Evaluating the Alignment of IT with Business Processes in SMEs

Paul Cragg
Department of Accountancy, Finance and Information Systems
University of Canterbury
Christchurch, New Zealand
Email: paul.cragg@canterbury.ac.nz

Marco Tagliavini
Cattaneo University
Castellanza, Italy

Annette Mills
Department of Accountancy, Finance and Information Systems
University of Canterbury
Christchurch, New Zealand
Email: annette.mills@canterbury.ac.nz

Abstract

This paper takes a new approach to IT alignment by focusing on the alignment of IT with business processes. Thus the paper focuses on operational alignment rather than strategic alignment. The paper proposes a new instrument for measuring IT alignment, based on the process view of firms. The Process Classification Framework (PCF) (APQC 2006) was used to create a 24 item instrument that formed part of a questionnaire for structured interviews with managers in 66 SMEs. Analysis using partial least squares indicated a positive relationship between IT alignment and IT Success. In addition, IT alignment was found to be low in many firms, and low for many business processes. The typical SME had about 5 business processes with insufficient IS support. However, IT alignment was at an acceptable level for the most important business processes. The study also indicates that the business process view could provide an efficient measure of IT alignment. Opportunities for further research are outlined.

Keywords

Information systems, IT alignment, functional integration, business processes, SMEs.

Introduction

The fit or alignment between IT and the business has received considerable attention during the last ten years because many argue that, to be successful, organisations need a good fit between IT and the business (Luftman 2000). It seems that IT alignment may help us understand the elusive relationship between IT use and organisational performance (Chan et al. 1997). Furthermore, there is evidence that many firms struggle to achieve alignment (Reich & Benbasat 1996). As a result, IT fit has been viewed as a problem of considerable practical significance.

Many studies of IT alignment have used the framework of Henderson and Venkatraman (1993). An important contribution of Henderson and Venkatraman (1993) was their recognition of many types of alignment, in particular, the concepts of alignment at the strategic level and alignment at the functional level. They termed the two types of alignment as strategic alignment, that is, the fit between business strategy and IT strategy, and functional alignment, that is, the fit between Business Infrastructure and IT Infrastructure. While a growing number of studies have examined IT alignment, most have focused on strategic alignment. There have been relatively few studies of IT alignment at the functional or operational level. Another bias of prior work is the focus on large firms. Very few studies of SME alignment have examined alignment at the operational level. This is a significant gap in our current understanding of IT in SMEs as there is strong evidence that SMEs are more operationally oriented rather than strategically oriented (Levy, Powell & Yetton 2001; Ravarini, Tagliavini & Buonanno 2002). This suggests that operational alignment in SMEs could be at least as important as strategic alignment, and possibly of greater importance. Yet operational alignment in SMEs is poorly understood and an under-researched topic. This project is therefore aimed at extending current frameworks of IT alignment in SMEs by examining alignment at the operational level. Theoretical arguments for the proposed study and research model are grounded in the widely accepted IT alignment model (Henderson and Venkatraman 1993),

the process-based view of the firm (Garvin 1998), and supporting literature (Bergeron, Raymond & Rivard 2001; 2004). The American Productivity and Quality Center's Process Classification Framework (PCF) was also used to help identify salient processes for examination of alignment at the operational level (APQC 2006). The PCF was considered appropriate to this study due to its comprehensive nature and coverage of key business processes, and can be used to identify macro-level processes or to examine processes at the more detailed level. Use of the PCF suggested 12 primary business processes. The PCF was then used to create a 24 item instrument. Data was collected from 66 SMEs in Northern Italy using structured interviews. This paper presents the background literature, the development of the instrument, data collection, instrument validation, and results, including testing a structural model using partial least squares (PLS). Finally, we provide discussion of the study's significance, implications, research opportunities, and limitations.

Literature Review

The model of IT alignment by Henderson and Venkatraman (1993) provides an understanding of IT alignment that has been accepted by many researchers. Their model is depicted in Figure 1 and identifies the following four domains: business strategy, IS strategy, organizational infrastructure, and IT infrastructure. One important feature of the model is that organizations have many aspects of alignment to manage. Of particular interest to management rather than IS researchers, has been the fit between strategy and structure that is, fit between the upper and lower parts of Figure 1. Of greater interest to IS researchers has been the need for firms to manage the fit between business and IS, that is, the relationship between the left and right sides of Figure 1. Henderson and Venkatraman (1993) argued that if there is a good fit between the business and IS, then IS will enable the firm to perform well. Numerous studies have examined this relationship. For example, Bergeron, Raymond and Rivard (2004) reviewed six studies that examined the performance impacts of alignment. As with other studies (e.g. Chan, Sabherwal & Thatcher 2006; Sabherwal & Chan 2001), Bergeron, Raymond and Rivard (2004) also found a positive relationship between alignment and business performance. Such studies thus support the theory that IT alignment is important for business success.

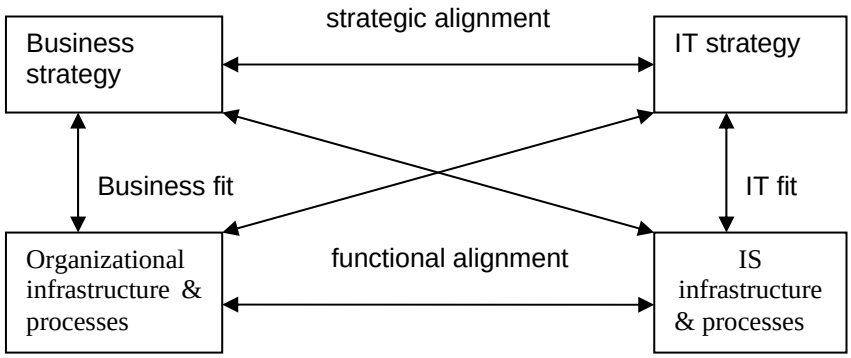

Figure 1: The major components of alignment (adapted from Henderson & Venkatraman 1993)

Bergeron, Raymond and Rivard (2004) noted that five of the six studies they reviewed focussed on strategic alignment, that is, alignment at the strategic level between business and IS, as depicted in the upper part of Figure 1. Only one of the six studies focussed on operational alignment, that is, alignment at the operational level between business and IS. However, subsequent studies have examined IT alignment at the operational level. For example, Rai, Patnayakuni and Seth (2006) showed that IT enabled supply chain integration can improve firm performance.

IT alignment has also been studied in SMEs. The most ambitious of these studies was by Bergeron, Raymond and Rivard (2004) who addressed all aspects of the Henderson and Venkatraman (1993) model, unlike other studies which have focused on only a part of the model (e.g. Sabherwal & Chan 2001). Thus the study by Bergeron, Raymond and Rivard (2004) included Business strategy, IT strategy, IT infrastructure, and Organisational infrastructure. Their study was based on the co-alignment view of alignment, which focuses on internal consistency. If elements are consistent then there is low internal conflict; if elements are inconsistent then there is internal conflict. Using measures of all four variables in the Henderson and Venkatraman (1993) model, Bergeron, Raymond and Rivard (2004) identified four types of SME based on consistency. Of these four types, two were considered less aligned than the other two. Their analysis indicated a relationship between alignment and firm performance.

While the study by Bergeron, Raymond and Rivard (2004) is significant in that it examined all variables from the Henderson and Venkatraman (1993) model, it does have limitations in terms of the constructs used to

represent the four major variables. For example, they measured IS Infrastructure through only two dimensions: IT planning and control, and IT acquisition and implementation. These two dimensions reflect aspects of IT management, which is a small part of the concept of IS Infrastructure and processes proposed by Henderson and Venkatraman (1993). Similarly, their measure of IT strategy was based on the two dimensions of IT environment scanning, and strategic use of IT. This and other studies (Bergeron, Raymond and Rivard 2004) highlight a lack of comprehensive research instruments to examine the complexities of IT alignment in SMEs.

The related studies by Hussin, King and Cragg (2002) and Cragg, King and Hussin (2002) had a narrower focus than the Bergeron et al (2004) study as they focused on strategic alignment in SMEs, that is, between business strategy and IT strategy. Hussin, King and Cragg (2002) found that strategic alignment in SMEs was influenced by many factors, but particularly by IS maturity and the CEO's software knowledge. Cragg, King and Hussin (2002) reported that many SMEs have achieved high levels of alignment between IS and business strategy, and that firms with high alignment performed better. As with Bergeron, Raymond and Rivard (2004), they created their own instrument to study alignment. Their instrument identified nine elements of strategy, including price, quality, and new markets. Although the nine elements were drawn from the SME literature, the instrument had no significant theoretical base and had not been used by other researchers, including researchers of SME strategy. This may reflect the lack of strategic orientation in SMEs. The approach to strategy formation in SMEs has been described as informal, inexplicit, intuitive, and incremental (Mintzberg 1988). Lefebvre and Lefebvre (1992) concluded that SMEs were not as strategically oriented as larger organisations, which makes the explicit identification of strategy more difficult. In addition, Chell, Kennedy and Roberts (1992) recognised the lack of strategic awareness in many SMEs -"For small companies, implicit strategies are the norm." (p. 5).

The lack of strategic orientation in SMEs has also been recognised in the IS literature. For example, Levy, Powell and Yetton (2001) classified many SMEs as 'efficiency' type SMEs, where IS was seen as a cost to the business but was useful in making processes more cost efficient. However, Levy, Powell and Yetton (2001) identified a lack of IT alignment in their efficiency type firms, and concluded that such firms did not recognise a role for IT in supporting business strategy. Levy, Powell and Yetton (2001) concluded that strategic alignment was recognised in only a minority of SMEs. In addition, Ravarini, Tagliavini & Buonanno (2002) reported: "SME managers think of IS support only in terms of automating the business activities, without considering it as a way to support or even redefine the business strategy" (p. 78). It can be concluded that when it comes to both business and IT, SMEs tend to be operationally oriented rather than strategically oriented. This bias to operational IT indicates that operational alignment may be more important than strategic alignment in the SME setting.

Despite its importance to SMEs, alignment at the operational level has received very limited attention in studies of IT alignment. The study by Raymond et al (1995) of SMEs found a strong correlation between structural sophistication (as an indicator of organizational infrastructure) and IS sophistication (as an indicator of IS infrastructure). Thus SMEs that were more structurally sophisticated (in terms of being more formal, more administrative and more professional) had more sophisticated IS (in terms of their IS use and IS management). They also found partial support for operational integration being linked to higher firm performance. Another study of alignment at the operational level focused on accounting information systems alignment, rather than the broader concept of IS alignment (Ismail & King 2005). They reported high levels of IT alignment in SMEs and a positive relationship between IT alignment and firm performance. Their instrument covered 19 accounting requirements, including speed of reporting, sectional reports, and what-if analysis. Their narrow focus meant that they failed to directly address a broader set of information systems, for example, the use of IT to support sales, production, and R&D.

In conclusion, IT alignment has become an important area of study for SMEs. Many studies of IT alignment draw on the Henderson and Venkatraman (1993) model, particularly their concepts of strategic alignment and operational alignment. Numerous studies have found evidence to link both strategic alignment and operational alignment with organisational performance. While most studies of IT alignment have focused on large firms, some have examined alignment in the SME setting. These studies provide evidence of strategic alignment in SMEs, and factors that influence alignment. However, few studies have examined alignment at the operational level in SMEs. This is a significant gap in our current understanding of IT in SMEs as there is strong evidence that SMEs are more operationally oriented rather than strategically oriented. IT alignment at the operational level in SMEs is an under-researched topic. Furthermore, although a number of research instruments have been created to aid the study of IT alignment, the existing instruments that measure operational alignment in SMEs have little breadth. By using the PCF, this study will yield a more comprehensive instrument that covers key business processes and operational alignment SMEs. Thus we know little about operational alignment in SMEs, and there is no strong instrument to study alignment at the operational level in SMEs.

Research Model

The research framework is shown in Figure 2, with IT alignment as the independent variable and IT success as the dependent variable. Henderson and Venkatraman (1993) conceptualised operational alignment as the fit between the organisational infrastructure and the IT infrastructure. They argued that a firm with high IT alignment is one where IT fits the needs of the business. For the case of operational alignment, this means that IT fits the operational needs of the business. For example, if aligned, a firm will have IT that fits the accounting needs of the business (Ismail & King 2005), or enhance the supply chain (Rai, Patnayakuni & Seth 2006). Hence the research framework depicts operational alignment as reflecting the fit between organisational infrastructure and processes with IT infrastructure and processes (Figure 2).

The relationship between IT alignment and IT Success is reflected in numerous studies of IT success. The likes of Henderson and Venkatraman (1993) and Luftman (2000) argue that IT alignment helps a firm to compete. Firms with poor IT alignment will struggle to achieve internal coherence, while firms with strong operational alignment will have many positive internal impacts from IT, for example, greater coherence and reduced costs. These impacts have been documented in numerous studies of IT and have been shown to take many forms (DeLone & McLean 2003). Organisational impact from IT reflects a range of benefits that have been referred to by others as IT success, or more recently, as net benefits (DeLone & McLean 2003). Thus the research model (Figure 2) depicts a causal relationship between IT alignment and IT Success. IT alignment is viewed as the fit between the organisational infrastructure and the IT infrastructure (Henderson & Venkatraman 1993) while IT success is conceptualised in terms of the extent to which IT impacts various performance indicators such as costs, productivity and revenue, and firm competitiveness Similar, conceptualisations have been used in the prior research on IT alignment (Bergeron, Raymond & Rivard 2004; Thong, Yap & Ramon 1996). The next section discusses how these variables were operationalised within this study.

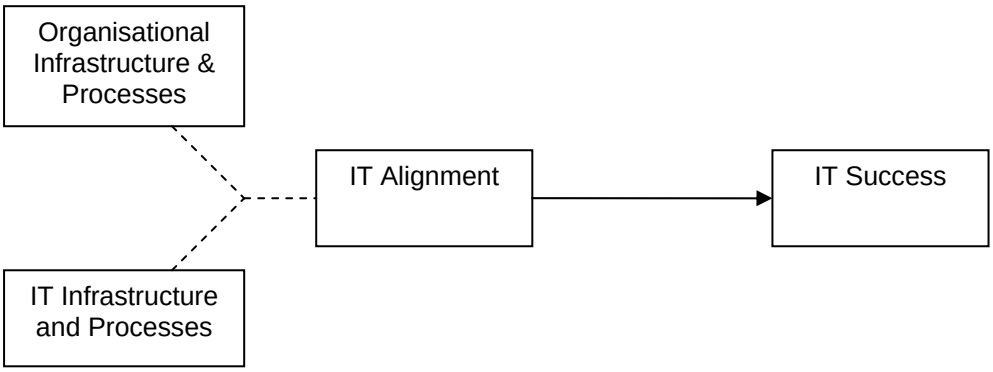

Figure 2: Research Framework

Methodology

A major aspect of the instrument development process involved the careful creation of an instrument to measure IT alignment based on business processes. Henderson and Venkatraman (1993) argued that an important aspect of alignment was the fit between IS and the firm's business processes. There is a body of literature that focuses on business processes and argues that the process view is useful when studying a number of common organizational problems, including the lack of cross-functional integration of organisations (Galbraith & Kazanjian 1986; Harrington 1991). Garvin (1998) argues that processes "provide a powerful lens for understanding organizations and management" (p. 34). Garvin also argues that one of the strengths of a process view is that "processes are concepts that combine activities into cohesive wholes" (p. 46). Garvin (1998) recognises that organisations have many processes. A comprehensive set of business processes is depicted in the Process Classification Framework (PCF) by the American Productivity and Quality Center's International Benchmarking Clearinghouse (APQC 2006). The PCF was developed as an industry-neutral enterprise model. The framework consists of a taxonomy of business processes which have been organized into four levels of detail: enterprise-level categories, process groups, processes, and activities. At the highest level there are 12 enterprise-level categories. The APQC refer to the first 5 as operating processes and the other 7 as management and support services. The set of 12 enterprise-level categories are listed in Table 1.

The study chose to focus on the highest level of a business process, that is, the 12 enterprise-level processes, rather than attempt to include 60 processes or more in a very long instrument. As with other studies of alignment in both large and small firms, the study adopted a bi-variate view of alignment (Chan et al. 1997; Hussin, King and Cragg 2002). Thus the PCF (APQC 2006) was used to gather data on two variables, organisation infrastructure and IS infrastructure. One question was used to capture the importance of each of the PCF's 12

first-level processes (see Appendix). A second question sought the level of IS support for each of the PCF's 12 first-level processes. Thus two sets of data were collected, one for the importance of each business process and another for IS support, using 24 items in total. Five point Likert scales were used, ranging from one (low) to five (high). (See for an extract from the questionnaire). Informed by approaches used in the prior research on IT alignment (Henderson &Venkatraman 1991; Bergeron, Raymond and Rivard 2001; 2004), the PCF was used as the basis for identifying salient business processes and collecting data for both Business infrastructure (12 items) and IS infrastructure (12 items).

Table 1: The 12 enterprise-level categories of the APQC's Process Classification Framework (APQC 2006)

Operating processes	Management and Support Services
Develop vision and strategy	Develop and manage human capital
Design and develop products and services	Manage information technology
Market and sell products and services	Manage financial resources
Deliver products and services	Acquire, construct and manage property
Manage customer service	Manage environmental health and safety
	Manage external relationships
	Manage knowledge, improvement and change

Quantitative data for this study was collected using a structured questionnaire administered in face-to-face interviews with managers of 66 SMEs. The firms were selected from a list of companies in the Milan region of northern Italy to provide a range in terms of both size and industry sector. Using European Community definitions, the sample was 30% of *micro* companies (from 1 to 10 employees), 53% of *small* firms (from 11 to 50 employees), and 17% of *medium-size* companies (from 51 to 250 employees). Interviews were conducted with the CEO in 86% of the firms, or with another senior manager when the CEO was not available. The surveyed companies represented a range of industries: metal and mechanical (35%), mechanical (30%), other manufacturing (11%), printing and packaging (5%), service firms (19%).

Considering the debate in the literature, the moderation approach was selected as the way to calculate alignment based on the two scores (Chan et al. 1997). The moderation approach assumes that fit reflects a synergy between IS and business. Under moderation, alignment is calculated as the interaction between the business score and the IS score. For example, if a business process gains an importance score of five, and an IS support score of three, then the moderation approach would calculate the product of the two, that is, (4 * 1 = 4) to indicate a level of alignment of 4. This approach automatically gives a higher weight to the processes that are seen as most important to the organisation. This is based on the notion that, if a business process is considered to be highly important, then it is most important for IS to support that process if the firm aims to perform well. Under the moderation approach, a low score indicates low alignment. The formula for moderation is (x * y), that is, the product of the two values x and y.

The next phase of the data analysis focused on the measurement properties of the instruments used in the study. It is important to note that all constructs were operationalised using formative indicators rather than reflective indicators. As a result, typical approaches to content validity, for example, factor analysis and internal consistency, are not necessarily appropriate as individual items are not expected to be highly correlated with each other (Chin 1998). For example, it was expected that a firm would rate some processes as operationally very important (e.g., customer service), and others as less important (e.g., managing health and safety). Many analytical approaches and tools assume that constructs are modelled as reflective rather than formative (e.g., LISREL, AMOS). However, the partial least squares (PLS) approach, as implemented using PLS-Graph 3.00, is one approach that is able to handle formative items (Chin 1998). Thus PLS-Graph 3.00 was used in this study for the data analysis.

Various instruments have been used to measure IT success, including IT impact, that is, the impact of IT on the organisation (DeLone & McLean 2003). This study chose to focus on IT impact and adapted the prior instrument used with SMEs by Thong et al. (1996) and validated in other studies on IT alignment (Bergeron, Raymond and Rivard 2004) resulting in eight items, on a five point Likert scale (see Appendix). This measure of IT success is particularly useful as it captures to some extent the complex nature of IT success in firms.

In PLS, R^2 values provide an indication of model fit. This statistic was used in the validation phase to determine the validity of both IT alignment and IT Success. The questionnaire included alternative indicators for both of these variables - two indicators for IT alignment and one for IT impact. The R^2 values reported in Table 2 show how well each instrument explained the alternative items. Both R^2 values are significant and indicate good content validity for the instruments.

Table 2: Instrument content and validity within the measurement models

Variable	Number of items	Scale for each item	Type	Mean	R^2 value
IT alignment	12	1 to 25	formative	127	0.429
IT Success	8	-1 to +3	formative	12.3	0.539

Descriptive statistics and item weights from PLS are reported for the main study items in Table 3. The weights indicate the relative contribution of specific items to the overall construct. Only those weights that are significant contribute to the overall construct, for example for IT alignment: Mods 1, 2, 3, 6, 7, 8, 9 and 12. Typically at this stage, some items may be dropped based on low weights or loadings to improve internal consistency. However, as all 12 items for IT alignment were formative and based on key business processes as identified by the PCF (APQC 2006), there was no good theoretical basis for dropping the items. Indeed, these items may be important for other firms, but not for the firms in this particular sample. It should also be noted that any items with a low weight would have little impact on the final measure (Mathieson, Peacock and Chin 2001), and can therefore be retained in the measurement model.

Table 3: Means, standard deviations and weights for the study items

	Mean	Standard Deviation	Item Weight
Mod1 Develop vision and strategy	8.88	4.86	0.310*
Mod2 Design and develop products and services	14.53	8.35	0.243*
Mod3 Market and sell products and services	9.94	6.84	0.265*
Mod4 Deliver products and services	15.92	5.09	-0.048
Mod5 Manage customer service	14.94	6.05	0.073
Mod6 Develop and manage human capital	8.71	6.19	-0.341*
Mod7 Manage information technology	12.45	5.84	0.125*
Mod8 Manage financial resources	13.67	5.93	0.138*
Mod9 Acquire, construct and manage property	6.32	4.27	-0.142*
Mod10 Manage environmental health and safety	7.95	5.65	-0.039
Mod11 Manage external relationships	5.82	4.11	0.068
Mod12 Manage knowledge, improvement and change	9.92	6.17	0.284*
Imp1 Reduce costs	1.30	1.04	-0.015
Imp2 Improve company image	1.70	0.94	0.498*
Imp3 Improve staff productivity	1.64	0.89	-0.107
Imp4 Improve quality of decision making	1.48	0.96	0.047
Imp5 Help us compete	1.44	1.00	0.359*
Imp6 Improve sales revenue	1.29	1.05	0.218*
Imp7 Improve profitability	1.17	0.94	0.125*
Imp8 Improve internal integration	1.85	0.95	0.189

Note: the weights are from the full structural model which included all of the above indicators. The weights marked with a * are statistically significant at the 20% level.

Results

This section presents descriptive statistics for the major research variables followed by a PLS test of the research model. The significance of the results is discussed later in the discussion section. Table 4 reports the means and standard deviations for three key variables: process importance, IS support, and IT alignment. To help interpret this data, the data has been sorted on process importance, with the most important business process of deliver products and services appearing at the top of the list of processes with a mean value of 4.26.

The process importance data shows which business processes were considered of most/least importance by the SMEs in the sample. It shows two business processes with mean scores above 4 (on a scale of 1 to 5). Both of these are PCF ‘operating processes’ rather than ‘management and support services’. Managing financial resources is the highest rated ‘management and support service’. Two processes had mean scores of less than 3; both were ‘management and support services’ within the PCF framework.

The IS support column in Table 4 indicates how well each business process was supported by IS. The data indicates two patterns of importance. Firstly, the IS data shows a reasonable fit to the process importance data. For example, IS support tends to be highest for the processes of greatest importance and lowest for those processes of least importance. The process of Manage IT is the exception to this pattern. The second observation

is that the scores for IS support are all lower than the 'importance' scores, with the one exception of Manage IT. These differences are discussed later in the paper as they suggest, in general, that firms need to improve their IS support for most business processes.

Table 4: Descriptive statistics for the key variables for each business process, sorted on process importance

PCF #	Business Process	Process Importance mean (SD)	IS Support mean (SD)	IT alignment moderation mean (SD)
4	Deliver Products and Services	4.26 (0.79)	3.64 (0.90)	15.55 (4.99)
5	Manage Customer Service	4.17 (1.03)	3.41 (1.00)	14.56 (5.96)
8	Manage Financial Resources	3.73 (1.04)	3.50 (0.97)	13.44 (5.97)
2	Design and Develop Products and Services	3.70 (1.37)	3.58 (1.32)	14.52 (8.25)
7	Manage Information Technology	3.33 (0.77)	3.56 (1.26)	12.15 (5.80)
12	Manage Knowledge, Improvement, and Change	3.23 (1.21)	2.80 (1.07)	9.86 (6.17)
6	Develop and Manage Human Capital	3.21 (1.09)	2.52 (1.12)	8.62 (6.23)
1	Develop Vision and Strategy	3.18 (1.02)	2.70 (1.06)	8.85 (4.82)
10	Manage Environmental Health and Safety	3.11 (1.02)	2.30 (1.07)	7.83 (5.69)
3	Market and Sell Products and Services	3.09 (1.45)	2.80 (1.13)	9.64 (6.77)
9	Acquire, Construct, and Manage Property	2.74 (1.09)	2.14 (0.97)	6.20 (4.30)
11	Manage External Relationships	2.35 (0.98)	2.24 (1.02)	5.76 (4.14)

Table 4 also indicates which of the 12 PCF business processes were most/least aligned in the sample. The data shows that some processes are better aligned than others. The most aligned processes were: Deliver Products and Services, and Manage Customer Service. The least aligned processes were: Acquire, Construct and Manage Property, and Manage External Relationships. (Note that this latter PCF process refers to relationships with the Government and other bodies, and not with customers or suppliers.) The maximum possible score for alignment for a specific process was 25 (i.e., 5*5). The highest average alignment score in Table 4 is 15.55. This indicates that even for the most important processes, there is plenty of potential for many SMEs to increase alignment. The variability data also shows this. For example, for the most important process of Deliver Products and Services, the standard deviation was 4.99. Actual scores ranged from 8 to 25.

While alignment for each process was reported in Table 4, data for total IT alignment is reported in Table 5, where total alignment is the sum of the alignment score for all 12 PCF processes for each firm. The data shows a mean of 127 points for total alignment. In theory, the maximum alignment score for a firm was 300, as each process has a potential maximum of 25 (based on scores of 5 * 5). Only 9% of the firms had scores of 160 points or more. Table 5 also shows considerable variability across the sample. Scores ranged from 76 to 172, which means that some poorly aligned firms had scores of less than half that of leading firms.

Table 5: Frequency distribution for IT alignment by firm

Total IT alignment	Number of firms (n = 66)	Percentage
Less than 100	12	19
100 to 119	10	15
120 to 139	20	31
140 to 159	18	28
160 plus	6	9
Mean (Standard Deviation)	127 (23)	

In this study, PLS-Graph 3.00 was used to test the research model (Figure 3). The component-based approach used in partial least squares analysis was considered more suitable than other methods such as covariance-based analysis. The PLS approach is also considered more suitable for smaller samples and where formative rather than reflective items are used (Chin 1998). In this study, bootstrap analysis as implemented using PLS-Graph 3.00 was conducted using 200 resamples to determine the statistical significance of the item weights and path values.

The results of the test of the measurement model (i.e. item weights) were reported in Table 3. This showed which items were significant in respect of IT alignment and IT Success. The weights for eight specific business processes were statistically significant and thus these processes contributed most to total IT alignment. The

results for the structural model are shown in Figure 3. In PLS, R^2 values are an indication of model fit, while the path coefficients indicate the strength of a contribution. The high R^2 value of 0.693 for IT Success indicates that the independent variable of IT alignment explains about 70% of the variability of IT Success. The path coefficient of 0.833 in Figure 3 was statistically significant, indicating support for the hypothesis that IT alignment influences IT Success.

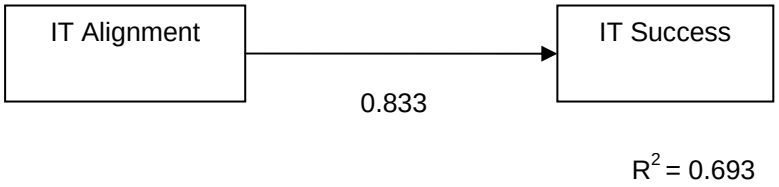

Figure 3: PLS path coefficients and R^2 values for the research model

Discussion

A major contribution of the study is that it examined the relationship between IT alignment and IT Success. Importantly, this study is one of the first papers to report this relationship for operational alignment in SMEs, rather than for strategic alignment (Bergeron, Raymond and Rivard 2004; Cragg 2002). The data supported the hypothesis that IT alignment influences IT Success. The data confirms the idea that IT is important to small firms, and that IT alignment is a key plank in our understanding of IT success. The study reported a high value R^2 value of 0.693 for IT Success, that is, IT alignment explained about 70% of the variability of IT Success. This is a very much larger R^2 value than reported in prior research. For example, Thong, Yap and Ramon (1996) evaluated the impact of three independent variables using a sample of 114 SMEs. Their study reported an R^2 value of 0.10. The results of the current study therefore indicates that IT alignment is a very important predictor of IT Success in SMEs and worthy of more attention by researchers.

Another major contribution of the study is that it provided new insights on levels of IT alignment in SMEs. The data in Table 5 reported a mean score for IT alignment of 127 points, a standard deviation of 23, and a range from 76 to 172. Although not directly comparable, the mean scores are less than those reported by Cragg et al (2002), who reported a mean score of 106 with a standard deviation of 30 for an 8 item measure of strategic alignment. Also, Ismail and King (2005) reported high levels of alignment in about 25% of their sample, and classified about 16% as not-aligned. The high variability reported across these studies of IT alignment in SMEs indicates that some firms have much stronger IT alignment than others. It seems possible that some firms have, what could be termed “acceptable levels of alignment”, but many others have low alignment. The overall finding of relatively low alignment among SMEs is similar to results from large firms, where alignment has also proven to be difficult to achieve (Luftman 2000).

The study’s new instrument is also an important contribution of the study. A novel way of measuring IT alignment was proposed based on the fit between IT and the 12 business processes of the PCF (APQC 2006). This relatively simple 24 item instrument thus adds to the set of tools that are available to researchers of IT alignment. The new instrument was created and validated with a sample of 66 SMEs. The instrument has a number of strengths. In particular, managers of SMEs can relate to its simple and process-oriented approach as many see IT as functional (Ravarini, Tagliavini & Buonanno 2002). Another strength of the instrument is that it can be used at a total alignment level, and also at the business process level. Thus the instrument has the potential to be used in benchmarking at the firm level as well as a diagnostic tool when used at a process level. For example, the instrument could be used to identify which processes are important to a firm, and which are poorly supported by IT. Thus it has the potential to identify strengths and weaknesses of a firm.

Limitations and Future Opportunities

Before outlining research opportunities it is important to indicate the limitations of this study. An important limitation is that this study created and used a new instrument to measure operational alignment. While many sound research practices were followed in the development of the instrument, the instrument has only been tested on one sample of 66 SMEs. The firms covered a range of sectors and were from one part of Northern Italy, so a different sample could provide different results. Furthermore, the instrument was applied in face-to-face interviews with managers, so it has not been used as part of a postal questionnaire or a web-based survey which may present different results due to interviewer effects. In addition, although the instrument is based on sound theory and prior research (e.g. Bergeron, Raymond and Rivard 2004; Henderson & Venkatraman 1991), the APQC’s business process classification framework was particularly useful as a supplementary framework for identifying key business processes. Although the PCF was designed as a generic framework, it may be biased

somewhat towards manufacturing firms. Thus future use of the instrument with other firms should therefore be accompanied by validation tests.

The study opens up a number of research opportunities. In particular, it identifies a need for a greater understanding of the antecedents to IT alignment, and thus build on the work of Hussin, King and Cragg (2002) in small firms and Luftman (2000) in large firms. As IT alignment is an important factor within firms, we need to know why some SMEs have greater operational alignment than others. The current study found that SMEs were typically providing insufficient IT support to many business processes. This lack of alignment requires further research as it indicates a potentially serious issue within SMEs. For example, the lack of balance may reflect the limited availability of software that is appropriate to SMEs. While many SMEs may be able to find suitable IT to support some parts of their business (e.g., deliver products and services), other areas are not as well supported (e.g., manage knowledge, improvement and change). As a result, SMEs may opt to use IT where they can because good software exists, instead of where they need to as good software may not be available. Although the data in Table 5 does not identify any one business process as of particular concern, it may provide a useful starting point for researchers seeking causes of poor alignment in SMEs. The alignment gaps may also indicate market opportunities for software development firms.

Conclusions

This study examined IT alignment, with a particular focus on the alignment between IT and business processes. An instrument was created then used in structured interviews with managers of 66 SMEs in Northern Italy. The data indicated that many SMEs are poorly aligned. Many business processes could be better supported by IT. The data also indicated that alignment has a significant influence on IT Success. Thus IT consultants and managers of SMEs could focus on improving operational alignment with the goal of improving the effectiveness of IT. Another important contribution of the paper is that it has proposed and tested a novel approach to measuring IT alignment, based on the alignment literature (e.g. Henderson & Venkatraman 1991) and using APQC's business process classification framework (APQC 2006) to identify a comprehensive range of key business processes. This instrument provides a major step towards the development of a simple yet practical method of measuring operational alignment in SMEs. The relative simplicity of the instrument shows promise as both a measurement instrument for researchers and a diagnostic tool for managers.

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Appendix: Extracts from the questionnaire

Process Importance

Two similar questions were used for Process Importance and IT Support. Both reflected the PCF's 12 business processes, thus they each had 12 items, and used the same 5 point Likert scale. For process importance the full question was:

Using the scale below, please quantify the strategic importance of each of the following 12 business processes.

Very low	Low	Average	High	Very high
1	2	3	4	5

Business Process	Strategic Importance
1 Develop Vision and Strategy	1 2 3 4 5
2 Design and Develop Products and Services	1 2 3 4 5
3 Market and Sell Products and Services	1 2 3 4 5
4 Deliver Products and Services	1 2 3 4 5
5 Manage Customer Service	1 2 3 4 5
6 Develop and Manage Human Capital	1 2 3 4 5
7 Manage Information Technology	1 2 3 4 5
8 Manage Financial Resources	1 2 3 4 5
9 Acquire, Construct, and Manage Property	1 2 3 4 5
10 Manage Environmental Health and Safety (EHS)	1 2 3 4 5

11 Manage External Relationships	1 2 3 4 5
12 Manage Knowledge, Improvement, and Change	1 2 3 4 5

IT Support

The question used for IT Support was the same as above, except the opening part was:

Using the scale below, please quantify how well your IT systems support each of the following business processes.

IT Impact

During the last three years, how highly have computers impacted on your firm?
(*circle one number for each row*)

Negative impact	No impact	A little positive impact	Much positive impact	Considerable positive impact
-1	0	1	2	3

Computers have helped us reduce costs	-1 0 1 2 3
Computers have helped us improve company image	-1 0 1 2 3
Computers have helped improve staff productivity	-1 0 1 2 3
Computers have helped us improve the quality of decision making	-1 0 1 2 3
Computers have helped us compete	-1 0 1 2 3
Computers have helped us improve sales revenue	-1 0 1 2 3
Computers have helped us improve profitability	-1 0 1 2 3
Computers have helped us improve internal integration	-1 0 1 2 3

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