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Measuring IT core capabilities for electronic commerce

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This paper reports on the theoretical development and empirical validation of a measurement instrument for three information technology (IT) core capabilities in an electronic commerce context. The instrument is based on the work of Feeny and Willcocks (1998) and includes the capabilities 'information systems (IS)/IT governance', 'business system thinking' and 'relationship building'. It was validated using a sample consisting of 179 respondents, all of whom were IT managers or chief information officers. The results demonstrate that the constructs are reliable (α coefficients > 0.8) and valid. A confirmatory factor analysis on the data set yielded a moderately acceptable model fit. The model also demonstrated highly significant factor loadings ($p < 0.001$). The paper shows that a respecification of a competing model in which IS/IT governance is split into 'business IT strategic thinking' and 'IT management' provides better measures of fit. The paper concludes that the core capabilities of IT departments are useful constructs for incorporating into future research. They are successfully able to predict behaviours that have relatively little overlap. Recommended further research includes the relationship between capabilities and governance structures as well as further investigation into how IT core capabilities are formed and strengthened in organizations.

Introduction

It has frequently been argued that, to be successful in information systems (IS) development and implementation, the relationship of the information technology (IT) department with the rest of the business is of critical importance. Indeed, IS researchers have focused on numerous facets of this relationship, including the executive relationship with general management (Feeny *et al.*, 1992), alignment with business strategy (Reich and Benbasat, 1996), the IT governance structure to be used (Sambamurthy and Zmud, 2000) and the involvement of users in system development efforts (Ives and Olson, 1984).

When IT departments move beyond purely internal applications and incorporate electronic commerce (e-commerce) in their service portfolio the relationship between business and IT becomes an even more important issue. Indeed, the deployment of e-commerce systems requires the involvement of almost every functional part of the organization (Turban *et al.*, 2000). Cooperation with the marketing department is necessary for developing the commercial features of the front end, cooperation with the operations department is required for helping fulfil incoming electronic orders and cooperation with the accounting department is necessary for complying with accounting standards for e-commerce. Effective cooperation with these and other functional units is required in order to achieve working e-commerce solutions. Because of all this, Earl (2000) observed that the complexity and status of the chief information officer's (CIO) job have risen with the advent of e-commerce.

A promising approach in conceptualizing the relationship between IT departments and the business environment is based on the core capability view of the firm (Penrose, 1959; Amit and Schoemaker, 1993; Teece *et al.*, 1997). In line with this perspective, Feeny and Willcocks (1998a) operationalized three core capabilities that deal specifically with the IT–business relationship. However, no measurement instrument has yet been developed for these capabilities and, consequently, their application in empirical work and the advancement of theory is hindered.

This paper extends the work of Feeny and Willcocks (1998a) by developing measurement instruments for these three capabilities in an e-commerce context. Specifically, the objectives of the research reported in this paper were threefold. The research aimed (1) to develop an instrument for measuring three core capabilities for e-commerce, (2) to assess the psychometric features of these measures empirically and (3) to suggest ways in which the instrument can be used in the future.

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The outline of this paper is as follows. The next section discusses the theoretical antecedents of this study and the conceptual framework, the following section describes the research design and the subsequent section presents the results and implications for both research and practice. The paper ends with a number of conclusions and recommendations.

Theoretical antecedents

The core capability perspective on organizations, which is also associated with the competencies perspective or the resource-based view of the firm (Penrose, 1959), is a relatively established approach in the field of strategic management. From the core capabilities point of view, organizations build a number of core capabilities with which future environmental challenges are to be met (Prahalad and Hamel, 1990; Hamel and Prahalad, 1994). These capabilities include organization-specific routines, processes, skills and resources. They need to be built through learning processes and cannot be readily bought. In the short term, they are not imitable in other settings and replicable by competitors (Amit and Schoemaker, 1993). Through this property, capabilities enable a firm to achieve sustainable competitive advantage in the market (Teece *et al.*, 1997).

The core capabilities perspective has been very influential in the field of strategic management, although it has been subject to criticism. Williamson (1991, 1999) mentioned the obscure and tautological definition of a core capability (i.e. 'a capability which is core') and the lack of sufficient operationalization of the concept. In order to overcome these limitations, more research is needed in order to further the measurement and operationalization of capabilities.

There has been IS research carried out within the capabilities perspective that has been both conceptual (Clemons, 1991; Feeny and Willcocks, 1998a) and empirical (Bharadwaj *et al.*, 1999; Bharadwaj, 2000). The present paper builds further on the work of Feeny and Willcocks (1998, 1999). Based on a body of empirical evidence (Feeny *et al.*, 1992), they developed a view of the IS function as a set of core capabilities. In their framework the IS function faces challenges in the environments of 'business', 'technology', 'service' and 'governance'. Nine distinct core capabilities are needed in order to deal with the challenges in these environments. These are depicted in Table 1.

Three of these capabilities cover the relationship of the IT department with the rest of the business. 'IS/IT governance' refers to the executive relationship between IT management and business management. 'Business system thinking' is concerned with the business knowledge and understanding of the IT department. 'Relationship building' refers to the relationships between business employees and IT employees.

Feeny and Willcocks (1998b) attached a short list of behaviours to each of the capabilities. The measurement instrument used here is based on the perceived occurrence of these behaviours. In other words, it is proposed to measure a capability by asking respondents to what extent the IT department performs the three to four behaviours that are associated with the capability. A strong manifestation of the capability implies substantial occurrence of each of these behaviours.

The behaviours associated with the capabilities will now be discussed in more detail.

IS/IT governance

IS/IT governance is 'the capability to integrate IS/IT effort with business purpose and activity' (Feeny and Willcocks, 1998b). The ability to deal with interdependencies that arise between the business and the IS function falls into this category. Being a management capability, it is typically developed between the IT manager or CIO and the general manager or chief executive officer (CEO) (Jarvenpaa

Table 1 Nine core capabilities of the IS function (Feeny and Willcocks, 1998b)

	Core capability	Description
1	IS/IT governance	Integrating IS/IT effort with business purpose and activity
2	Business systems thinking	Envisioning the business process which technology makes possible
3	Relationship building	Getting the business constructively engaged in IS/IT issues
4	Designing technical architecture	Creating the coherent blueprint for a technical platform which responds to present and future business needs
5	Making technology work	Rapidly achieving technical progress – by one means or another
6	Informed buying	Managing the IS/IT sourcing strategy which meets the interests of the business
7	Contract facilitation	Ensuring the success of existing contracts for IS/IT services
8	Contract monitoring	Protecting the business' contractual position, current and future
9	Vendor development	Identifying the potential value of IS/IT service suppliers

and Ives, 1991; Feeny *et al.*, 1992), but also between the CIO and the management of the other business departments.

Four behaviours reflect this capability (Feeny and Willcocks, 1998b). The first indicator refers to the quality of the executive relationship (indicator 1.1) between the CIO and the other executives. High-performance CIOs build and develop good quality relationships with their peer executives in the firm.

Another behaviour associated with this capability is the ability to arrive at shared objectives (indicator 1.2) and visions. Shared objectives involves the alignment between business objectives and IT objectives. The alignment can be intellectual, social or both (Reich and Benbasat, 1996). The intellectual dimension refers to the factual similarity between IT plans and business plans. The social dimension refers to whether IS and business executives understand each other's objectives and plans.

Fostering an appropriate culture (indicator 1.3) in the IT department is a third behaviour associated with IS/IT governance. As Ward and Peppard (1996) observed, there is often a cultural gap between IT departments and business departments. This gap is often fostered by 'hard' elements (power and control structures), but also by the rituals, routines, stories and myths and symbols that set the IT department apart from the other departments. Therefore, strong IS/IT governance capabilities are associated with cultural alignment between IT and business departments.

Feeny and Willcocks (1998b) also associated the behaviour of incorporating best practices (factor 1.4) in management with this capability. Best practices, which is a broad term originating from the total quality management movement (Camp, 1995), is usually defined as the acquisition and implementation of (management) processes with superior performance on a continuous basis. Thus, the search for continuous improvement of processes is associated with strong IS/IT governance capability.

Business systems thinking

Business systems thinking is the capability 'to envision the business processes which technology makes possible'(Feeny and Willcocks, 1998b). This capability refers to the degree to which the IT department is able to identify itself with the business processes that it is serving. Four behaviours are said to be associated with this capability: involvement in business strategy, occupation with IT implications on processes, new processes made possible by IT and an eye for dependencies.

The first indicator influenced by this capability is the degree to which the IT department is involved in the formulation of business strategy (indicator 2.1). Although intended strategies are not realized strategies (Mintzberg, 1994; see also Chan *et al.*, 1997), the degree of involvement in the process of business strategy formulation is clearly a sign of participation in the general orientation of the business.

At a more operational level, business systems thinking is exposed by a clear interest by the IT department in the relationship between IT and the business processes. It is useful to distinguish between the capabilities of IT in improving existing processes (indicator 2.2) and the new processes (indicator 2.3) made possible by IT (Davenport and Short, 1990; Davenport, 1993). IT departments demonstrate their business systems thinking capabilities by proactively occupying themselves with these themes and, when necessary, acting upon the insights at which they arrive.

Finally, IT departments that endorse business systems thinking monitor the dependencies (indicator 2.4) that arise through business use of IT. For example, one department may be ignorant of useful data which is captured in an IS by another department. An IT department may be in the best position to signal and reveal such dependencies.

Building relationships

Relationship building is the capability concerned with 'getting the business constructively engaged in IS/IT issues' (Feeny and Willcocks, 1998b). This capability refers to the degree to which the IT department is capable of sustaining effective working relationships with business employees. The possession of strong capabilities in this area affects the user's understanding of IT potential, the effectiveness of the cooperation and the establishment of business ownership for all IT projects.

A first indicator that is affected by strong relationship-building capabilities is the degree to which users obtain an understanding (indicator 3.1) of the potential of IT. Possession and use of communicative skills to a large degree determine the extent to which this understanding can be achieved.

The building-relationships capability also influences the cooperation (indicator 3.2) of the IT department with the rest of the business in specific projects or task forces, for example in the context of software development projects. There is empirical evidence that group processes within teams are significant predictors for team performance in requirement determination (Guinan *et al.*, 1998). Promoting user involvement by introducing business people to the software development team is an effective strategy and a sign of strong relationship-building capabilities.

A third and final indicator associated with strong relationship-building capabilities refers to the degree to which the business takes ownership (indicator 3.3) of the projects that the IT department executes. Ownership is typically facilitated when (1) there are clear benefits of the IT projects for users and (2) when these benefits can be clearly communicated to them. For this reason, we expect degree of ownership to be affected by strong relationship-building capabilities.

Research design

Method

Survey research followed by confirmatory factor analysis (CFA) was adopted for addressing the behaviours developed in the previous sections. In such an approach, the three capabilities are modelled as latent constructs and the behaviours that are affected by these capabilities are the manifest measures of the latent constructs (Bollen, 1989).

The 11 behaviours discussed above were translated into statements with which the respondent could wholly agree or wholly disagree on a five-point Likert scale. Each statement was then adapted to an e-commerce context. At the end of the survey, questions were asked about the organizational position of the respondent, the size of their IT department in terms of headcount and the sector their business was operating in. The resulting questionnaire is included as Appendix 1 at the end of this paper.

In this research project, the author cooperated with a commercial company in The Netherlands that had developed and maintained an on-line survey engine. The questionnaire was programmed by using this tool and subsequently published on the Internet. The tool uses a cookie-based approach in order to prohibit the submission of multiple answers from the same client machine. The tool was developed in such a way that the respondents could view the aggregated results of the survey immediately after submitting their answers. This incentive was communicated in the introductory paragraphs of the questionnaire. No other incentives for participation were included.

In order to obtain an adequate sample size for the study the author cooperated with the commercial survey company as well as the local (Dutch) branch of an international IT magazine. Both companies maintained on-line communities. The first on-line community consisted of 600 Dutch IS executives. The second community consisted of the on-line subscribers to the Dutch version of the IT magazine. This community consisted of approximately 10 000 subscribers. Both communities were invited to participate in the research through e-mail messages. A link that pointed to the Internet page where the on-line survey was located was embedded in the e-mail. Although technically possible, the e-mail was not personalized (for example 'Dear Mrs Smith of Company X') so as to keep in spirit with the anonymity of the research.

Results

The study remained on-line from 10 April to 7 May 2000. In total, 472 individuals from the communities responded to the survey. Sixty per cent of this group responded in the first 2 days and 95% of the respondents responded in the first 10 days. Reminder e-mails were not sent because the project partners believed this would have compromised their commercial interests.

All respondents with missing values were deleted using list-wise deletion, resulting in a data set of 420 responses. One hundred and seventy-nine of the respondents in this set classified themselves as IT managers or CIOs. In addition, there were 47 general managers, 18 financial managers, 15 marketing managers and 66 consultants. We decided that only CIOs would be sufficiently qualified for judging their relationship with the rest of the business. Therefore, only the CIO sample of the 179 respondents was used for the analysis. Figures 1 and 2 provide details of the respondents and show the sizes of their IT departments and the sectors in which they worked, respectively.

Data analysis

In order to examine whether the capabilities discussed above could be meaningfully measured using this 'behavioural self-diagnosis' approach, a number of statistical tests were carried out. In particular, the reliability and validity of the measurement instrument were examined.

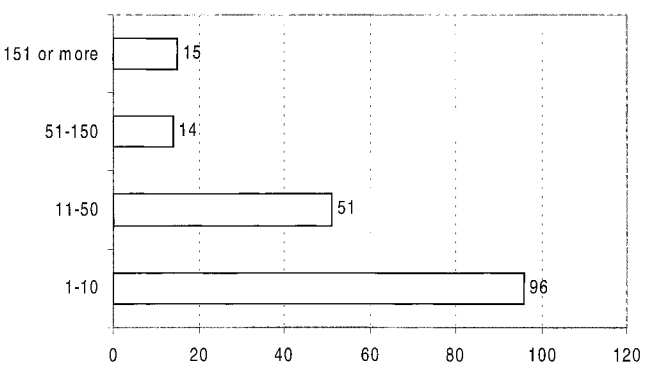

Figure 1 Number of employees in IT department (n = 179) (three missing)

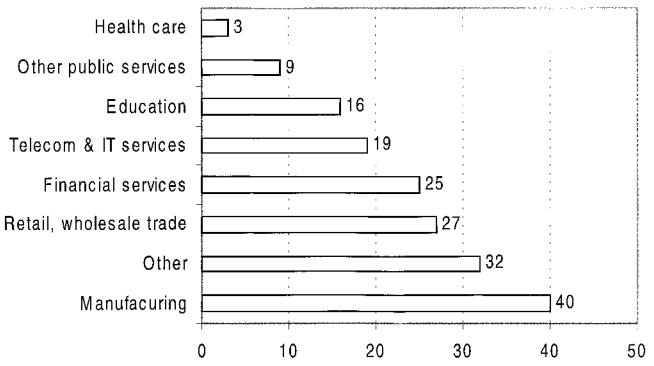

Figure 2 Sector of respondent's business (n = 179) (eight missing)

Reliability can be defined as the extent to which a set of indicators measure an aggregate concept consistently (Hair *et al.*, 1998). In this case, the behavioural assessments (the indicators) needed to be consistent with the composite assessment of the capability (the aggregate concept). In general, the more reliable the indicators, the lower the likelihood that the instrument will suffer from errors in measurement.

Cronbach's α is commonly used as a measure for assessing the reliability of composite constructs (Nunally, 1967). IS/IT governance had α = 0.81, business thinking had α = 0.80 and relationship building had α = 0.83. These values were acceptable given the threshold values of 0.60 for exploratory research and 0.80 for confirmatory research (Hair *et al.*, 1998). The implication is that the capabilities are reliably measured with the behaviours put together by Feeny and Willcocks (1998b). Considering the fact that these items have little overlap and that Cronbach's αs tend to be higher when the overlap between items is larger, these high reliability scores were quite impressive.

Validity can be defined as the extent to which a set of indicators measure an aggregate concept accurately (Hair *et al.*, 1998). There are many ways of assessing validity (for an overview see Bollen, 1989). A CFA is typically employed for examining whether each indicator actually measures the construct it is set up to measure. A CFA with maximum likelihood estimation using Amos 4.01 was performed (Arbuckle and Wothke, 1999). For replication purposes, the covariance matrix of the indicators is added as Appendix 2 at the end of this paper.

The process of setting up a CFA basically involves (1) specification of a hypothesized model and (2) examination of measures of fit, i.e. measures that confirm whether this model is confirmed by the underlying data. The better the measures of fit, the more accurate the data in relation to the proposed theory.

Figure 3 shows the specifications of the proposed model and the resulting factor loadings. All of them are highly significant at $p < 0.001$.

Because there are multiple measures of fit available in the literature, a number of those that are generally accepted were examined. Table 2 presents their values as well as their recommended values (Hair *et al.*, 1998).

The χ^2-test was highly significant at $p < 0.001$. However, χ^2-tests are sample size dependent and favour complex models over simpler ones (Long, 1983; Hair *et al.*, 1998). When adjusted for degrees of freedom, these and other measures of fit are acceptable. The exception is the root mean square error of approximation, the lower bound 90% confidence interval of which is just above the threshold level of 0.08 (Browne and Cudeck, 1993). For these reasons, it was concluded with some reservation that the original model was a valid representation of the data.

Do the self-diagnosed behaviours reflect one big IT capacity or three distinct ones? This question can be addressed by a discriminant validity test. In order to

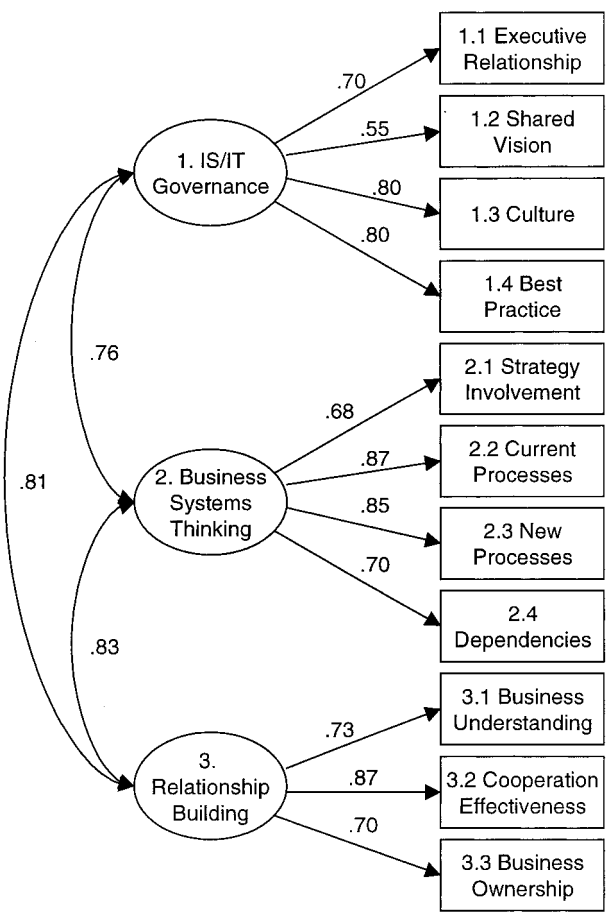

Figure 3 Standardized coefficients for the original model. Latent constructs are shown in rectangles. All coefficients are significant at $p < 0.001$

Table 2 Fit statistics and recommended values for original model

Fit statistics	Recommended values (Hair *et al.*, 1998)	Value
χ^2 (d.f.)	Non-significant	114.14 (41)***
χ^2/d.f.	Between 1 and 0.66	2.87
GFI	Close to 1	0.89
AGFI	>0.80	0.83
RMSEA	<0.08	0.10 (±0.02)
NFI	>0.90	0.90
Tucker-Lewis index (or NNFI)	>0.90	0.91

GFI, goodness-of-fit index; AGFI, adjusted goodness-of-fit index; RMSEA, root mean square error of approximation; NFI, normed fit index; NNFI, non-normed fit index. ***$p < 0.001$.

test for the discriminant validity of the three capabilities, the χ^2-difference test was used. This test compares the χ^2-statistic of the original CFA model to a model in which the latent constructs are perfectly correlated (e.g. set to a fixed value of 1.0). The perfectly correlated model, which reflects the fact that there are no distinct capabilities but instead one single capability, yielded a χ^2-value of 131.85 (d.f. = 44). The difference between the statistics (17.71) exceeded the critical χ^2-value of 7.82 (d.f. = 3 and $p = 0.05$). Thus, the perfectly correlated model was rejected when compared to the original model and this suggests discriminant validity of the three capabilities.

Respecifications of competing models

Because there was the possibility that the original model was a misspecification, two competing models were specified for representing the data and their psychometric properties examined. The models are discussed below.

Model 2

It could be argued that IS/IT governance is a capability that reflects IT performance at the managerial level, while business systems thinking and relationship building reflect IT performance at the operational level. In other words, the first capability is developed by the management of an IT department, whereas the other two are developed by the IT department as a whole. Following this line of argument, behaviour 2.1 (strategy involvement) is misplaced in the original model because it is a management activity, not an operational one. It is defensible to argue that only the IT management is closely involved in the formulation of the organizational strategy. Therefore, a competing model is suggested that moves behaviour 2.1 to capability 1.

Model 3

It could also be argued that IS/IT governance is concerned with both outward managerial skills (building executive relationships, shared objectives and strategy involvement) and inward management skills (developing culture and processes). In a similar fashion, Bharadwaj *et al.* (1999) identified the capabilities 'business IT strategic thinking' and 'IT management'. (Bharadwaj *et al.* (1999) identified five dimensions of IT capability: 'IT business partnerships' is roughly similar to relationship building, 'IT business process integration' is similar to business systems thinking, business IT strategic thinking and IT management would constitute IS/IT governance and, finally, 'IT infrastructure' would be in the technical domain and 'external IT linkages' in the service domain.) In order to test the argument that IS/IT governance reflected two capabilities, a third model that distinguished between business IT strategic thinking and IT management was specified. The former included behaviours 1.1, 1.2 and 2.1 and the latter included behaviours 1.3 and 1.4.

Table 3 provides the measures of fit for the three competing models.

Clearly, model 2 does not fit the data better. Compared to the original model, model 2 performs slightly worse on the overall fit indexes. Model 3, on the other hand, performs much better than the original model. The χ^2-statistics are more acceptable. Furthermore, the goodness-of-fit index and adjusted goodness-of-fit index rise to more acceptable levels. Finally, the root mean square error of approximation point estimate decreases to the more acceptable level of 0.07, i.e. below the generally established tolerance level of 0.08. These results support the argument that the IS/IT governance capability is in fact an aggregation of two capabilities.

Table 3 Goodness-of-fit indicators of three models for measuring IT capabilities ($n = 179$)

Model	d.f.	χ^2	χ^2/d.f.	GFI	AGFI	RMSEA	NFI	NNFI
Original model	41	114.14***	2.78	0.89	0.83	0.10	0.90	0.91
Model 2	41	116.45***	2.84	0.89	0.82	0.10	0.90	0.90
Model 3	38	71.92**	1.89	0.94	0.89	0.07	0.94	0.95

GFI, goodness-of-fit index; AGFI, adjusted goodness-of-fit index; RMSEA, root mean square error of approximation; NFI, normed fit index; NNFI, non-normed fit index. **$p < 0.01$, ***$p < 0.001$.

Discussion of the findings and research implications

This research project was aimed at empirically assessing the measurement of three e-commerce capabilities of IT departments in relation to their business environment. It did so by treating capabilities as latent, unobserved constructs that manifest themselves through their influence on directly observable variables. A CFA on the data indicated moderately acceptable fit and significant loadings. A *post hoc* respecification in which IS/IT governance was respecified into business IT strategic thinking and IT management, (cf. Bharadwaj *et al.*, 1999) revealed a more acceptable fit to the data.

The author believes that this work contributes to the body of knowledge in IS research. This research has extended work on IS core capabilities by developing and testing a measurement instrument for three e-commerce capabilities. The validation of the instrument suggested that two capabilities (business systems thinking and relationship building) are reliable and valid measures. Other researchers are encouraged to use these measures in their own research.

The IS/IT governance capability appears to be an aggregation of two capabilities, i.e. business IT strategic thinking and IT management. These measures require further validation with an independent data set. The inclusion of additional measurement items related to outward executive relationship building and inward IT management is suggested in order to reduce measurement error and avoid identification issues in subsequent research.

Feeny and Willcocks (1998b) derived six other capabilities, three related to vendor management and three related to technical management. These capabilities await further operationalization and future research could be directed towards the development of measurement instruments for these capabilities. This research field would then have a portfolio of measurable capabilities for IT departments alike on which to base further research.

This work was subject to a number of limitations. In the first place, respecification of theoretical models for improving the fit to data should be appreciated in the context of theory building not theory testing. The revised model could not be tested with the data set here. It can only be suggested that the new model be used to further stronger theory in this area. Future research will have to develop and validate the measurement of the newly formed capabilities. In particular, the number of items for the new capabilities is too small at this stage. Besides identification issues in structural equation models, measurement error may occur.

In the second place, the respondents were specifically asked about the performance of their IT departments in the area of e-commerce. E-commerce is a broad term and activities that are considered as being e-commerce by some IT managers are not considered as being e-commerce by others. In addition, the study was carried out with Dutch respondents. It is possible that the results cannot be translated well into other sociocultural contexts such as those found in North American or Australasian countries. Therefore, it is recommended that this study be replicated in other cultural settings and with more specific application foci. This would improve both the generalizability and precision of the model.

In the third place, data collected through an on-line survey engine may not be as reliable as, for example, similar data collected using postal mail. People are better positioned for masquerading their true profiles and 'cheating' on their answers on the Internet than in postal surveys: no cross-checks or validations are typically in place to ensure that people are indeed what they say they are. The author does not believe that this is a strong limitation in this particular case however. First of all, the communities did periodically check the quality of their user profiles by contacting the community members by telephone. Second, there was no real incentive to cheat as the survey was anonymous and voluntary. Nevertheless, the study did not control for non-respondent bias and self-selection bias in the sample and these biases might reasonably have occurred. Therefore, interpretations should be read with these limitations in mind.

Practical implications

Although the primary purpose of this research was to substantiate IS theory, some practical implications for IT managers can be derived from the resulting work. In the first place, the research draws attention to the usefulness of a capability-oriented view towards e-commerce. Second, the research provides guidelines for operationalizing the management of IT capabilities. In doing so, it suggests some prescriptive actions that can be taken for improving IT capabilities for e-commerce. Each of these implications will now be discussed in more detail.

Many IT managers will acknowledge that e-commerce is a multidisciplinary undertaking and, because of this, cooperation with the rest of the business is of vital importance. Yet IT managers may be confronted with symptoms that reflect a certain unhealthiness in the relationship between business and IT, for example late delivery of user-specified e-commerce software, sloppy IT service when web site

bugs are discovered by the marketing department, etc. Understandably, IT managers will want to focus on the underlying causes of these symptoms and poor execution of the capabilities discussed in this paper may be very likely candidates. Hence, it is not the symptoms that need to be carefully examined and assessed, but the way in which the department implements its core capabilities. Adopting a capability perspective should allow IT managers to move away from symptoms-driven management and tackle the roots of their issues.

In terms of day-to-day IT management for e-commerce, this paper offers guidelines for improving IT capabilities that focus on the relationship with the rest of the business. The paper demonstrates that specific behaviours are associated with these capabilities and predicts that these behaviours 'come in groups', i.e. if an IT department exhibits one behaviour, it is likely to exhibit the other behaviours belonging to that same capability. By operationalizing the capabilities into behaviours, IT managers are provided with 'target' or 'destination' indicators that they can work on and strive for.

For instance, if an IT manager decides to work on the relationship-building capability, the target indicators that this paper suggests are increased 'business understanding', increased 'cooperation effectiveness' and increased 'business ownership'. In order to improve the IT department with respect to the first behaviour, i.e. business understanding, IT managers could organize internships for selected IT personnel in the marketing department or they could train their personnel with respect to the logistical processes in the organization. Without a unified perspective these and other remedies are likely to be unfocused. Capabilities provide integrative concepts for ordering and assessing these remedies under a single header.

Conclusions

Our research has confirmed that core capabilities influence a variety of behaviours of IT departments. Although these behaviours have little overlap at first sight, they share common 'core' capabilities. In other words, the perceived exposed behaviours of an IT department can be successfully 'imploded' into a reduced set of variables. Therefore, capabilities present themselves as a suitable unit of analysis for synthesizing work on the behaviour of IT departments. Prior studies on the behaviour and performance of IT departments have been somewhat fragmented and a unifying unit of analysis may provide an opportunity for stronger theory based on cumulative empirical results.

Theory development based on capabilities could proceed in at least two directions. In the first place, the manifestations of certain capabilities could be theoretically associated with established dependent variables in IS research. This would generate predictive validity for the capabilities. Candidates include IS effectiveness variables such as user information satisfaction (Bailey and Pearson, 1983; Ives and Olson, 1984), strategic impact (Chan *et al.*, 1997) and SERVQUAL applied to IT (Pitt *et al.*, 1995).

The relationship between capabilities and the governance structure of the IT department may be particularly fruitful: it could be fully centralized, fully decentralized or a hybrid form. The literature suggests that organizational context variables such as size and type of strategy predict the IS governance solution (Sambamurthy and Zmud, 2000). Recent findings support the theory that perceived IT capabilities at the business unit level matter and, indeed, may generate 'deviant' governance structures (Brown, 1997). This paper suggests that decentralized IT functions are associated with stronger 'business thinking' capabilities and centralized IT functions with weaker capabilities.

A second area of future research is the way in which capabilities are created and developed. Capabilities have been argued as arising dynamically (Teece *et al.*, 1997) following organizational learning processes. Qualitative research could investigate how the capabilities of IT departments are formed and strengthened. Since the core capabilities that provide competitive advantage are (1) scarcely available in the market and (2) not readily redeployable in other organizational settings, these characteristics of capabilities are particularly worth investigating.

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Biographical notes

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Appendix 1: the survey

The survey below is a translation from the original in Dutch. The original survey instrument is available from the author.

Respondents were asked to express their opinion on 11 statements using a five-point Likert scale (wholly disagree to wholly agree).

IS/IT governance capability

1. In the context of e-commerce the IT department of our organization maintains close relationships with business management.
2. The vision of our IT management on the role of e-commerce is similar to the vision of business management.
3. The IT department actively develops a culture in which e-commerce skills are stimulated.
4. The IT department is actively occupied with the implementation of best practices in the area of e-commerce.

Business systems thinking capability

1. With respect to e-commerce our IT department is closely involved in the formulation of the organizational strategy.
2. Our IT department is actively engaged in the impact of e-commerce on our business processes.
3. Our IT department is actively occupied with new business processes made possible by e-commerce.
4. Our IT department guards the dependencies that arise because multiple departments are affected by e-commerce.

Relationship building capability

1. Our IT department ensures that the business has a good understanding of the possibilities of e-commerce.
2. With respect to e-commerce our IT department ensures that IT employees and the business cooperate effectively.
3. Our IT department ensures ownership of the business with respect to her e-commerce activities.

About the respondent

1. Which position do you fulfil?
   IT manager or CIO/Financial manager/Marketing manager/General manager or CEO/Consultant/Something else.
2. How many persons (internal and external) are located within your IT department?
   No IT department/1–10/11–50/50–150/150 or more.
3. In what sector do you operate?
   Financial services/Telecom and IT services/Manufacturing/Retail or wholesale trade/Education/Health care/Other public services/Other.

Appendix 2: the covariance matrix used for analysis

	v1.1	v1.2	v1.3	v1.4	v2.1	v2.2	v2.3	v2.4	v3.1	v3.2	v3.3
v1.1	1.384	–	–	–	–	–	–	–	–	–	–
v1.2	0.678	1.185	–	–	–	–	–	–	–	–	–
v1.3	0.673	0.509	1.345	–	–	–	–	–	–	–	–
v1.4	0.703	0.501	0.977	1.390	–	–	–	–	–	–	–
v2.1	0.847	0.733	0.646	0.674	1.671	–	–	–	–	–	–
v2.2	0.842	0.448	0.696	0.724	0.973	1.559	–	–	–	–	–
v2.3	0.642	0.418	0.713	0.714	0.858	1.182	1.509	–	–	–	–
v2.4	0.523	0.349	0.568	0.628	0.608	0.809	0.828	1.282	–	–	–
v3.1	0.534	0.351	0.684	0.572	0.574	0.607	0.612	0.560	1.101	–	–
v3.2	0.674	0.472	0.642	0.659	0.693	0.793	0.742	0.750	0.715	1.106	–
v3.3	0.584	0.364	0.601	0.617	0.591	0.758	0.694	0.698	0.582	0.739	1.342