Building the Invisible Palace:
Capability gaps, traps and overlaps in complex software projects

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Abstract
The growth of the IT industry has been dramatic and information and communication technologies (ICTs) now play a fundamental part in many, if not all, of the critical infrastructures upon which modern society depends. The use of ICTs within organisations of all types is approaching ubiquity with many such systems being viewed as mission critical. This spread and the increasing criticality of such systems itself relies upon the ability to develop complex software systems in a reliable and predictable fashion. However, there is widespread evidence that the development of software in such a fashion continues to present a formidable challenge to many organisations with software typically being delivered late, over budget and with reduced functionality.

Whilst large software projects have always posed huge challenges for suppliers of bespoke software, the nature and scale of that challenge has evolved over the years. At the level of the individual firm, modern information systems development takes place in the context of a series of interconnected complexities concerning alignment with organisational goals, primary and secondary sourcing, integration of new systems and backward integration with existing systems. At the level of the industry, these complexities are in turn managed in the context in which specialist capability has largely migrated to the IT services industry, necessitating the involvement of a range of intermediaries. Such work takes place within the wider context of a range of highly flexible technologies with high rates of technical and skill obsolescence. Within this turbulent situation data across a range of performance metrics may be difficult or impossible to obtain with the result that organisations will often operate in the absence of reliable information.

This exploratory paper will provide a high-level examination of the major challenges associated with the development of large-scale complex software systems and trace the emergence of the current situation facing many organisations. In order to provide a context for the discussion, the paper will examine the recent growth and development of the software and computer services industry and draw on earlier work that assesses its maturity (Flowers and Brady, 2001). The development of complex sourcing for IT (Venkatraman, 1997) and the rapid growth and expanding role of intermediaries within the software industry will also be examined.

The nature and implications of the migration of specialist capability within the IT and software industry will be explored and the paper will build on earlier work in the area (Feeny & Willcocks, 1998) to argue that there has been the emergence of a series of capability gaps, traps and overlaps that provide a further layer of sourcing complexity to what is already a hugely complex procurement and development context. The issues and implications of this situation will be examined and it will be argued that the emergence of significant capability imbalances against the background of poor data provide the context for the continued uneven performance of complex software projects. The paper will conclude with an examination of the implications of this situation to the development of complex software projects.

Introduction

The last few decades have seen role of IT shift inexorably from a playing a support to an increasingly mission-critical role within the value chain of very many organisations. In parallel with this development, the sourcing of IT has moved increasingly to a range of specialist computer services frims, consultancies and other organisations. This shift in the sourcing of software and computer services means that organisations will tend to employ such third-party organisations in order to take advantage of the opportunities offered by the increasing power and complexity of the latest technology.

Whilst this description outlines the realities faced by many organisations, this situation is often not reflected in the literature which tends to take a firm-based, specifically buyer or client, approach to these issues. It is the purpose of this paper to draw on several strands of literature surrounding the effective use of IT within organisations and provide an alternative analysis of capabilities across the IS/IT supply chain.

Building from a range of earlier work in the area of capability, this paper will explore the location and nature of organisational capabilities across the major actors within the IS/IT supply chain. In developing this analysis the paper will examine a series of trends concerning the success rates of IT projects, the scale and complexity of the projects themselves, the sourcing of IT services, and the growth in IT consulting and research. In order to place the trends in a commercial context, the case of an supplier of IS/IT systems, X Corp, will be examined.

In exploring the notion of capabilities across the IS/IT supply chain, the paper will introduce a new framework for analysing the spread of capabilities between Supplier, Client and Advisor organisations. In addition to mapping capabilities identified in earlier work, the paper will introduce the notion of Enactment an Engagement capability types. The potential for capability gaps, traps and overlaps will be identified and the implications explored. The paper will conclude with an examination of some of the major issues raised for each and outline a range of important questions for further research.

Research Method

The case study was selected because X Corp, an IS systems supplier operating in the financial services industry, is facing significant new challenges both in technical terms but also in the tendering process. Although the study is limited to a single case from a single sector it provides a useful supplier-side perspective on information systems and computer service capabilities and, as such, provided novel insights to what, in the IS literature, is an almost solely Client perspective. The empirical research was carried out in a series of interviews in the latter months of 2001 with senior staff within X Corp

Adopting a supplier perspective on buyer capabilities provides a novel route into the way in which such organisations employ IS/IT within their organisations and their procurement processes. Whilst such insights, obtained from a single supplier of IT systems operating in a single commercial sector, could not be viewed as representative of all user organisations, it does provide some useful insights into the changing nature of capabilities within the IS/IT function. The case outlines the trends facing many organisations as the technical complexity of their systems grows dramatically. The case also shows the impact that Advisor groups are beginning to have on the procurement of large IS systems.

Trends - the delivery of IT projects

The development of large IT systems, and the software that they contain, represent some of the most complex engineering activities that have ever been attempted by human civilisation. The creation of such large, complex, systems like air traffic control or space shuttle avionics, often represent the frontier of human understanding of the technologies or the applications being created and may thus be viewed as genuine pioneering efforts. Given the high level of novelty encapsulated in such systems it is perhaps unsurprising that projects of this type sometimes take longer, cost more, or fail to meet all their objectives - sometimes all three. However, this type of very large scale, one-off bespoke system are untypical of the much larger volume of commercial software systems that are developed for use within commercial and public sector organisations.

At the level of the project, the evidence concerning the success rates of such mainstream developments is not impressive, with over 70% of projects being either late, substantially over budget, cancelled, or failures (Standish, 2000). Whilst the data regarding success and failure of software projects is often very difficult to obtain and whilst there are many examples of public sector software project failure, there is also extensive anecdotal evidence of private sector IT project failure. Whilst it is recognised that the notion of success and failure are complex and multi-faceted (Morris and Hough, 1987), one of the few metrics in this area is provided by the Standish Group who have undertaken research in this area since 1995. Using their rather narrow definitions of success and failure the 1995 survey reported that 31.1% of projects were cancelled before completion (Failures), and a further 52.7% were completed over-budget (Challenged), late and offered fewer features and functions than originally specified. Only 16.2% of projects were completed on-time and within budget (Standish Group, 1995). In contrast the 2000 study reported that project Failures stood at 23%, Challenged projects 49% and Successful projects 28% (Standish Group, 2000).

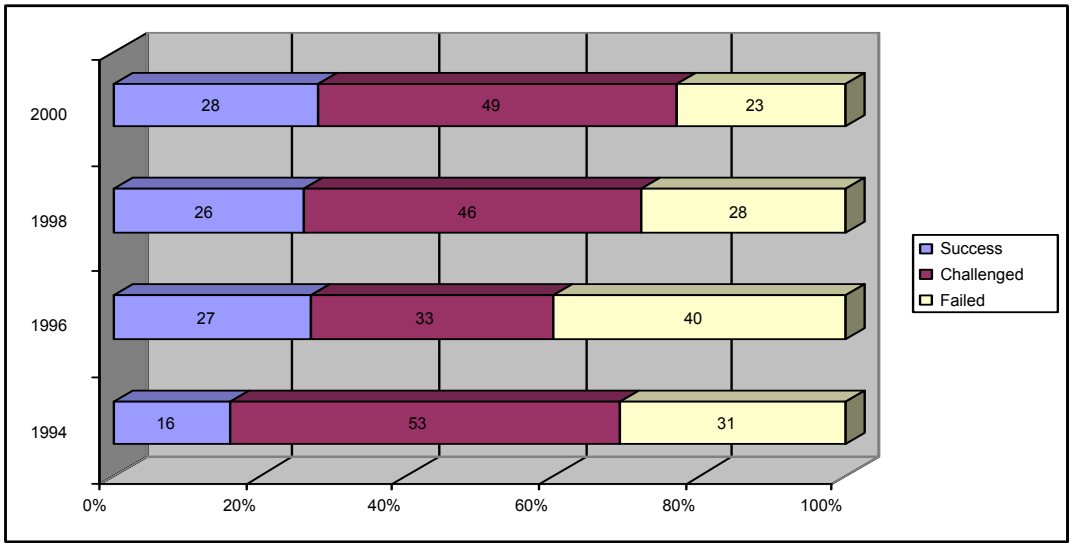


Figure 1, Success rates of IT projects 1994-2000

The data in figure 1 relate to the findings of research undertaken by the Standish Group into the rates of success and failure of IT projects and show the results for the four years 1994, 1996, 1998 and 2000. Over this period of time the findings indicate that only a minority of projects, in terms of narrow definition of being delivered on time, to original specification, and within budget, can be considered as successful. Whilst this definition of success may itself be questioned, and the self reporting methodology adopted challenged, it is clear that the industry as a whole has significant problems in successfully completing IT projects on time and to budget and that, in these terms, such projects carry significant risks.

A comparative perspective on this data may be obtained by examining the results of work looking at similar high-risk development activities. The development and procurement of new defence equipment is recognised as an activity in which uncertainty and changes to specification can lead to significant budget overspends and schedule slippages. A Department of Defense (DoD) survey that examined cost and schedule data from 93 major acquisitions started between the years 1975 and 1998 found that the acquisitions overran the original schedule estimates by an average of 24%. Further studies concluded that weapon system development typically overran cost by 20-40% and that acquisitions average 16-18 years (GAO, 1998). Whilst these data raise almost as many questions as they answer, and further work needs to be done to understand the precise causes and mechanisms of this situation, it is clear that even now IT projects continue to pose considerable challenges.

Trends - Scale and complexity

Such problems not only affect IT systems but also a wide range of large software-intensive systems, including a whole of class of constructs termed Complex Product Systems. Complex Product Systems, or CoPS, can be thought of as the large-scale systems that form the basis of the infrastructure of the developed economies, with examples including banking automation systems, mobile communication systems, semi-conductor fabrication plant, flight simulators and

petrochemical installations. More precisely, CoPS have been defined as 'high value products, systems, capital goods, control units, networks and high-technology constructs' (Hobday and Rush, 1999). By their very nature such systems tend to be produced either as a one-off or as part of a small batch.

Whilst CoPS and their software counterparts may represent the pinnacle of achievement in terms of scale and complexity, there is a clear trend for the software component of IT projects to grow. A major factor in this shift is the move away from the early automation model of computerisation, via scaled-up integrated versions of early manual systems, to systems whose conception and application rely entirely upon an IT-intensive approach. Such systems, termed first, second and third-order systems respectively, encapsulate the fundamental difference in the philosophy, conception and complexity of the systems themselves. Thus, whilst the first wave of commercial computerisation largely focused on a labour substitution model of use and automated existing areas of work, the most recent wave offered organisations the opportunity either to perform existing processes in entirely new ways (e.g. ERP systems) or to offer entirely new services in entirely new ways (e.g. E-Commerce). This move from the first–order use of computers to the IT-intensive use has required a corresponding increase in the scale and complexity of the software systems required to support it (Flowers and Brady, 2001)

One indication of the scale of current application software may simply be drawn either by the lines of program code that has been produced or from a function point perspective. The lines of program code is a widely used metric but, as an estimating tool, suffers from its inability to deal easily with the issue of fixed costs in a production process. The function point is a widely-used metric, developed in IBM Research Labs, in order to provide a more reliable estimator of overall software system cost than that based on cost per line of code alone. The function point value of a system is derived from five external attributes of software systems: inputs, outputs, inquiries, data files and interfaces. Recent work attempting to map the growth in the size of projects found a continuous upward trend in scale, estimating that between 1970-2000 that the definition of large software projects has grown in size from 1,000 to 10,000 function points (Longstreet Consulting, 2000). To put this in context, a report (AGC, 1995) by the Canadian Government into the management of large public sector software systems estimated that, of the six major systems under development at the time of the enquiry, all contained between 14,000 and 16,000 function points, including one system that had already been scaled down.

Trends – sourcing of IT services

The shift in the positioning of IT within organisations has been reflected in the themes that have emerged within the literature. One strand is concerned with the way in which an organisation can gain competitive advantage through the effective use of IT. Developing from Porter and Millar's information intensity approach (Porter and Millar, 1986), via business process reenginering (Hammer, 1990) to an examination of the role of IT in enabling business transformation (Scott Morton, 1991, Short & Venkatraman, 1992, Tapscott & Caston, 1993). This has been a remarkably consistent theme and continues to be an inherent feature concerning certain types of IT use within organisations. A parallel discussion is concerned with the issues associated with the sourcing of an organisation's IT operations and encompasses a broad and growing literature in this area. This debate has moved from the discussion of case examples (e.g. Huber, 1993; Cross, 1995) to detailed examinations of the benefits and risks of the approach (e.g. Lacity and

Hirschheim, 1993; McFarlan and Nolan, 1995; Earl 1996), to a contingent approach (e.g. Lacity et al, 1996) to a re-examination of the role of IT as a source of value within the organisation (Venkatraman, 1997).

Over the period of these twin debates not only has the scale and nature of what can be achieved with IT developed dramatically but the scale of IT outsourcing operations, and the scale of the industry to support it, has also grown. The move to outsourcing IT services has been significant with market growth in the UK of 43% in 1996, 22% in 1999, and projected to level out at around 18% until 2003. The revenue of the top ten outsourcing organisations in the UK for 1999 was a little over £3.7 billion (Holway, 2000).

On a broader perspective, in 1995 the global market for computer services was estimated by IDC to be worth over $220 billion, of which the development of custom software accounted for nearly $16bn and IT consulting $11 billion (IDC, 1995) In the same year the UK the software consultancy and supply industry (SIC 72.20) had a combined turnover of around £13 billion and by 1998 had grown by over 22%. In Europe, the software and computing services market (which in this context includes outsourcing) grew by 14.7% in 1999 to some Euro 127 billion, and is forecast to grow at around the same rate for several years and be worth Euro 211 billion in 2003 (Holway, 2000). The increasing importance of this sector is likely to be a result of structural changes both in the way in which information and communication technologies are used within organisations and the sourcing of the IT services themselves.

Trends – growth in Management and IT consulting

Another perspective on this rapid growth is to examine the size and scale of the Management Consulting industry. In 1999, the European Management Consulting industry was composed of 40,000 individual firms which employed around 260,000 consultants and generated Euro 36 billion revenue, an increase of 15.9% in revenue terms over the previous year. Within this IT Consulting accounted for 44% of turnover with a growth rate of 38% on 1998 figures. Over the period 1995-1999 Management Consulting in Europe has grown from 0.14 % to 0.33% of European GDP and is moving to towards comparability (in GDP terms) with the US position, in which Management Consulting turnover accounts for 0.5% of GDP (FEACO, 1999). Growth rates of the consulting industry as a whole are high and are growing significantly faster than the host economies, which have typically grown much more slowly over the same period. Indeed, UK growth rates over the period 1993-1999 have averaged around 14%, indicating that the sector enjoyed high growth.

This sector now provides the full range of IT-related services and the development of this IT services market has meant that organisations no longer need to maintain a full array of the capabilities required to be an effective user of IT. However, one potential implication of this, as noted by authors on outsourcing (Martinsons, 1993; Earl, 1996) is that key capabilities may, over time, be lost to the organisations. For example, for many organisations the capabilities and resources required to develop a leading-edge 3rd order IT system may not exist within the firm and could only be obtained from outside, most likely from an external IT consultancy. The existence of a significant gap between those capabilities that are likely to exist within organisations and those available outside, arguably the basis of a strong service sector, is clear

and it is likely that, as a group, consultancies have now become the prime source for many IT capabilities.

As the complexity of applications and sourcing has grown so too has the market for IT research and advice. This market, which includes organisations like Gartner, IDC, Forrester, AMR and Meta, provides advice on a wide range of technologies and technology-related business issues. The scale of this market is significant and growing with revenues in 2000 in excess of $1.5bn, a growth of over 30% on 1999 (Gartner, 2001).

Organisational Capabilities and Absorptive Capacity

In response to these trends, as the leading-edge uses of IT have moved from 1st to 3rd order applications, IT sourcing has evolved, and organisations have needed to deploy an increasingly sophisticated array of capabilities in order to deal with innovative technologies and applications. Whilst the importance of core internal capabilities in being effective in the use of IT have been emphasised (e.g. Feeny & Willcocks, 1998, Earl& Feeny, 2000) the discussion has tended to be inward-looking and from the perspective of the buyer. In their paper, based on earlier work with buyer organisations, Feeny and Willcocks identified nine core capabilities that were proposed to be central to a high performance IS/IT function. Positioned within the context of the growth in outsourcing of the IT function, the work aimed to identify which IS technology and management capabilities are core to an organisation's future capacity to exploit IT succesfully. The capabilities that were identified are summarised in Table 1.

Core IS Capability	**Outline**
IS/IT Leadership	Integrating IS/IT efforts with business purpose and activity
Business Systems Thinking	Envisioning the business process that technology makes possible
Relationship building	Getting the business constructively engaged in IS/IT issues
Architecture Planning	Creating the coherent blueprint for a technical platform that responds to current and future needs
Making technology work	Rapidly achieving technical progress – by one means or another
Informed buying	Managing the IS/IT sourcing strategy that meets the interests of the business
Contract facilitation	Ensuring the success of existing contracts for IS/IT services
Contract monitoring	Protecting the business's contractural position, current and future
Vendor development	Identifying the potential added value of IS/IT service suppliers

Table 1: Core IS/IT capabilities for exploiting Information technology (after Feeny and Willcocks, 1998)

These capabilities, synthesised from earlier research , may be viewed as an ideal model of the capability profile that should be possessed by an IS function in order for it to be 'dynamic and fully functional' (Feeny and Willcocks, 1998). Whilst this work takes an exclusively buyer perspective, it is useful to supplement this view with some insights into the capabilities possessed by suppliers of high-technology products. These capabilities have been referred to as Project capabilities (Davies and Brady, 2000) and include a range of bid preparation and project management capabilities. Bid preparation capabilities include requirements gathering, conceptual design, cost estimation, service definition and risk management. Project management capabilities include integrating organisational functions, purchasing and managing resources, team working, and the use of tools and techniques (e.g. project management tools) to improve project performance.

Another perspective on the role and importance of a broad set of organisational capabilities may be obtained by considering how easy it is for an organisation to recognise, absorb and exploit external information. This capability, termed Absorptive Capacity (Cohen and Levinthal, 1989), may be viewed as a type of innovative capability. Whilst the term was originally employed in the context of R&D activity within high-technology firms, it is proposed that Absorptive Capacity has a similar importance for an organisation's IS/IT function. Drawing on research on individual and organisational learning, Cohen and Levinthal suggest that prior and related knowledge enables new information to be recognised and exploited. Further, the breadth and depth of an organisation's existing knowledge base largely determines its ability to absorb and exploit new information. Absorptive Capacity is thus both path dependant and accumulative in nature and its absence in an area can not only result in an organisation being locked out from an area of technology, but also affect its tactical and strategic behaviour. Whilst it is possible for an organisation to build, or re-build, the expertise to be effective in a particular technical domain, it is likely to be difficult and take a long period of time. In short, 'once off the technological escalator, it's difficult to get back on' (Reich 1987, quoted in Cohen and Levinthal, 1990).

The supplier view – the case of X Corp

The IT systems supplier, here given the fictional name X Corp, supplies core back office systems to the insurance industry and has systems installed in many leading companies. They are an established supplier and have a significant presence within the industry. As is common within the industry, X Corp are invited to tender for many contracts and have extensive experience of the tender process from a supplier perspective. Tender processes can be protracted may last for many months. The size and scale of the projects required to install a new system is significant requiring anything up to 200 person-years and taking years to complete. The staff interviewed were all senior within X Corp, with many years experience within the industry.

The picture that emerges from X Corp presents an interesting dichotomy. Whilst main business drivers appeared to have remained broadly the same for X Corp's customer base, the technical challenges have grown significantly. The insurance industry is interesting in that the systems and procedures they operate may, for long established firms that have grwon through acquisition and merger, include everything from a door-to-door tally-man collection to a 24/7 internet service, with everything in between. Whilst the level of automation has grown insurance policies may last many decades and the systems that that support them tend also to remain in operation, with some organisations maintaining over 300 separate systems. As a result the scale and complexity

of the systems required to both extend and enhance functionality whilst remaining backwardly compatible are considerable. The development of X Corp's products may arise from a range of sources including customers, sales staff, and changes in financial services regulation. However, in terms of product innovation, X Corp is generally perceived by its client base as customer led and market driven, with customers demanding greater thought leadership and market-making activity.

Technical Challenges

The growth in the technical complexity of the projects is a combination of structural changes and the increasing competitive pressures that are occurring within the insurance industry. As the insurance industry has begun to consolidate, so more projects have begun to be either pan european or global in scope, providing a whole set of additional project challenges in terms of scale and logisitics. At the same time projects will often involve several X Corp products (e.g. a back office administration system together with a customer relationship management system). These products will need to be configured, linked and integrated with both with the existing back office systems and the front end systems. As a result the testing scenarios are very complex and increasingly challenging. In order to manage this growth in project complexity a range of new roles and review processes have evolved within X Corp in order to better manage the evolving technical architecture and project management issues. The highly developed and comprehensive methodology used by X Corp, 'X-Method', is also used throughout the project lifecycle.

The Role of Outside Advisors

A typical procurement process for an X Corp project will often be initiated by receipt of a Request For Proposal (Rfp) document from a prospective client. This proposal document that is created in response to this may initiate a chain of events that will result in reference sites being visited, technical evaluations and, finally the proposal being short-listed. The final selection from the short list being made on the basis of a range of factors including the time to delivery, functionality and cost. The management of this process, and within it the role of outside advisors has changed significantly in recent years. There appears to be a greater willingness to employ outside advisors and, whilst a few years ago they would manage one in three new proposals, they are now always employed by clients to manage the Invitation To Tender (ITT) process. These outside advisors will define and handle the ITT process and, as a result, manage both clients and prospective suppliers through what may be a very rigid series of stages to the final supplier selection. Outside advisors fall into two types: Type A advisors will focus on ITT process consultancy and their involvement will cease on the award of the contract; in contrast, Type B advisors are generally larger organisations for whom ITT process consultancy is a small part of a broader portfolio of services. Type B advisors, who may be specialist systems integrators or software suppliers in their own right, would tend to view the ITT process as a first stage contract and seek to develop further follow-on work with the client organisation.

During the ITT process it is common that Type B advisors will seek to meet with potential suppliers and discuss, on an informal basis, what their further role could be on completion of the procurement process. Managing this collusive relationship is seen as a key element of the overall procurement process and the ceding of interest in certain elements of the final contract to the advisors an important factor in winning the business. As a result, on completion of the ITT process it is not uncommon for the outside advisors to move into a Programme Management role within the wider development process.

The impact of these developments have been significant for X Corp. On the one hand, the prevalence of outside advisors has introduced a mediating layer and thus makes it far harder for X Corp to build any relationship with their potential clients. On the other hand, the need to cede certain important elements of the overall contract to advisors means they will often lose the important programme management role and, importantly, the value of the business is proportionately reduced. In addition, in those tender processes that X Corp is successful, it is now faced with contracts that are far more tightly framed than they once were. There has been a clear trend towards fixed price contracts, with time and materials contracts now becoming very rare. Clients will generally attempt to transfer maximum risk onto their supplier and all contracts are generally far tighter, with penalty clauses a standard feature.

X Corp is thus facing projects of increasing and evolving technical complexity at the same time as there is the mediating involvement of outside advisors on the client side, resulting in highly structured procurement processes and tighter fixed-price contracts, with the advisors likely to take an overall programme management role.

Discussion

In seeking to give shape to the profile and trajectory of the IS/IT capabilities possessed by mainstream commercial organisations, as opposed to suppliers of IS/IT systems, a range of data have been examined that bear directly upon the issue of organisational capability in this area. By examining commercial context and interfaces of IS/IT client organisations a novel perspective has been developed that throws light on a wide range of issues concerning the current state, and possible longer term trajectory, of IS/IT capabilities. There can be little doubt that the IS/IT industry continues to face significant challenges in delivering IT projects on time, to budget and with the required functionality. Even if we handle with caution the project failure rates published by the Standish Group, broadly similar results have been obtained by others in the area, albeit in the context of public sector IT projects.

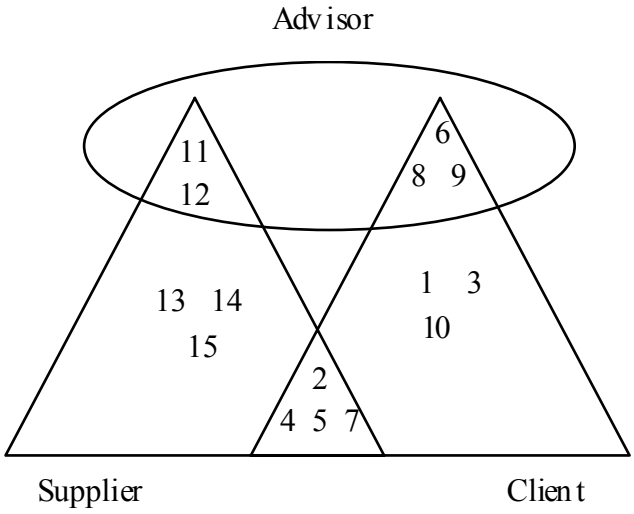
The rapid and continued growth of the IT services industry, both in terms of outsourcing, consulting and IT research provides significant evidence of important changes concerning the help organisations require to manage and develop their use IS/IT. Of themselves, the high growth rates in these areas do not necessarily demonstrate the decay or absence of in-house capability, although a circumstantial case could be built to argue that this has occurred. However, the evidence presented within the X Corp case does provide further insights into the nature of the IT challenges faced by some organisations, together with the presence and trajectory of such capabilities that may exist.

The X Corp case illustrates that there has been a clear trend for client organisations looking to buy in IS/IT systems to effectively outsource several core IS capabilities including Informed buying, Contract facilitation and Contract monitoring. These three capabilities form the overwhelming bulk of IS/IT procurement capabilities and their outsourcing could imply that, effectively, some client organisations have little or no residual procurement capability in key areas. Whether this situation is a result of the growth in the complexity of the IS/IT systems themselves, a side effect of outsourcing, the buoyancy of the IT jobs market, or a peculiarity of the insurance industry is unclear. However, the growth of IT Consulting and the IT Research and Advice industry lends credence to the argument that this may not be an isolated phenomenon.

The large and growing demand for consulting services and research may well be partly a function of the growth in the technical challenges in large IT projects, however the increased incidence of ITT process consultants evidenced within the X Corp case illustrates that other factors are also likely to be at work.

Whilst it is clear that the X Corp case indicates that a drift of core procurement capabilities may have taken place in many client organisations, it also casts doubt on the medium term viability of a number of other notionally core Client capabilities. If we accept that, to some extent, the informed buying capability is either in decline or else is absent, the continued growth in the complexity of IS/IT systems identified in the case has serious implications for client organisations. In the absence of such capabilities it is likely to sustain the core IS capabilities of Architecture Planning and Making Technology Work. Further, the IS/IT leadership role will become increasingly difficult to sustain as a result of the weakening of the organisation's absorptive capacity in this area.

It may be conjectured that a major factor in the growth of the IT services industry is *precisely* because many of these capabilities have either declined or are largely absent from many Client organisations. If this is the case then it is necessary to revisit the notion of what constitutes IS/IT core capabilities for client organisations. Using the evidence presented above we could propose that a capability map that covers suppliers, clients, and advisors could look as illustrated in Figure 2.



Capability Overview

1	IS/IT Leadership	9	Contract Monitoring
2	Business Systems Thinking	10	Vendor Development
3	Relationship Building	11	Project Management

4	Technical Architecture Planning	12	Programme Management
5	Business Architecture Planning	13	Systems Realisation
6	Informed Buying	14	Bid Development
7	Making Technology Work	15	Change Management
8	Contract Facilitation		

Figure 2: Supplier, Client, Advisor Capability Map

This represents a first attempt at positioning the capabilities required to procure, deliver and implement complex IS projects across the IS supply chain. This model builds and extends the earlier work on ideal-type buyer capabilities (Feeny and Willcocks, 1998) and the work examining supplier capabilities (Davies and Brady, 2000) to provide an overall view of capabilities within the IS supply chain. Based on the X Corp case and work on supplier capabilities a number of additional capabilities have been proposed. These are summarised in Table 2.

Capability	**Outline**
Business Architecture Planning	Creating the coherent blueprint for the business architecture that underpin the strategic and tactical business objectives
Technical Architecture Planning	Creating the coherent blueprint for a technical architecture to enable the delivery of the business architecture
Programme Management	Managing and coordinating the individual technical and organisational projects required to deliver intended business goals
Project Management	Managing and coordinating the necessary resources to deliver agreed technical project goals to time and budget
Technical Systems Realisation	Undertaking the IT systems development and IT systems integration activities required to deliver the required technical systems
Change Management	Managing and coordinating the necessary resources to deliver agreed organisational change goals.

Table 2: Extended capabilities

This extended capability map is a first attempt to outline an approach that more accurately reflects the disaggregation of capabilities that has occurred, and is probably continuing to occur, throughout the IS/IT supply chain. The terms employed adopt a less user-centric world view and aim to indicate that, whilst some capabilities are solely located in either the Supplier, Client or Advisor, there are a range of other capabilities that may only be demonstrated in partnership with another actor in the supply chain. It can be seen that of the nine original 'ideal' capabilities it is proposed that only the three capabilities of IS/IT Leadership, Relationship Building and Vendor Development remain wholly within the Client organisation. All other capabilities are likely to now reside outside the Client organisation with either Suppliers or Advisors.

In this approach it is proposed that capabilities can be classified as either Enactment or Engagemen t capabilities. Enactment capabilities are fully formed and organisations and individuals who possess such capabilities have the skills and abilities to be able to undertake and successfully complete tasks related to the individual capability in question. In contrast, Engagement capabilities are only partially formed and only confer the ability to engage effectively with those who possess a full Enactment capability. The Engagement capability does not, necessarily, enable its possessor to be an intelligent customer of an Enactment capability, rather it provides the basis of an informed discussion.

Based on this research, few Client capabilities are likely either to be fully formed or self supporting, with the overwhelming majority being of the partial Engagement variety. It is likely that, as a result of (in the case of a fully or partially outsourced IS/IT function) a sub-critical Client IS/IT group, the absorptive capabilities of the group will be weak with only residual internal capabilities. In the model presented in figure 2 above, it is proposed that the Client organisation is just such a position, with the result that, of the ten capabilities that it ostensibly possesses, the majority are of the Engagement type, as shown in Table 3.

Supplier	**Advisor**	**Client**	
Enactment Capabilities	Enactment Capabilities	Enactment Capabilities	Engagement Capabilities
2, 4, 5, 7, 11, 12, 13, 14, 15	6, 8, 9, 11, 12	1, 3, 10	2, 4, 5, 6, 7, 8, 9

Table 3: Distribution of Enactment and Engagement capabilities

Given this position, it could reasonably be argued that there is now a clear capability gap between Client and Advisors or Suppliers, in that procurement and delivery Enactment capabilities are now largely absent within Client organisations. Further, given the likely weak Absorptive Capacity underpinning the Client capabilities, it is also likely that the key IS/IT Leadership capability will be either under threat or in decline. As a result, the Client IS/IT function may find itself in a capability trap in which it becomes increasingly difficult or impossible to assess both the rapidly changing external IS/Itenvironment, and to deal with Advisors and Suppliers. A range of ostensibly core Client capabilities may thus have declined to become Engagement type capabilities, since they have, of necessity, been effectively outsourced.

The potential migration of capability away from Client organisations to other actors in the supply chain is likely to impact on their Absorptive Capacity and leave these organisations impoverished and facing an increasing capability imbalance between themselves and potential Advisors and Suppliers. In this context, informed decision making concerning either tactical or strategic issues becomes possible only with the external advice and guidance. Residual Client capabilities are under constant threat of decay and strategic, IS/IT-intensive, developments may be more likely to be initiated or influenced by external actors who, in turn, obtain the contracts to deliver them. In this context, market-making by such external actors may be both welcomed and sought, placing the Client IS/IT function in a reactive, dependent position.

The implications of this situation are significant and far-reaching. At the level of the Client firm, this work throws new light on the long-running debate concerning the sourcing of IS/IT services and highlights its implications in terms of organisational capabilities and Absorptive Capacity. The implications of the market power, in terms of influence and capability, that now resides with Suppliers and Advisors based on the capability gaps and traps that have emerged are important and require further examination. Whilst the emergence and increased incidence of Advisors may mitigate this power, this too will have effects that require further study in order to more fully understand their significance. Given the turbulence of the IS/IT marketplace and its fundamental immaturity, it is likely that technologies, IS service models and related capabilities will continue to evolve at a fast rate. It may be unrealistic for many Client organisations to attempt to maintain a viable Absorptive Capacity and, as a result, the market for impartial Advisors may grow. However, given the centrality of IS/IT to the competitive success of many other Client organisations – that IS/IT is now the core business infrastructure upon which the entire operation now depends – it is likely that a high level of internal capability and Absorptive Capacity will be required.

Whilst this research has raised a number of important issues a large number of questions need further examination in order to develop this approach. These include the impact of Advisors on the procurement processes in other sectors, the scale and nature of Client capabilities and the viability of the Enactment and Engagement typology. The role and impartiality of different types of Advisors in the procurement process and their impact needs further examination, as does the scale and implications of capability overlaps between Advisors and Suppliers. In the light of the findings of this work the whole notion of ‘core’ Client IS/IT capability in the context of a long-term trend in favour of outsourcing needs further examination. The transferability and applicability of the concept of Absorptive Capacity in the context of IS/IT also needs further work in order to better understand its impact.

Conclusion

This paper has provided an examination of the major market and sourcing trends within the IS/IT context and has examined their likely implications for Client capabilities. The IS/IT capabilities that should, ideally, be possessed by Client organisations were examined and the notion of Absorptive Capacity, in the context of IS/IT, explored. The X Corp case provided a novel, supplier-side, perspective on the nature of Client capabilities and important trends concerning technical complexity and bidding and contractural issues identified.

The broader re-casting of capabilities across the main actors (Supplier, Client and Advisor) within the IS/IT supply chain and the proposal of two types of capability, that of Enactment and Engagement, provides a new framework with which to examine organisational capabilities in this context. The potential existence of capability gaps, traps and overlaps were examined and the firm level and policy implications briefly outlined. The need for further research to substantiate this exploratory work was emphasised and a range of important research questions identified.

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