value of IT resources to organisations' decision-makers. We demonstrate how IT-related knowledge transfer is continually facilitated in this dynamic environment.

An important element in progressing empirical research relates to developing and validating measures for suggested constructs. This exercise provides researchers with the necessary tools to develop further understanding of issues by adopting and leveraging this new knowledge. We adopted a mature and robust set of procedures to develop reliable measures of the elements and resources of our suggested dynamic IT-deployment environment.

RESEARCH CONTRIBUTIONS

The theorising and development of a higher-level dynamic environment, and the measurement item development exercise outlined in this paper offers several contributions. First, this study reports a rigorous process of creating and validating measurement items for an organisational environment, the dynamic IT-deployment environment, with which organisations could develop new and sustain existing IT-related capabilities. This effort is important in understanding how organisations can continue to be competent with the use of their invested IT resources. The discussed procedures ensured high level of confidence in developing content validity, and establishing construct validity and reliability of the measurement items. The EFA and CFA showed that the suggested measurement items are reliable and purport to measure what they are supposed to measure. Future research could adopt this design to ensure strong reliability and validity in their empirical studies. This effort will be especially important in studies that may consider other forms of related resource interactions that result in other higher-level dynamic environments.

Second, future research could employ the measurement items developed in this study in various settings to investigate how organisations could be competent in developing new, and sustain their existing IT-related capabilities. Extant research (for example, Mata et al., 1995; Melville et al., 2004; Wade and Hulland, 2004) suggests various IT-related capabilities and marginal IT-related capabilities. Marginal IT-related capabilities possess some unique competences, but these competencies are not significant to provide competitive advantage. Organisations could differentiate themselves if they could transform marginal IT-related capabilities to new IT-related capabilities. Much of this competence development is best undertaken internally, as internally, organisations have the unrestrictive freedom to manage their own various resources (Coase, 1937). Organisations need to question their existing resource organisation, and understand how reorganisation of these resources could provide them with necessary competencies to improve their business processes. Middle management capability of shared organisational knowledge, and top management capability of top management commitment towards IT-related initiatives drive the adoption, and use, of IT resources in organisations (Ray et al., 2005). The suggested dynamic IT-deployment environment is an ideal vehicle to re-examine these IT-related capabilities to determine ways to renew or expand their commitment towards organisational IT requirements.

Research can also consider how the suggested dynamic IT-deployment environment develops a flexible IT infrastructure. This effort is important because a flexible IT infrastructure can recognise opportunities better, and embed them into organisations' information systems. Sustainable IT-related capabilities can also influence how firms invest in emerging communication and collaborative tools.

Web 2.0 tools present enormous opportunities to businesses to improve their communication and collaboration. The extent of organisations penetration into these technologies will be contingent upon management knowledge of the benefit of these technologies. Research can examine how dynamic capabilities can develop this understanding, and help organisations in utilising these assets to improve their business value.

Third, this paper informs on the need for well-developed and validated measurement instruments in IS research. This effort is especially important as it contributes quantitative empirical credibility to IS research, and strengthens the IS field. This paper suggests some insights to those intending to conduct similar evaluations to strengthen their empirical investigations.

LIMITATIONS

This research has some limitations. First, we achieved a response rate of 10.75 percent on our pilot study. While this rate of response is considered appropriate (Jeffers et al., 2008), this could present some bias in the outcomes of the analysis of this data. However, we received 268 responses, which was adequate to conduct the required tests to determine the measurement properties of pilot test data. Second, despite rigorous attempts to validate the perceptive measures, and careful administration of the survey instrument, perceptions are susceptible to bias and error. But, we envisage our efforts have minimised these errors and biases.

CONCLUSION

The instrument development effort discussed in this paper attempts to improve organisations' competencies with the use of their IT resources. This effort will help addresses the important aspect of ways to develop new, and sustain organisations' IT-related capabilities. Further, this study sets the foundation to consider other combinations of resources that could create dynamic IT-deployment environments. Organisations could have other resources in their bundle of resources whose synergy could create other higher-level environments. The theoretical frameworks suggested in this study can help in suggesting these environments, and our discussed approach can help in developing and validating measurement items of the elements of such environments. Our effort contributes to moving this aspect of IS research forward. We envisage this research effort improves our understanding on how organisations could become smarter in the use of their IT resources.

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