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## Enterprise Systems contracting: developing and testing a model of divergent approaches in the service and manufacturing sectors

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**Abstract:** Virtually all Enterprise Systems (ES) implementation projects start with a purchase contract. Yet there has been little research on ES contracting approaches, and how those approaches relate to the previous literature on productivity gains from spending on those systems. Building on the IT productivity paradox notion, this paper proposes a model of divergent ES contracting approaches in the service and manufacturing sectors. Two main ES contracting approaches are defined – the revisionist-adversarial approach, associated with ES contracting elements geared at potentially short-term and change-oriented relationships with ES vendors; and the preservationist-cooperative approach, associated with ES contracting elements aimed at mutual cooperation over the long run with ES vendors. It is proposed that service sector organisations generally display a preference toward the revisionist-adversarial approach, whereas manufacturing sector organisations generally display a preference toward a preservationist-cooperative approach. These propositions, which are aligned with the IT productivity paradox phenomenon, are supported by a survey of 116 organisations.

**Keywords:** survey research; partial list squares; Enterprise Systems (ES); IT contracting; service sector; manufacturing sector; IT productivity paradox.

**Reference** to this paper should be made as follows: Kock, N. and Verville, J. (2006) 'Enterprise Systems contracting: developing and testing a model of divergent approaches in the service and manufacturing sectors', *Int. J. Management Practice*, Vol. 2, No. 2, pp.127–143.

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## 1 Introduction

Information Technology (IT) contracting is part of the IT acquisition process, which in turn has the ultimate goal of improving the 'bottom-line' of the acquiring organisation through the design or enhancement of IT-enabled business processes. In that light, IT can be seen as a capital investment that is expected to eventually lead to gains in quality and productivity; gains that hopefully more than justify the initial IT spending. While IT investment has historically been high and growing, the returns on that investment in terms of productivity have been much lower than expected, particularly in certain types of organisations. This phenomenon has been generally dubbed the IT productivity paradox.

The IT productivity paradox phenomenon is primarily characterised by organisations in the service sector having historically dismal productivity returns on IT investment, especially when compared with manufacturing sector organisations (Brynjolfsson, 1993; Dehning *et al.*, 2003; Roach, 1991). Many explanations have been put forth to account for this phenomenon. Among those explanations are measurement errors, lack of or poor redesign of work practices to take advantage of new IT, and generally careless and wasteful IT spending in the service sector of the economy (Brynjolfsson, 1993; Carr, 2003; Devaraj and Kohli, 2002; Kock, 1999; Kock and Murphy, 2001; Ross and Beath, 2002).

One surprising omission in the possible explanations for the IT productivity paradox is the set of characteristics that define IT contracting, or the nature of contractual relationships between IT buyers and vendors. This omission is surprising because virtually all IT implementation projects start with a purchase contract between the company purchasing the technology and the technology vendor.

The research investigation discussed in this paper is an initial attempt at addressing the above omission, from both a theoretical and empirical perspective, centred on the study of IT contracting in the context of Enterprise Systems (ES) acquisition. The focus on ES is due to the fact that these computer systems are among the most critical, expensive, and resistant to commoditisation of all IT products (Bajwa *et al.*, 2004).

The acquisition of ES is considered a high-expenditure activity that often consumes a significant portion of an organisation's capital budget. It is a process fraught with risk and uncertainty, since choosing the wrong ES or ES features can lead to negative consequences to the organisation as a whole, in several different areas and on several different levels. These can, in turn, adversely affect organisation-wide productivity and quality (Verville and Halington, 2001). ES acquisition creates a much more complex buying situation than many other types of IT buying scenarios, because the needs and behaviour of the individuals (*i.e.*, buyer and the vendor representatives) involved in the acquisition, as well as the complexity and many special requirements of the ES solution, have to be taken into consideration.

Building on the IT productivity paradox notion, a model of divergent ES contracting approaches in the service and manufacturing sectors is proposed here, where two main ES contracting approaches are defined. The *revisionist-adversarial* approach is associated with ES contracting elements geared at potentially short-term and change-oriented relationships with ES vendors. The *preservationist-cooperative* approach is associated with ES contracting elements aimed at mutual cooperation over the long run with ES vendors.

It is proposed in this paper that service sector organisations generally display a preference toward the revisionist-adversarial approach, whereas manufacturing sector organisations generally display a preference toward a preservationist-cooperative approach. These propositions, which are aligned with the IT productivity paradox phenomenon, are supported by a survey of perceptions by IT executives from 116 service and manufacturing sector organisations. Those perceptions are based on actual purchases of ES by those organisations prior to the administration of the survey.

## **2 IT productivity returns: service and manufacturing sector differences**

One of the most important areas of research in connection with IT acquisition and management has been that in connection with the return, in terms of productivity gains, on IT investments (Im *et al.*, 2001). Research in that area has consistently led to one main conclusion, often referred to by the term 'IT productivity paradox', which essentially is that organisations in the service sector have historically experienced dismal productivity returns on IT investment (Brynjolfsson, 1993; Dehning *et al.*, 2003; Hackett, 1990). This conclusion is compounded by the fact that service sector organisations are among the biggest investors in IT, typically investing twice as much per employee as organisations in the manufacturing sector. In fact, organisations in the manufacturing sector have historically obtained significantly more productivity gains from their IT investments than service sector organisations.

Steven Roach has apparently coined the term 'IT productivity paradox' in the late 1980s, when he worked as Morgan Stanley's chief economist. He was also the author of a widely cited study on service sector productivity and its relationship with investment in

IT (Roach, 1991). The term refers to the poor gains in productivity in the service sector in spite of heavy IT investments by service organisations such as banks, insurers, airlines, retailers, and telecommunications providers. As pointed out by Roach (1991, p.82): “Massive investments in technology have not improved productivity. On the contrary, they have made service organisations less profitable and less prepared to compete on other fronts”.

Many reasons have been provided for the IT productivity paradox. Brynjolfsson (1993) has pointed out that the paradox may be due to measurement errors, and may not reflect the reality of productivity returns in the service sector, where he argues output measures are poorer than in the manufacturing sector. This is a point that is picked up by Brynjolfsson and Hitt (1998), who also add that the adoption of new work practices seems to be an important factor in reaping productivity gains from IT investment. Hammer and Champy (1993), as well as Davenport (1993), have shown that service sector organisations have traditionally done a particularly poor job at redesigning their work practices to take advantage of new IT. This is a point that, when combined with Brynjolfsson and Hitt’s (1998) argument regarding new work practices, seems like a reasonable explanation for the IT productivity paradox.

A similar argument was made by Kock (2003), who claimed that the emergence of what he refers to as the business process redesign movement in the 1990s has led to an improvement in productivity gains from IT investment in service sector organisations. That movement is characterised by an emphasis on business processes in the change-oriented improvement of organisational work. It builds on several ideas in connection with IT-centred redesign of work practices proposed by Davenport (1993), Hammer and Champy (1993), and Harrington (1991). Kock (2003) also suggests that business process redesign needs to focus more strongly on the redesign of the communication flow in business process to yield even better benefits when combined with the implementation of new IT.

Carr (2003) has put forth what could be seen as a different hypothesis that could be used to explain the IT productivity paradox. The hypothesis essentially states that IT spending has been generally careless, and therefore wasteful, especially in the service sector of the economy. Service sector organisations have traditionally invested more heavily in IT, and in many cases have a greater dependence on IT to run their operations than manufacturing sector organisations (Kock, 2003). Therefore, Carr’s (2003) general argument also seems to provide a reasonable explanation for the IT productivity paradox.

### **3 The IT contracting imperative**

Given that virtually all IT implementation projects start with a purchase contract between the company purchasing the technology and the technology vendor, it is somewhat surprising that the nature of those contractual relationships has not been more carefully researched in connection with the IT productivity paradox. Moreover, IT contracting issues have achieved significant importance over the years due to several trends, particularly the trend toward IT outsourcing (Ang, 1998; Xue *et al.*, 2005). With exception made to the discussion of broad IT acquisition approaches and their relationship with previous findings in connection with productivity gains from IT

spending (Brynjolfsson, 1993; Brynjolfsson and Hitt, 1998; Carr, 2003), there is virtually no research on specific IT contracting approaches and their relationship with previous findings on those productivity gains.

Since there is a significant difference in productivity returns from IT spending in the service and manufacturing sectors, it is reasonable to expect that difference to be at least in part due to different approaches to acquisition of IT and, in turn, IT contracting. In consequence, one could expect that service sector organisations would adopt a somewhat different approach to acquiring IT products through contracts than manufacturing organisations, an approach that would arguably be inferior from a return on investment perspective.

Acquisition contracts, especially for products that are used over a relatively long time period, set the foundation for the likely future relationship that a buyer will have with its vendor (Milgrom and Roberts, 1992). Acquisition contracts, particularly those in connection with expensive and integrated IT products, may in fact play a role in and be affected by strategic planning (Grant, 2003). As pointed out by Gilbert (1992, p.169), the acquisition contract can be “an integral part of an organisation’s strategy, including its risk management strategy, by circumscribing relationships among interdependent parties seeking to create projects jointly around a multiplicity of diverse purposes”.

An IT acquisition contract can be viewed as a dynamic and legally binding document that results from agreements that are structured to allow consensual changes in the obligations imposed in order to fulfill the IT contract in uncertain conditions (Salbu, 1997). As such, an IT acquisition contract allows the organisation and the vendor to mutually adjust commitments while maintaining a shared perception of reciprocal responsibility (Smith, 1991).

Organisations may take several different approaches toward acquiring IT products, which should be reflected in the way IT acquisition contracts are perceived and negotiated (Atkins, 2003), particularly by the IT managers of the acquiring company. Arguably, approaches associated with mutual cooperation over the long term would yield better results in terms of return productivity returns on investment than more short-term oriented and adversarial approaches. These two different approaches could be seen as instances of what Davenport (2000) refers to as business decision and technology decision-driven approaches, respectively.

#### **4 ES contracting: the revisionist-adversarial and preservationist-cooperative approaches**

Among IT products, certain large and integrated software products often referred to as Enterprise Systems (ES) are usually among the most critical, expensive, and resistant to commoditisation (Davenport *et al.*, 2004). One common characteristic that sets ES apart from other software products is their broad scope and integration of several different business processes of an organisation’s supply chain (Davenport, 2000). Shang and Seddon (2002, p.272) define ES as “a set of packaged application software modules with an integrated architecture, which can be used by organisations as their primary engine for integrating data, processes and information technology, in real time, across internal and external value chains”.

From an ES acquisition perspective, the two main types of approaches discussed in the previous section would most likely be characterised by differing concerns regarding ES acquisition contracting elements. For simplicity, the type of approach that is more short-term oriented and adversarial will be called here the *revisionist-adversarial* approach. The type of approach where the emphasis is on mutual cooperation over the long-term as the will be referred to here as the *preservationist-cooperative* approach.

#### *4.1 The revisionist-adversarial approach*

It is also proposed here that the underlying orientation of the revisionist-adversarial approach to ES acquisition should be reflected by greater concerns regarding contract elements aimed at allowing the acquiring organisation to revise, or change, the ES and terminate the ES contract should the acquiring organisation feel that termination is warranted. Among those contract elements would arguably be the right of the acquiring organisation to customise the ES during the software acceptance period, the right of the acquiring organisation to develop and own derivative works (*i.e.*, code changes, translation, adaptations, customisations) based on the ES, and the right of the acquiring organisation to terminate the contract for cause or convenience.

#### *4.2 The preservationist-cooperative approach*

Conversely, it is proposed here that the underlying orientation of the preservationist-cooperative approach to ES acquisition should be reflected by greater concerns regarding contract elements aimed at the cooperative solution of issues stemming from a long-term contractual relationship. Among those contract elements would arguably be rights to software license reassignment within the acquiring organisation, portability to different hardware platforms that the acquiring organisation have adopted or may adopt, and assurances regarding forward compatibility of the software with hardware and software changes affecting the acquiring organisation.

The above should be true whether contracts are complete or incomplete. Complete contracts are defined as contracts wherein all contingencies are addressed at the time of writing, whereas incomplete contracts include clauses that allow flexibility to address unforeseen circumstances (Gifford, 1999; Williamson, 1975). Within the IT field, incomplete contracts have historically been the norm, to some extent due to the dynamic nature of the field (Harris, 2000; Kavanagh, 2004; Richmond *et al.*, 1992).

## **5 A model of divergent ES contracting approaches in the service and manufacturing sectors**

Previously in this paper it has been pointed out that there is a significant difference in IT spending-related productivity gains in the service and manufacturing sectors, a phenomenon that has been generally referred to as the IT productivity paradox. It has also been pointed out that different approaches to acquisition of IT, reflected in different approaches to IT contracting, could display a close alignment with that significant difference.

In the previous section, the above assumptions were applied to ES contracting. This extension of assumptions regarding IT contracting to ES contracting makes sense given that ES are usually among the most critical and expensive IT products. Moreover, from an industry practitioner's relevance perspective, this extension is warranted by the continued industry interest (Berryman and Seaberg, 2004; Grant, 2003), as well as the continued and in some cases growing spending in ES.

A simple theoretical model follows naturally from the above mentioned extension, which itself builds on the categorisation of ES contracting approaches as being of two main types – revisionist-adversarial and preservationist-cooperative. The theoretical model can be summarised through the following propositions, and also makes the basic assumption, which follows from last section's discussion, that the revisionist-adversarial approach is generally inferior to the preservationist-cooperative approach.

*Proposition 1* IT managers in service sector organisations generally display a preference toward the revisionist-adversarial approach to ES contracting.

*Proposition 2* IT managers in manufacturing sector organisations generally display a preference toward the preservationist-cooperative approach to ES contracting.

The propositions above incorporate a theme that is closely aligned with the IT productivity paradox phenomenon. That theme is that if service sector organisations as a group have historically had inferior productivity-related returns on IT investment than manufacturing sector organisations, then that should be reflected in inferior IT contracting practices, and thus inferior ES contracting practices. That is, ES contracting would reflect a broader problem (the IT productivity paradox), and perhaps be situated at the source of that problem. The propositions above also acknowledge the IT productivity paradox as a real phenomenon, and not simply as a result of bad productivity returns measurement (see, *e.g.*, Brynjolfsson, 1993).

The model of divergent ES contracting approaches proposed here is a temporal and somewhat normative model, in the sense that it both reflects the likely *status quo* and points at directions for changes in that *status quo*. Incidentally, this is also true of the IT productivity paradox model discussed earlier.

## 6 Research method

The theoretical propositions of the ES contracting model proposed here were tested based on three main test criteria developed based on the model's discussion. The first criterion was that evidence of a preference toward revisionist-adversarial approach to ES acquisition should be reflected by an emphasis on at least one of the following contract elements: customisation rights and termination rights. The second test criterion was that evidence of a preference toward the preservationist-cooperative approach would be reflected in an emphasis on at least one of the following contract elements: reassignment rights, portability rights, and compatibility assurances. Table 1 lists each of the contracting approaches, respective contract elements where particular emphasis is placed, and the meaning of each contract element.

**Table 1** ES contracting approaches, respective contract elements, and their meaning

<i>Contracting approach</i>	<i>Contract element</i>	<i>Meaning</i>
Revisionist-adversarial	Customisation rights	Rights allowing the acquiring organisation to revise, or change, the ES
	Termination rights	Rights allowing the acquiring organisation to terminate the ES contract should it feel that termination is necessary
Preservationist-cooperative	Reassignment rights	Rights allowing the acquiring organisation to reassign ES licenses within its organisational boundaries
	Portability rights	Rights allowing the acquiring organisation to port the ES to different hardware platforms that the acquiring organisation have adopted or may adopt
	Compatibility assurances	Assurances by the ES vendor regarding forward compatibility of the ES with hardware and software changes affecting the acquiring organisation

The third main test criterion was that a preference toward an ES contracting approach should be reflected in a lack of emphasis on all of the contracting elements of the opposing approach. For example, an emphasis on customisation rights would be an indication of a preference toward the revisionist-adversarial approach only if it was accompanied by a lack of emphasis on reassignment rights, portability rights, and compatibility assurances.

The main method of data analysis employed was Partial Least Squares (PLS), for which the PLS-Graph software package was utilised (Chin *et al.*, 1996; Chin, 1998). While this study could have employed a comparison-of-means method for data analysis (Rosenthal and Rosnow, 1991), PLS was employed because it offered certain advantages. PLS allowed for the use of multiple indicators for each construct and for the test of the entire model at once, without the need to calculate construct scores based on indicators (*e.g.*, by averaging indicators). PLS also allowed for the assessment of the model with and without control variables in a relatively simplified manner.

### 6.1 Data collection

The data for this study was collected via a mail survey sent to IT executives in charge of ES contracting. The survey questionnaire was developed based on a previous research project on ES acquisition practices (Verville, 2000), a study of software contracting by the Society of Information Management (SIM, 1995), and a literature review in area of contract law. A small pilot study, conducted with 30 respondents, was used to pre-test the instrument and to identify any ambiguities and other problems with the survey questionnaire.

The survey questionnaire was mailed to a random group of 817 organisations. The organisations varied in size and were from both manufacturing and service sectors. Following a second request, the number of usable responses was 116, for an overall response rate of approximately 14%. Approximately 61% of the respondents were from the manufacturing sector, and 39% from the service sector. In terms of size, based on

number of employees, 10.4% of the organisations had less than 1000 employees; 59.7% had between 1000 and 9999 employees; 22.4% had between 10 000 and 49 999 employees; and 7.8% had more than 50 000 employees. In terms of type of ES acquired, 57.8% of the organisations had acquired enterprise resource planning systems; 18.3% had acquired a customer relationship management, supply chain management, or other type of ES; and 25% had acquired more than one type of ES. In terms of the ES vendors, in 12.1% of the cases it was SAP; 12.1% was Oracle; 17.2% was PeopleSoft; 4.3% was BAAN; 35% was other vendors; and 19% was more than one vendor.

## 6.2 Constructs and measures

The data analysis gravitated around five main perception-based constructs, modelled as latent variables in PLS. The constructs were: customisation rights, termination rights, reassignment rights, portability rights, and compatibility assurances. All constructs were measured through two indicators, with exception of compatibility assurances, which was measured through three indicators (see Table 2). The Appendix lists the question-statements associated with each indicator. Answers were provided on a 7-point Likert-type scale.

**Table 2** Item-to-construct loadings and reliability coefficients

Construct	Indicator	1	2	3	4	5	CR
1. Customisation rights	Custom01	<u>.82</u>	.12	.18	.17	.08	.82
	Custom02	<u>.88</u>	-.05	.01	-.13	-.05	
2. Termination rights	Termin01	.25	<u>.78</u>	.14	.04	.20	.81
	Termin02	-.13	<u>.84</u>	-.04	.11	-.06	
3. Reassignment rights	Reassi01	.12	-.07	<u>.84</u>	-.01	.18	.70
	Reassi02	.06	.16	<u>.82</u>	.11	-.08	
4. Portability rights	Portab01	-.03	.04	.11	<u>.79</u>	.27	.68
	Portab02	.06	.13	-.01	<u>.80</u>	.22	
5. Compatibility assurances	Compat01	.01	.03	-.05	.13	<u>.90</u>	.91
	Compat02	.04	.02	-.01	.21	<u>.87</u>	
	Compat03	.01	.10	.25	.25	<u>.74</u>	

Notes: Factor extraction method – principal component analysis;  
rotation method – varimax with Kaiser normalisation;  
CR = composite reliability, PLS analysis.

Table 2 shows indicator-to-construct loadings and composite reliabilities for each construct. The indicator-to-construct loadings have been calculated through factor analysis employing varimax rotation (Rencher, 1998), and generally indicate acceptable levels of factorial and discriminant validity (Carmines and Zeller, 1979) for the measurement model used. The composite reliabilities for each construct were calculated using the PLS-Graph software and, although slightly lower than expected for reassignment rights and portability rights, generally suggest acceptable levels of reliability (Bagozzi, 1980; Nunnally, 1978), particularly given that they are based on a new measurement instrument that is being used for the first time in this study.

## 7 Results

Table 3 summarises descriptive and inferential statistics generated based on the data collected through the survey. The main independent variable was economic sector, that is, either manufacturing ('manu') or service ('serv'). The  $\beta$ 's were calculated as partial correlations between the independent variable and each of the five dependent variables (which, as indicated in Table 2, present a high degree of orthogonality). The T values were calculated through the bootstrapping method. The P values were calculated in the absence of control variables. The  $P_c$  values were calculated in the presence of two control variables, namely the size of the acquiring company and the type of ES acquired. The  $\beta$ 's and T's shown in Table 3 are for the no control variables condition. The  $\beta$ 's and T's for the control variables condition are slightly lower for the variables with  $P_c$  indicated as 'NS' (*i.e.*, non significant) and about the same for the variables with both P and  $P_c$  lower than 5% (*i.e.*, P and  $P_c < .05$ ). The rows in which P and  $P_c$  lower than 5% are highlighted through shading.

**Table 3** Descriptive and inferential statistics

<i>Dependent variable</i>	<i>Mean (manu)</i>	<i>Std. dev. (manu)</i>	<i>Mean (serv)</i>	<i>Std. dev. (serv)</i>	$\beta$	T	P	$P_c$
Customisation rights	5.18	1.24	5.68	1.12	.220	2.35	<.05	<.05
Termination rights	5.76	1.01	6.07	0.89	.164	1.94	<.05	NS
Reassignment rights	6.60	0.70	6.31	1.03	-.205	1.90	<.05	NS
Portability rights	6.23	0.89	5.96	1.03	-.244	2.13	<.05	<.05
Compatibility assurances	6.07	0.88	5.78	1.21	.142	1.26	NS	NS

Notes:  $\beta$ 's from PLS analysis; independent variable: sector, manu = manufacturing, serv = service;  $P_c$  = P with control variables; control variables: company size, type of ES; T = T statistic, bootstrapping; NS = not significant.

According to Table 3, respondents from service sector organisations placed a higher emphasis on customisation rights ( $5.68 > 5.18$ ) as elements of ES contracts than respondents from manufacturing sector organisations; a difference that was statistically significant in both the absence ( $P < .05$ ) and presence of the control variables ( $P_c < .05$ ). Respondents from service sector organisations also placed a higher emphasis than respondents from manufacturing sector organisations on termination rights ( $6.07 > 5.76$ ) as elements of ES contracts; even though that difference was statistically significant only in the absence of the control variables ( $P < .05$ ).

It can also be concluded based on Table 3 that respondents from manufacturing sector organisations placed a higher emphasis than respondents from service sector organisations on reassignment rights ( $6.60 > 6.31$ ) and portability rights ( $6.23 > 5.96$ ). The difference in connection with reassignment rights was statistically significant only in the absence of the control variables ( $P < .05$ ). The difference in connection with portability rights was statistically significant in both the absence ( $P < .05$ ) and presence of the control variables ( $P_c < .05$ ). No statistically significant difference was found in connection with compatibility assurances.

## 8 Discussion and implications

A conservative view of the evidence would suggest that more attention be paid to the analysis results where both  $P$  and  $P_c$  are lower than 5%. Even when only those results are considered, it can be concluded that the results summarised in the previous section generally support the model of divergent ES contracting approaches proposed in this paper. That is, according to the test criteria previously discussed in this paper, IT managers in service sector organisations do seem to generally display a preference toward the revisionist-adversarial approach to ES contracting; whereas their manufacturing sector counterparts seem to prefer the preservationist-cooperative approach. Table 4 shows each of the model's propositions, whether they are supported or not, and a summary of the supporting evidence.

**Table 4** ES contracting model propositions, conclusions, and related evidence

<i>Proposition</i>	<i>Supported?</i>	<i>Summary of supporting evidence</i>
P1: IT managers in service sector organisations generally display a preference toward the revisionist-adversarial approach to ES contracting.	Yes	Respondents from service sector organisations placed a higher emphasis on customisation rights (5.68 > 5.18) as elements of ES contracts than respondents from manufacturing sector organizations ( $P < .05$ ; $P_c < .05$ ).
P2: IT managers in manufacturing sector organisations generally display a preference toward the preservationist-cooperative approach to ES contracting.	Yes	Respondents from manufacturing sector organisations placed a higher emphasis on portability rights (6.23 > 5.96) as elements of ES contracts than respondents from service sector organisations ( $P < .05$ ; $P_c < .05$ ).

The difference in perceived importance of customisation rights by IT executives in service and manufacturing sector organisations was approximately 10%; with service sector executives perceiving customisation rights as more important. The difference in connection with portability rights was approximately 5%; with IT executives in the manufacturing sector perceiving portability rights as more important. These differences can be seen as compounding each other, since the perceptions refer to contracting elements of two opposing ES contracting approaches. The emphasis on customisation rights characterises the revisionist-adversarial approach, whereas the emphasis on portability rights characterises the preservationist-cooperative approach.

The evidence is not only consistent with the IT productivity paradox, but it also suggests that the paradox may be in part addressed by a service sector-based shift in IT contracting from a revisionist-adversarial to a preservationist-cooperative approach, assuming ES contracting to reflect IT contracting in general closely enough so that the findings of this study could be extrapolated. Moreover, as indicated by the evidence, the perception that customisation rights are important is the single most discernible difference between ES contracting approaches employed by service and manufacturing sector organisations. This suggests that trying to customise ES is not very advisable.

One could argue that the service sector's ES contracting preference pointed at by the evidence is symptomatic of the highly varied systems requirements (real or perceived) that exist in service sector organisations in general. It may be more important to IT

managers in service sector organisations to have the ability to customise ES to meet their specific needs, as those managers perceive them. Often, generic ES software may be seen as lacking key components perceived as needed by service sector organisations. Within the manufacturing sector, on the other hand, IT managers' preference regarding ES may be seen as analogous to those in connection with a brand-new, factory-ordered car with all the bells and whistles. In other words, IT managers in manufacturing sector organisations may, due to their view of the products that their own organisations' produce, dread the word 'customisation' and all the complexities, risks and added costs associated with it.

The evidence however, does not provide a very clear picture regarding the strength of the impact on productivity returns on IT investment of taking a more revisionist-adversarial or preservationist-cooperative approach. That could have been inferred from a PLS-based analysis of a model in which the main dependent variable measured productivity returns on ES spending; such variable was not incorporated in this study (this is discussed in more detail below, as a research limitation). Nevertheless, some estimates can be put forth that would at least suggest the relevance to IT executives of moving away from revisionist-adversarial and toward preservationist-cooperative approaches to ES contracting.

Previous literature suggests that the gap in productivity returns from IT spending in the service and manufacturing sectors may be about 15% (Brynjolfsson and Hitt, 1998; Hackett, 1990). Therefore, the difference in ES contracting approaches is likely to account for less than 15% of those productivity returns. This does not mean that the amounts at stake are negligible. Losses in productivity gains due to the adoption of a revisionist-adversarial approach can be substantial, especially in large organisations. For example, in a company investing \$20 million in an ES implementation, and adopting a revisionist-adversarial approach to ES contracting, a loss in productivity gains of about 5% (a third of the difference suggested by the literature) may easily amount to an absolute loss of \$1 million.

## **9 Research limitations**

One of the limitations of this study is the relatively small sample size used. The current sample size of 116 adequately meets the ten cases per parameter rule for calculation of sample sizes in PLS-type analyses (Kline, 1998), which are essentially structural equation modelling-type analyses (Schumacker and Lomax, 1996). In the absence of the control variables, the number of parameters would be 11 and thus the required sample size would be 110 cases. However, the inclusion of the control variables adds four parameters, and thus brings the appropriate sample size up to 150 cases; a requirement that is not met by the current case study. Given the effect sizes indicated by the beta coefficients obtained through the PLS analysis, it is reasonable to assume that if the distribution of answers were to remain essentially the same as in this study, a higher sample size would provide stronger support for the ES contracting model proposed here. Of course the opposite could happen if the distribution of answers were to change significantly in the opposite direction – *i.e.*, with emphases indicating perceptions that go against the proposed ES contracting model.

This study assumes that the IT productivity paradox phenomenon extends to the sample of organisations studied. This is used as a basis to relate the ES contracting model here proposed to previous literature on IT spending gains. However, this study does not build on actual measures of productivity returns on IT investment for the organisations that participated in the survey. This essentially means that the findings presented in this study could be wrong if productivity gains from ES spending in the organisations studied were not aligned with expectations based on the IT productivity paradox. For example, if the service sector organisations studied had better productivity returns from ES spending than the manufacturing sector organisations, then their apparent preference toward the revisionist-adversarial approach could have been beneficial (rather than detrimental, as assumed) to those service sector organisations.

Nevertheless, it is not very likely that the limitations above substantially affected the results of this study. The sample size is not small enough to lead to serious concerns that it could substantially bias the results (Schumacker and Lomax, 1996), particularly given that the PLS analysis employed bootstrapping for the estimation of change probabilities – bootstrapping is a non-parametric technique designed for use with small sample sizes (Diaconis and Efron, 1983; Nevitt and Hancock, 2001). Also, the notion that a preference toward the revisionist-adversarial approach would lead to better productivity returns on IT spending is inconsistent with much of the literature on ES contracting (see, e.g., Verville, 2000). It is nevertheless suggested that the above limitations be addressed in future research projects through increases in sample size and revisions of the data collection instrument (see Appendix) to include measures of productivity returns on ES spending. It also seems advisable to include measures in connection with other performance indicators, such as profitability, revenues, and quality.

## 10 Conclusion

Many different explanations have been proposed for the IT productivity paradox phenomenon, which generally refers to low returns on productivity gains from IT spending, particularly in the service sector. Among those explanations are measurement errors; the poor job that service sector organisations have done at redesigning their work practices to take advantage of new IT; a misguided lack of business process redesign emphasis on communication flows; and wasteful and careless IT spending in the service sector of the economy.

A sub-optimal approach to IT contracting is not among the above explanations, and apparently has not been investigated as a possible reason for the IT productivity paradox. This paper makes an important contribution to the research literature by taking a first step in addressing that omission. It does so from both a theoretical and empirical perspective, by looking at IT contracting approaches in the context of Enterprise Systems (ES) acquisition. A model of divergent ES contracting approaches is proposed, featuring two main ES contracting approaches: the *revisionist-adversarial* approach, associated with ES contracting elements geared at potentially short-term and change-oriented relationships with ES vendors; and the *preservationist-cooperative* approach, involving contracting elements aimed at mutual cooperation over the long run with vendors.

The model proposes that service sector organisations generally display a preference toward the revisionist-adversarial approach, which is supported by evidence indicating that IT executives of service sector organisations perceive ES customisation rights as approximately 10% more important than IT executives of manufacturing sector organisations. The model also proposes that manufacturing sector organisations generally display a preference toward a preservationist-cooperative approach, which is also supported by evidence indicating that the difference in importance of ES portability rights is approximately 5%, with IT executives in the manufacturing sector perceiving those rights as more important.

This study generally supports the IT productivity paradox notion and also suggests a new explanation for it. The new explanation is that service sector organisations tend to adopt a more revisionist-adversarial approach to IT contracting, which in turn contributes in part to making them reap lower productivity gains from IT spending than their counterparts in the manufacturing sector. In particular, this study provides the basis on which one could argue that customisation of large, complex and expensive IT products such as ES may not be a good idea. This claim may be seen as more or less counterintuitive, depending on which IT vendors' views are considered. Those vendors that rely heavily on post-sale IT maintenance services for much of their revenues, which comprise many ES vendors today, may find the claim counterintuitive. Those vendors that rely heavily on license-based revenues, and that provide post-sale software maintenance as a bonus to their customers, may find the claim perfectly reasonable.

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**Appendix: Constructs and measures**

The dependent constructs used in this investigation are shown below, followed by the question-statements used to measure them. The question statements were preceded by the following instructions: "In your opinion, how important are the following contracting issues in the purchase of Enterprise Software? Specify your answer using a response scale of 1 to 7 where: 1) Not Very Important; 7) Very Important."

*Customisation rights*

- Custom01: The right to develop and own derivative works (*i.e.*, code changes, translation, adaptations, customisations) based upon the software.
- Custom 02: The right to customise during the software acceptance period.

*Termination rights*

- Termin01: The right to terminate for convenience.
- Termin01: The right to terminate for cause.

*Reassignment rights*

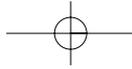
- Reassi01: The right to assign the software license to a new corporate entity resulting from a merger, consolidation, acquisition or divestiture.
- Reassi02: The right to re-assign software licenses within the corporate entity.

*Portability rights*

- Portab01: The right to port the software to any platform supported by the vendor at no or minimum charge.
- Portab02: In situations other than enterprise-wide licenses, the right to transfer the software to other equipment and operating systems at no costs.

*Compatibility assurances*

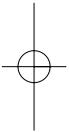
- Compat01: Contractual assurances regarding forward compatibility of the software with changes in operating systems.
- Compat02: Contractual assurances regarding forward compatibility of the software with changes in hardware.
- Compat03: Contractual assurances regarding forward compatibility of the software with changes in other software from the same vendor.



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