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Title: Complex Procurement Transactions for Enterprise Systems – recognizing the need to design a procurement planning strategy

Abstract

The identification, procurement, implementation, and support of a major enterprise system (ES) represents a major challenge for any organisation. ERP or Enterprise Resource Planning applications, such as core accounting systems, are often the central business support technologies that form the backbone of commercial operations and financial management control. Since 2000, the migration of vendor technologies to the cloud through SaaS applications (Software as a Service) has created a range of additional commercial options for organisations seeking to cost effectively purchase and implement a new enterprise level system. These commercial procurement transactions are often both contractually and technically complex; they may also involve a range of third parties like consultancies or system integrators. This study poses the question of whether organisations develop adequate procurement planning strategies for the acquisition of these technologies. The results of this study suggest that organisations may not recognise the complexity of this type of contractual procurement transaction early in the investment lifecycle and may often rely on what may be an ill-fitting, standard procurement approach during the project execution phase. Organisations may also deploy procurement selection processes that vendors may have considerable experience with over many years from other client bids - and subsequently may tilt the process in their favour. This study proposes an alternative approach to initiating and managing the procurement planning process for ERP and ES technologies.

Introduction

Almost all organisations buy or procure goods and services on a daily basis. This can range from simple office products through to new complex construction, production or technological capabilities. The procurement approach for most organisational goods and services appears to follow what is often termed as the sourcing process. This is at Figure 1. The origin of the sourcing process model is unclear, though some initial theoretical analysis and discussion of the efficacy of the model was conducted by Wall et al. (1994).

Kearney (2021) takes a differing perspective and present it as a linear process at Figure 2. It is suggested that Figure 1 more reflects the cyclic nature of procuring less complex goods and services on a two-to-three-year rolling contract basis. However, this study posits that the key in both process approaches is in the initial procurement planning and strategy stage.

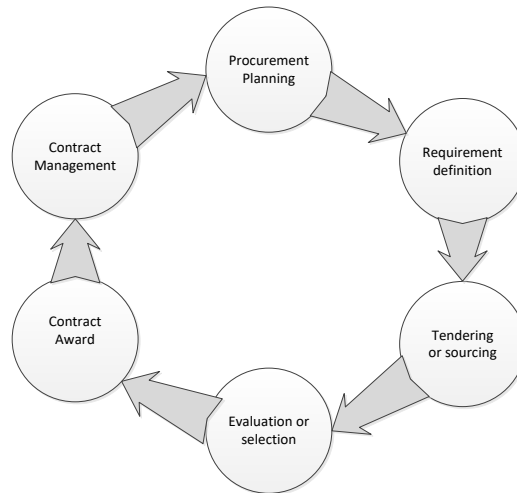


Figure 1 - The Sourcing Process (adapted from SpendMatters, 2021).

The Chartered Institute of Procurement and Supply (CIPS, 2021) recognises the complexity of the procurement model for more specialised goods and services and identify them as what are termed as complex transactions. They define these as occurring when “the specification is difficult or is an innovative or bespoke product or service. Therefore, procurement becomes higher risk to the organisation given the degree of competition which is often restricted to a limited market. The contract will often be more detailed and agreed using different commercial models” (CIPS, 2021). Whilst broad, the definition covers a wide range of procurement categories where there may be significant transactional and specification complexity.



Figure 2 – Linear Sourcing process (adapted from Kearney, 2021).

Therefore, for complex, often expensive Enterprise applications, how closely acquiring ES technology resembles a complex transaction is not easily defined in the literature. Theory on complex software technological procurement tends to focus on factor-based approaches. This study poses the question that given the level of investment and often complex technological complexity and contractual obligations, whether ERP and ES technologies are recognised as such – and that appropriate planning strategies adopted to meet the demands of the acquisition and investment. However, it has also been recognised that when procurement planning approaches are overlaid onto organisational structures, this may also create considerable additional complexity (Fontana and Neto, 2009).

From a technology project perspective, previous research suggests that recent or pre-existing experience in the acquisition and implementation of these technologies may be a key delivery factor (Cooke-Davies, 2002). Given the increasing predominance of SaaS (Software as a

Service) enterprise technologies, organisations may often be faced with both a range of major technological and commercial challenges; this can include more complex and costly package software applications (Taghipour, 2020), a differing support mechanism if the vendor hosts the application (Dašić et al. 2016), the need to customise the application (Ali et al., 2018), change management (Ali and Miller, 2017) and potential engagement with third party integrators if the software package provider does not provide this service (Petrevski et al., 2017).

The complexity of implementing these types of application has been identified in a plethora of research papers. Extensive research has also focused on ES implementation failures and activity that may be required to reduce risk and costs to the organisation.

Previous Research

From both a practical and academic perspective, a wide range of texts exist that attempts to explain the procurement or sourcing management process (Monczka et al. 2015, Lysons, 2020). Commercial training programmes like those provided by CIPS (Chartered Institute of Procurement and Supply) and ASCM (Association for Supply Chain Management) also cater for the developmental procurement needs of industrial and public sector organisations and individuals. There is a considerable volume of research on procurement activity on projects, procurement and contract management (Turner, 2017) as well as the role of project management and procurement components for SMEs (Turner and Ledwith, 2018).

However, there is also considerable research on a wide range of procurement category specific areas though theoretical content is limited. These include areas like procurement fraud services, (Purwanto and Emanuel, 2020), sustainability (Walker and Phillips, 2009), Facilities Management (Jensen, 2017), tender management in construction (Matveeva et al., 2019) and construction procurement management (Ruparathna and Hewage, 2015). Procurement research has also focused on theoretical sourcing and procurement strategy and its relationship to technology (Knudsen, 2003, Li and Shou, 2021). However, there appears to be limited research on theoretical strategies for specifically planning and managing complex procurement transactions and ES/ERP technologies; existing research suggests a focus on both product/service selection criteria - as opposed to the procurement planning process. However, theoretical research also reinforces the need for procurement planning; research has also focused on utilisation of a specific package selection approach (Poon and Yu, 2010). However, their conclusions do not specify any new alternative options for this stage and conclude by suggesting more accurate requirements definition and the potential for a form of proof of concept.

Though an ageing paper, Verville and Haltingen (2003) propose a theoretical six-stage buying process for ERP software and aligns with the sourcing cycle at Figure A. These stages include planning, information search, selection, evaluation, choice, and negotiations. A model approach was also attempted by Godse and Mulik (2009) though for SaaS products in general as opposed to ES or ERP technologies specifically. Damsgaard and Karlsbjerg (2010), define seven theoretical principles for package software selection that focuses on recommendations on software compatibility with known, common technical standards, standard data structures, high volume sales and accessible product knowledge. There is little research that addresses whether organisations (formally or informally) select their ERP application prior to project initiation and the project lifecycle – or more formally once the project has been initiated using a process

similar to that proposed by Verville and Halington (2003). Beheshti (2006) and Franch and Pastor (2000), though early research in the growth of ERP capability, identified and reinforced the importance of the procurement planning process; they suggest that it should be as systematic and thorough as possible; though there is little subsequent empirically tested research on the process. Many early initial studies into ERP procurement focused on definition of specific selection criteria (Bernroider and Koch, 2001, Wei et al., 2005). Early research by Stefanou (2001), Illa et al., (2000), Uta et al. (2007) and Jadhav and Sonar (2009), attempted to define a more focused analysis of selection criteria and procurement procedures.

However, SaaS applications and support models have now started to dominate the Enterprise software and support market (Kumar, 2017). SaaS applications may be fully hosted and supported by vendors or a blend of technical and service options. The complexity of procuring ES/ERP technology has been long understood; early ERP research suggest that “many ERP vendors just ignore the organisational fit concept and urge blind trust on ERP from their clients” (Hong and Kim, 2002, p.36). Kumar (2017), in a broad conceptual review of SaaS benefits and risks suggests that traditional procurement methods and models may not fit the SaaS environment; many organisations may deploy a: “Time consuming legacy procurement process that may not fit acquisition of SaaS offerings”. (Kumar, 2017, p.200) and alludes to the process at Figure A. Kumar (2017) conceptual paper is significant in that it addresses both the technical and commercial differences between on-premises and hosted applications though is not substantiated empirically. However, one of the key elements of the procurement or sourcing cycle is in the development of requirements for a new system that become part of the tender or RFP (Request for Proposal) tender. The problems with systems requirements creation and software are extensively documented (Carroll and Richardson, 2016, Hustad et al., 2016).

However, it may be suggested that SaaS applications differ greatly from organisation hosted applications, not only in commercial licensing terms but also in procurement acquisition and long-term technical management. Early attempts at understanding the implications of SaaS procurement suggests that: “The choice between SaaS and traditional on-premises based software applications should include more considerations than cost trade-offs alone. Additional areas to consider include business benefits, flexibility, and associated risks. In general, it is theoretically suggested that organisational “management should obtain a deep understanding of all areas that will be affected by the acquisition and implementation of the application” (Dippennaar, 2008, p.65). However, how managers develop a deep learning and understanding is not clear from the study conclusions. Alaskari et al. (2019) also attempted to identify the key stages of ERP selection - though focus involved onsite evaluation of a product using limited data provided by the client to prove functional capability. It is critically suggested the study their deployed a standard procurement approach. SaaS applications potentially create a procurement paradox; in essence whether, in general, organisations are procuring IT goods, services – or both; it may therefore be problematic from both a procurement planning and vendor selection perspective (Wynstra et al., 2018).

A study that focused on data from a survey of some 200+ decision makers on acquisition of SaaS technology concluded that: “These decision-making processes should also include objective assessors such as consultants to accomplish a more objective and rational evaluation of both their incumbent system as well as a possible new SaaS solution.” (Heidt et.al. 2017, p.12). Hurbean

(2006) suggests that client past experiences and implementations are the key to identifying suitable vendors. Tingling and Parent (2004) also reviewed the ERP vendor selection process but did not identify any significant elements in strategic planning for the procurement event. Considerable research effort has been expended on the selection and procurement of SaaS technologies has also included semantic based analysis, Afify et al. (2016).

Haddara (2018) suggests that system selection is pivotal to the organisational adoption process. Though a single site analysis, Haddara (2018) analysis of the organisational selection process concluded that: “Thus, the careful selection of vendors, products, and services provided is necessary, but the final decision has to be made considering the amount of organizational change required for the adoption and the implementation of the selected ERP system.” (Haddara, 2018, p.54).

The lack of both alternative ES/ERP procurement planning models and a general paucity of research on the procurement planning process suggests a gap exists in current knowledge. The Standish Group CHAOS Reports (2018) data suggests that around 16% of software projects will be abandoned, around 30% may be perceived as successful whilst the remainder may be suggested as challenged i.e., both problematic delivery and usage. However, the potential software market for these technologies is considerable. Statista (2018) suggested that by the end of 2020, c. \$460bn may have been invested in ERP technology globally. A one percent improvement in both procurement and delivery quality across this portfolio would be a significant change in investment performance.

Research Methodology

This study collected primary semi-structured interview data from 8 participating sites and 36 individual respondents on nine projects; one site had two investment projects having completed one - and initiated a second. Philosophically, this research adopted an inductive, qualitative approach as a means of identification of additional quantitative research (Bryman, 2012, Cresswell, 1994). This study deployed a Heideggerian approach which recognises that researcher pre-existing knowledge is a core component of research development (Reiners, 2012).

Potential participating sites were part of a maximum purposive sampling techniques (Acharya et al., 2013, Sharma, 2017). The objective was to identify and engage with sites from a cross section of sectors that may have deployed or about to deploy enterprise technologies. This would include commercial or manufacturing, government and academic or educational establishments. Site codes and organisational descriptions are at Figure 3, Table 1.

Respondents were all employees from participating sites but often with widely varying functional backgrounds - a key component of the decision to use an initial qualitative approach; their experiences would rely on both previous knowledge and level of project participation. Participant site coordinators for the study identified and provided the initial engagement with respondents. Acquiring participating sites was complex; several potential survey sites withdrew as early engagement suggested that there was a reluctance to discuss project details, particularly if the project had failed to be fully implemented or abandoned. Participating sites were provided with guidelines on the spectrum of respondents that the study would seek to engage to collect the data. Each site identified staff willing to participate that met the specified criteria.

Target respondents could include:

- a) Governance staff – executives and steering group members.
- b) IT Managers.
- c) CEOs.
- d) Site seconded Project staff – either early project initiation stage or post project participants.
- e) Operations staff – managers and system users.
- f) System Support staff.
- g) Project manager – if in place or closing a project.

Participants were provided with the title and objectives of the study in conjunction with a consent form. These were collated prior to the site visit. A profile of the respondents and their employment categories are at Table 2 and Graph 1. Several respondents had been engaged in multiple roles often with differing implementations on the same site.

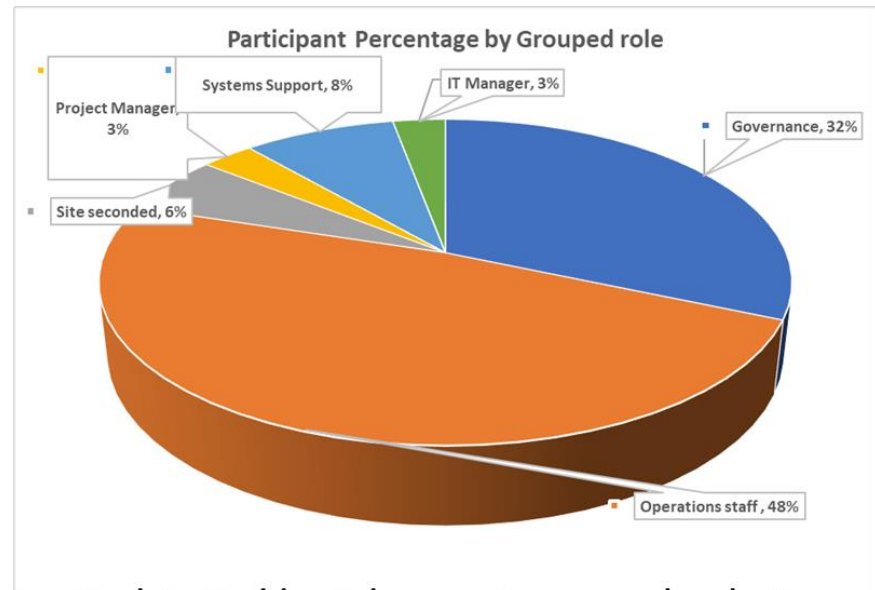
Data was collected from sites at both the pre and post project stages of development. Interviews were digitally recorded if the respondent approved and electronically transcribed to text. Both Interviews and transcribed text were reviewed simultaneously to clarify key elements of the transcription and to correct as appropriate. Data collection was cross-sectional in approach.

Site Code name	Stage	Organisation Type	Description	Interview count	Notes
CSERVProj1	Complete	Commercial	Field service application	6	Interviewees covered both systems
CSERVProj2	Initiated	Commercial	Customer Contact Application		Interviewees covered both systems
PUBERP1	Initiating	Governmental	Full ERP	1	Conceptual phase initiated
EDMPUB	Complete	Governmental	Full enterprise non ERP application	6	Re-run implementation effort after several attempts
EDMMGT	Initiating	Educational	Enterprise Educational admin	6	Front end closing and initiation commenced
EDERPA1	Complete	Educational	Full ERP	7	Full ERP implementation
EDERPA2	Complete	Educational	Full ERP	8	Full ERP implementation
MAN01	Complete	Manufacturing	Full ERP	1	Perceptions from merger/multi site implementation.
WFLO01	Complete	Commercial	Full integrated Enterprise workflow application	1	PM interview - company now closed, 2.5 years after implementation.
Total				36	Interviews c. 1hr duration.

Table 1 – Site codes by type.

Sector	Stage	Site	Position Group	Percentage of total participants
Government	Post	EDMPUB	Operations staff	11.1%
			Governance	2.8
Commercial	Pre	PUBERP1	IT Manager/CIO	2.8
	Post	CServProj1	Governance	5.5
	Pre	CServProj2	Governance	5.5
			Operations staff	11.1
Academic/Educational	Post	MAN01	Governance	2.8
	Post	WFLO1	Governance	2.8
	Pre	EDMMGT	Governance	2.8
			Site seconded	2.8
			Operations Staff	11.1
			Project Manager	2.8
	Post	EDRPA1	Governance	2.8
			Site seconded	2.8
			Operations staff	11.1
			Systems Support	2.8
	Post	EDRPA2	Governance	8.3
			System Support	5.5
			Operations staff	2.8
				100%

Table 2 – Participants by percentage work category.



Graph 1 – Participants by percentage grouped work category.

Figure 3 – Study demographics and sites

Analysis

The approach to qualitative data analysis was via a thematic approach (Braun and Clarke, 2019). A key benefit of this approach is that it provides for a comprehensive methodology that analyses communicated textual information with the intent of identifying evolving themes from the raw data. Similarly, thematic analysis also provides the capacity to develop more structured relationships within and between themes in the textual data. The application can, if the data evidence warrants it, provide the basis for model development from the text data. To enable this analysis, given the volume of transcribed textual data, NVIVO software was deployed to evaluate if thematic patterns existed within the data; this was the most suitable option given both volume and complexity (Braun and Clarke, 2019). Thematic, categorical and code analysis utilised Vaismoradi et.al (2013) methodology.

This data was then cross referenced via use of the Gioia Methodology (Gioia et al., 2013); this diagram is at Figure 4. Study initial overall findings are encapsulated in an Ishikawa Fishbone diagram at Figure 5. The fishbone diagram places the outcome on the right; each major inclined bone represents a group of antecedents or identified high level data themes; the horizontal fishbones are specific trends identified in the data patterns as specific data categories; this is at Figure 5.

This diagrammatic model is used for representation of diagnostic cause and effect in statistical process analysis methods. The use of cause-and-effect analysis in qualitative research has to be used with some caution as: "The ability of qualitative research to address causality has been a contested issue for some time" (Maxwell, 2012, p.33). It has also been suggested that: "Beliefs of the qualitative researcher may themselves shape the research structure and findings. As a result, qualitative findings may not provide any correlation between cause and effect on a broad scale" (Libarkin and Kurdziel, 2002, p.78).

Themes at Table 1 are identified from a combination and cross referencing of Nvivo coding, Gioia Methodology and Fishbone diagrams.

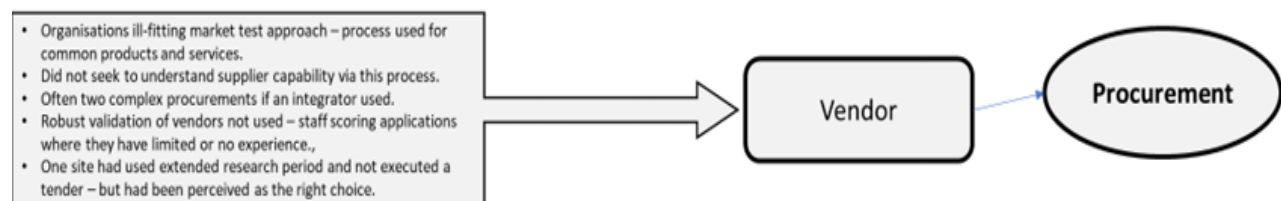


Figure 4. Gioia Methodology Analysis (adapted from Gioia et al., 2013)

This study has used the terms antecedent and outcome as findings are not suggesting causally related variables. Continuing research will now explore other themes. From this high-level analysis, a number of key themes emerged. These are at Table 1.

Top level theme	NVivo nodes
Procurement Theme	The end-to-end acquisition and commercial process deployed to procure the solution.
Categories	
	Pre Project-Procurement Planning
	Requirements
	Tendering/Market test
	Contract Award
	Contract Management
Risk	How vendor, organisational and project risks are managed

Table 1 – Top level themes and categories

Textual theme analysis revealed several key patterns around the impact of procurement process – particularly on those sites in the post project implementation phase.

This has study deployed triangulation (Flick, 2004, 2007) using several site participants to validate the findings. Findings have also been reviewed and validated by a senior IT executive participant on a separate interview and discussion.

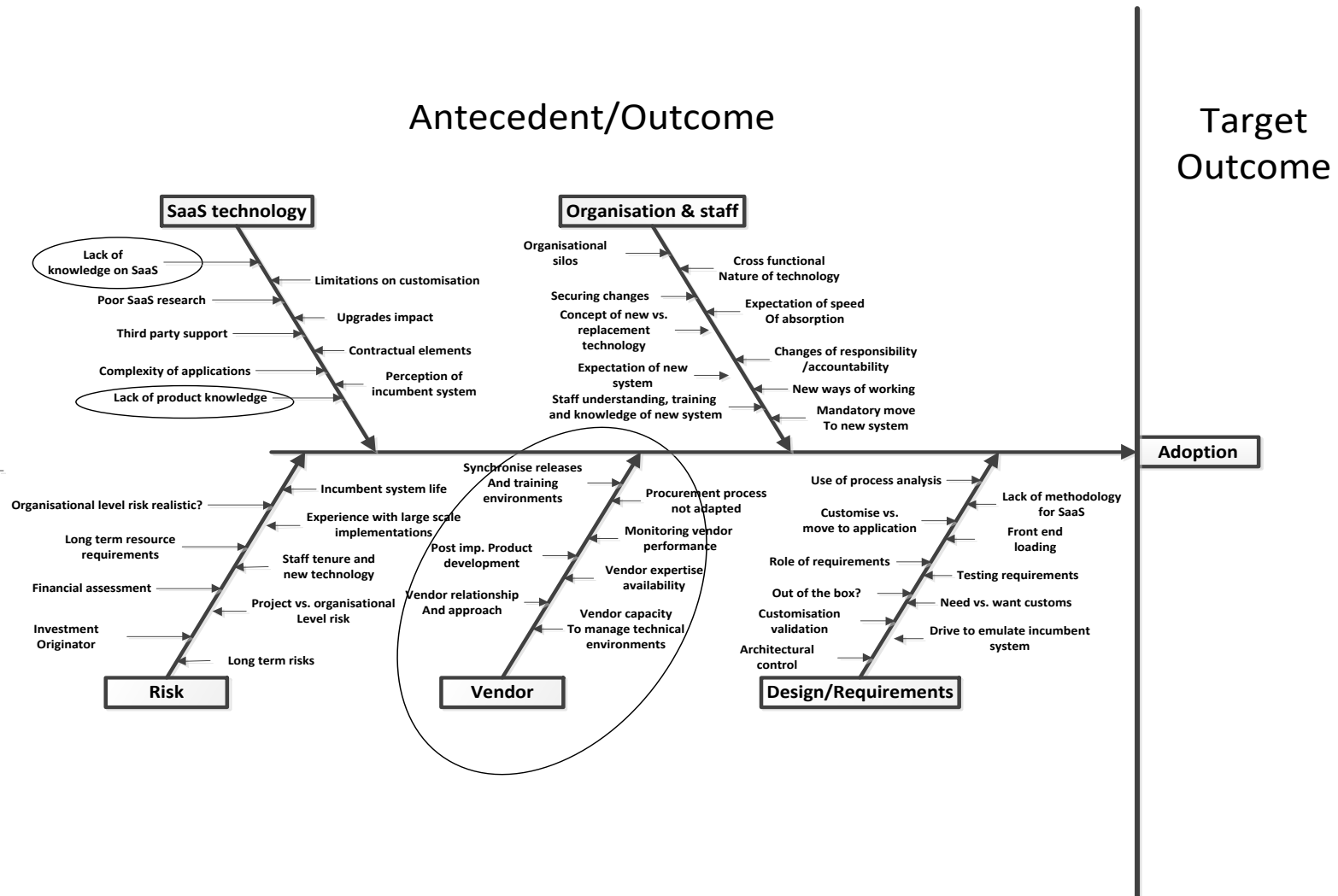


Figure 5 - Ishikawa Fishbone (Ilie & Ciocoiu, 2010 citing Ishikawa 1968), - antecedents and outcomes.

The Procurement Theme

One of the key significant data findings in this study is that all participants, across all post implementation sites, had been involved in the procurement process in some capacity. At the pre-project stage, participant procurement responses were generally limited to senior sponsors or stakeholder or project-based staff. Participants expressed little or no knowledge of this process as the product had been acquired several years earlier and staff turnover meant little or no knowledge of the acquisition process was accessible. Analysis of this theme will follow the procurement cycle at each stage of the process. This analysis will deploy Yourdon (1989) context diagrams. These diagrams align the comments as inputs to the process and are participant data responses.

Pre project stage procurement activity – procurement planning

From a financial perspective all sites appear to have completed and had approved some form of investment business case for the investment. However, analysis of both the depth and detail of these cases was not conducted as part of the study but is an area for future research.

Most sites, including those at the pre project stage, had engaged in some form of pre-project market engagement in attempt to understand the commercial elements and technical capability of products; this likely would have been a key step in obtaining high level costs estimates, a paper highlighting the key elements of what is termed as “soft market testing” has been published by Tersch (2021). A context diagram highlighting data around identified procurement planning activity is in Context Diagram 1.

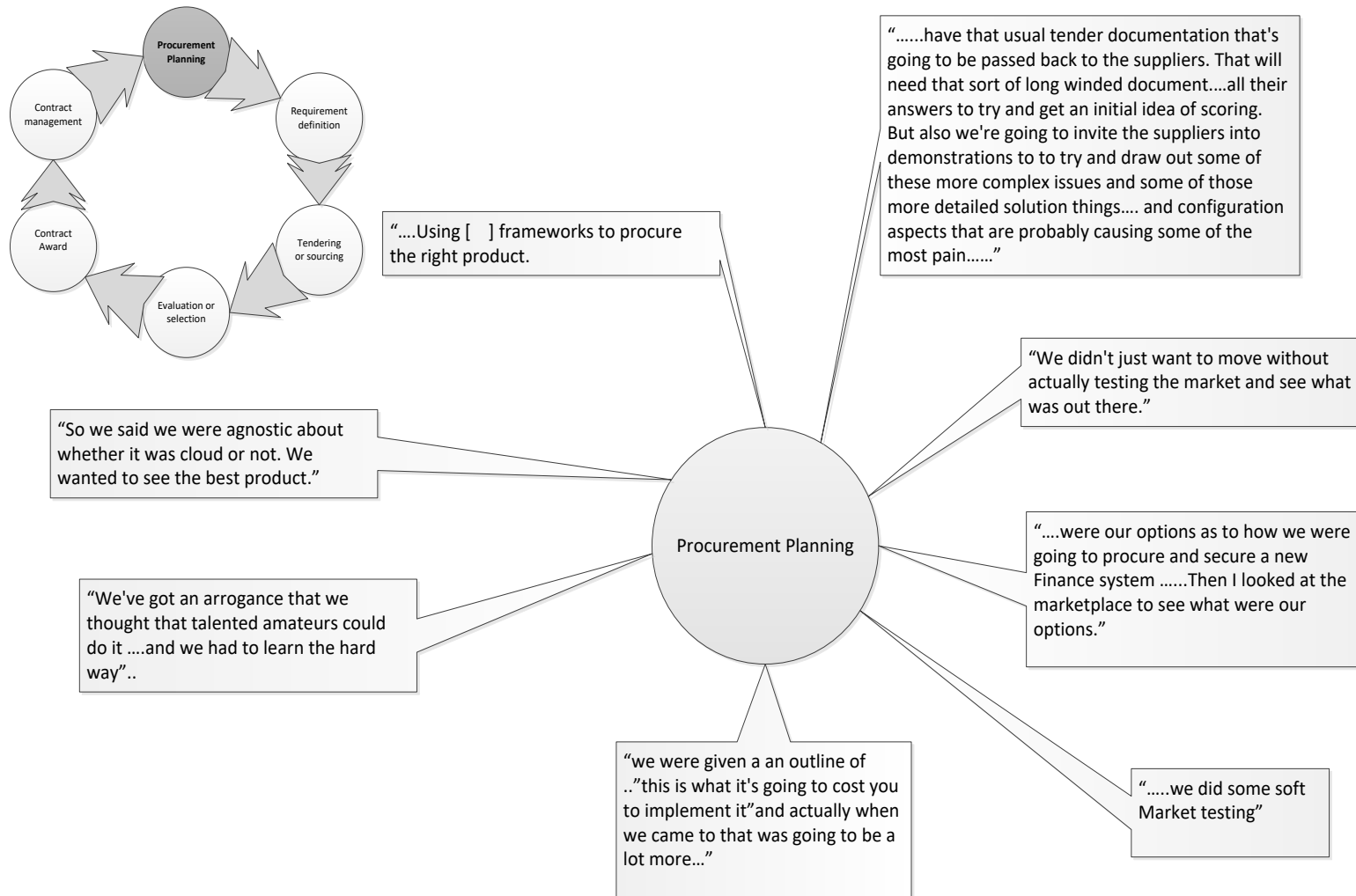
Early pre-project or soft vendor market engagement also allows some early visibility of the range of systems available. One site had taken a slightly different approach in that focus had been placed on ensuring vendors could demonstrate how their technology managed the type of financial transactions the organisation may generate. However, none of the site participants expressed any indication of whether procurement planning had been extended to approaching the commercial transaction from a differing commercial perspective other than that focused on the procurement cycle approach. However, one key emergent theme across all participating sites; both at pre and post project implementation stage, is the component of early organisational product knowledge development. Study data suggests that this knowledge covers understanding of the technology, SaaS model constraints, the role of integrators and overall Enterprise systems awareness. Sites appeared to have spent little time on this element – focusing instead on broader functional interests. This has to be contrasted with the experience of a non-ERP ES participating SME site where some considerable product and market research had been undertaken prior to formal vendor engagement and had therefore eliminated unsuitable vendors early in the project lifecycle.

The lack of focus on market and product knowledge was significant in 75% of the sites. At the pre-project stage there was little evidence in the interview data of any structured, targeted or validated market or product research. This study suggests that little detailed procurement planning had been undertaken; analysis of the market and vendor capabilities had been limited to often limited vendor demonstrations. Only the SME site had conducted extensive knowledge development prior to initiating the project. From a project management perspective, the pre

project or front-end stage on participating sites did not have a project manager in place; Stretton (2019) recognises this as a common factor in complex projects. Research by Williams et al. (2019) also identifies that there is a paucity of research on project front end or pre project stages. Williams et al. (2019) research also identifies business case development; feasibility, and a range of other internal organisational activities represent this early stage of project initiation but does not explain why implementation failure rates do not improve and are consistent (Chaos Report, 2018). However, many technology projects still align with the Systems Development Lifecycle approach or SDLC (Sommerville, 2016) which is often interwoven with commercial project management methodologies (PMI, 2018, PRINCE2, 2009, 2017). Both these methodologies are generic and not necessarily information systems focused. However, SDLC often requires several discrete stages that includes requirements definition, system and software design, implementation/unit testing, integration or end to end system testing and finally, post project, operation and maintenance. Procurement planning and execution are therefore almost invariably managed, under pressure, within the project – a factor that a number of participating sites recognised.

This study posits that many software projects where procurement activity is crucial may suffer from the concatenation of a range of methodologies. Projects may combine SDLC and elements of a commercial project management methodology; this may be further supplemented by a procurement methodology (Figures 1 and 2). This moves the procurement planning phase in to the project environment and is postulated as being one of the key elements that may help explain often limited systems knowledge; once the project is initiated, the pressure to deliver may quickly become intense. Turner (2021) suggests that the focus on standard methodological project management approaches may be a major error: “use conventional project management to manage your (mega) projects, it is your fault when the project fails” (Turner, 2021, p.15). Whilst Turner (2021) focuses on large or mega-projects, this study suggests that the comparative investment and importance of ERP systems in particular, classifies projects as “mega” but also adheres to the CIPS (2021) definition of a complex transaction.

This study suggests that the key impact of this lack of pre-project organisational evaluation is in the development of sufficient knowledge on which to base a formal market test. Study data suggests that vendors may understand this methodological alignment and therefore expect to be part of a process that they have experienced with other clients; in effect, a commercial process they can align with, and, to some extent, potentially commercially exploit.



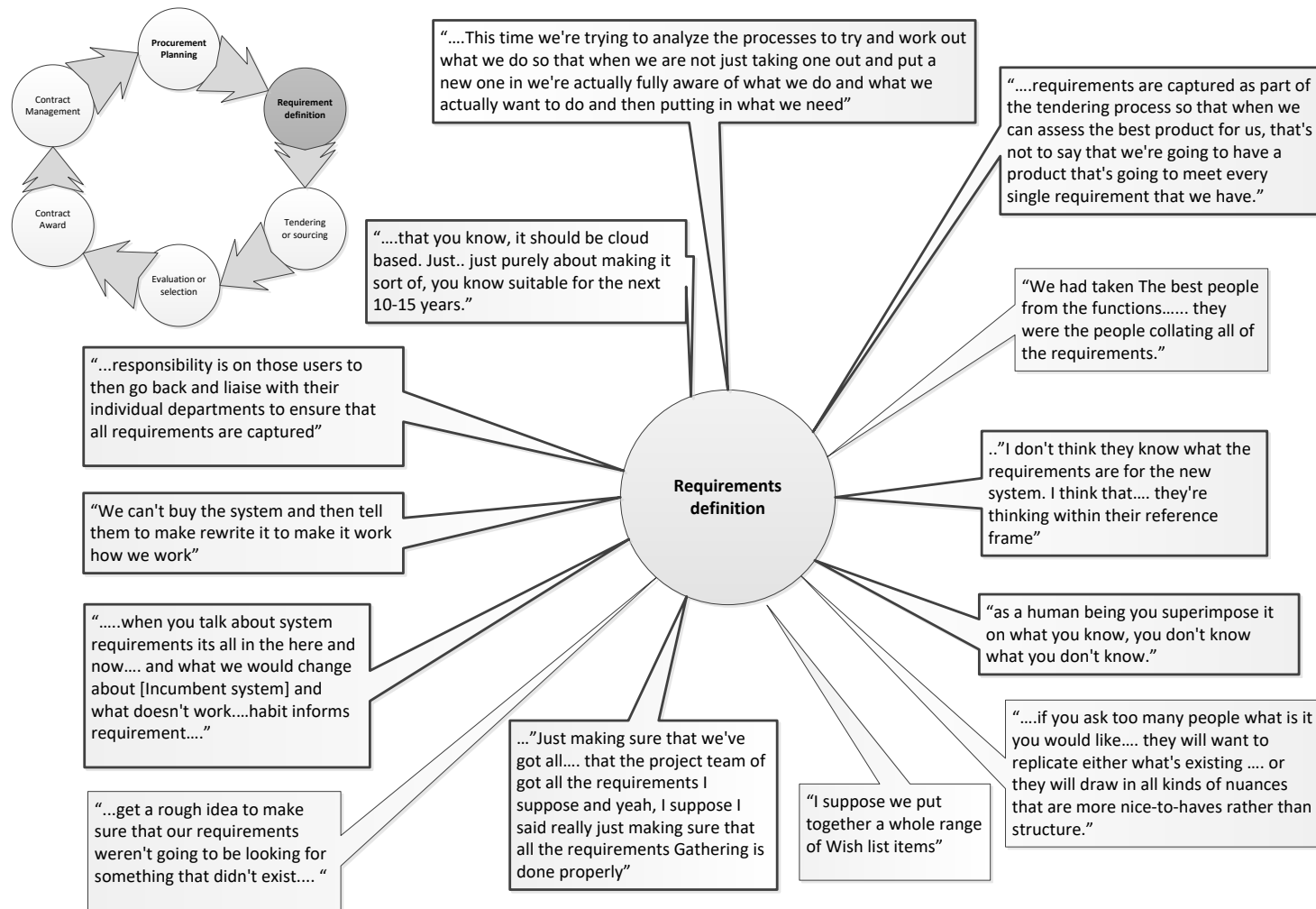
Context Diagram 1 – Procurement Planning

Requirement definition

This activity appears to have been dissipated over both the pre project and project phases. The data that relates to the requirements process is in Context Diagram 2. One notable factor in the two major ERP sites was the long-term replacement of systems that were over twenty years old. Many staff within these organisations were also long tenure and appeared to have developed their expertise on the incumbent technology. A study on the effect of incumbent systems (Polites and Karrahanna, 2012) suggests that the impact of these technologies is often significant and underestimated. It is difficult to envisage how staff who have been both the organisation and incumbent technology for often considerable periods of time can both evaluate and define a new capability that may be significantly more advanced than the incumbent system.

The data suggests that requirements definition was perceived by organisational participants in two distinct ways. Firstly, the project team would have gathered requirements as part of the process of creating a tender document. However, the data suggests that many staff viewed the requirements gathering process as one that sought to ensure that the new system did not technically deviate too far from the process they currently deployed on the incumbent system. This theme was common to many post-project sites – particularly ERPs. This has been explored by Bridger (2021). Bridger (2021) study also suggests that staff requirements gathering may also be perceived as an expectation of functionality delivery as opposed to a vendor assessment - and therefore not only increases risk but perhaps costs from over-customisation.

Study data does not support Poon and Yu (2010) conclusion on organisational adoption of a suitable package selection approach. Organisations in the study almost universally tended to adopt a generic procurement methodological approach and did not appear to identify specific package procurement complexities. However, this study does support Kumar (2017) conclusion that organisations may often opt to utilise legacy procurement processes as opposed to developing a differing, perhaps more innovative procurement planning approach.



Context Diagram 2 – Requirement definition

There is also a suggestion in one specific site that there was an organisational perception that the development of detailed requirements could reduce the cost of the implementation; this proved not to be the case once the project had been initiated. The volume of data that relates to requirements definition is considerable and suggests that many participants perceived that many of the problem's projects had encountered had a direct relationship to this activity or lack thereof. Considerable volumes of data are also related to the role of process analysis in requirements definition. Several sites suggested that detailed process analysis and re-design was a natural precursor to leveraging the investment; however, several sites perceived process analysis as a flaw in failing to help identify a number of elements in the operation that were not catered for once the application was live.

Alternatively, one site as an SME, mandated that the project manager spend as much time as possible understanding both the current workflow environment – and suitable market offerings. This period appears to have lasted almost a year and eventually obviated the need for a tender process. This period had ensured that both project and business areas understood the proposed technological change. Customisation expenses have also been significantly curtailed by this approach.

This study supports Carroll and Richardson (2016) and Hustad et al. (2016) conclusions on the complexity of software requirements creation and definition. However, this study does not fully support Dippennaar, 2008) conclusions on management developing a deep understanding of the impact of acquisition and implementation; this study suggests that a focus on procurement planning moves this knowledge acquisition process to a pre project phase and therefore can help develop a deeper understanding of potential package capabilities. This study does not fully support Alaskari et al. (2019) conclusion that use of client data to evaluate package software should be a standard procurement approach; experientially, packaged software is often a base, configurable product; it may therefore prove difficult for users to visualise how data is managed and stored.

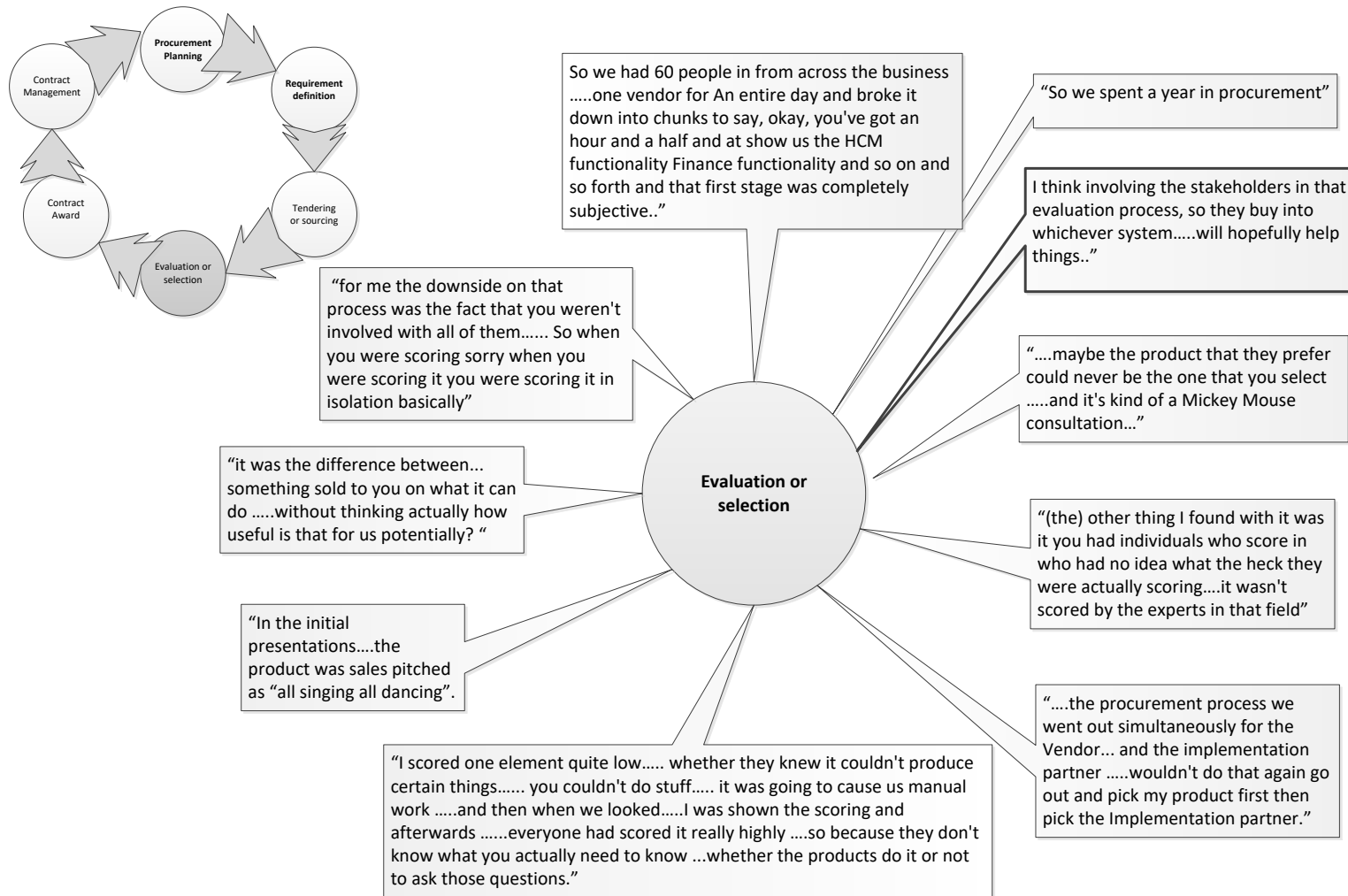
Tendering stage

For those projects at the post project stage, two sites had not opted to formally tender for the technology.

All other sites had adopted a formal competitive tendering process using an RFP (Request for Proposal) format. Few issues appeared to have been experienced at this phase. However, at this stage, one site had failed to identify that elimination of the incumbent vendor had created a significant commercial complexity. As the vendor was ending support for the incumbent system, the organisations technology support was then terminated and the system left unsupported for some considerable time whilst the final product selection and implementation proceeded to completion. It may be suggested that this would have been a comparatively normal vendor response to elimination in many procurement categories and therefore a readily identifiable project risk.

Evaluation/Selection

This phase appears, for most post project sites, to have created a range of both direct and indirect issues. All sites had evaluated their submitted tender responses with few problems. However, the selection and vendor product evaluation processes suggest a far more problematic environment.



Context Diagram 3 – Vendor evaluation or selection

Both major ERP sites had opted to create teams of assessors for vendor evaluation in the procurement process. Several participants alluded to experiences that suggest this stage may have been commercially flawed. One key factor was the inclusion or exclusion, from these sessions, of appropriately skilled staff in these functional domains and the involvement of evaluators who may have little experience or knowledge. No data was collected on how staff had been briefed to score and evaluate vendors. This study only partially supports Heidt et al. (2017) conclusion that consultants should be deployed to help with the evaluation process; by focusing on incumbent technologies there is a risk that, as Bridger (2021) points out, that consultants may start to emulate, with users, incumbent processes as opposed to deployment of native package capability.

Vendors also appeared, during this evaluation phase, to commence the process of system change requests; this is worthy of further research; it may be posited that there may be simultaneous relationship between exposure to vendor products and the initiation of customisation or change requests.

Contract Award

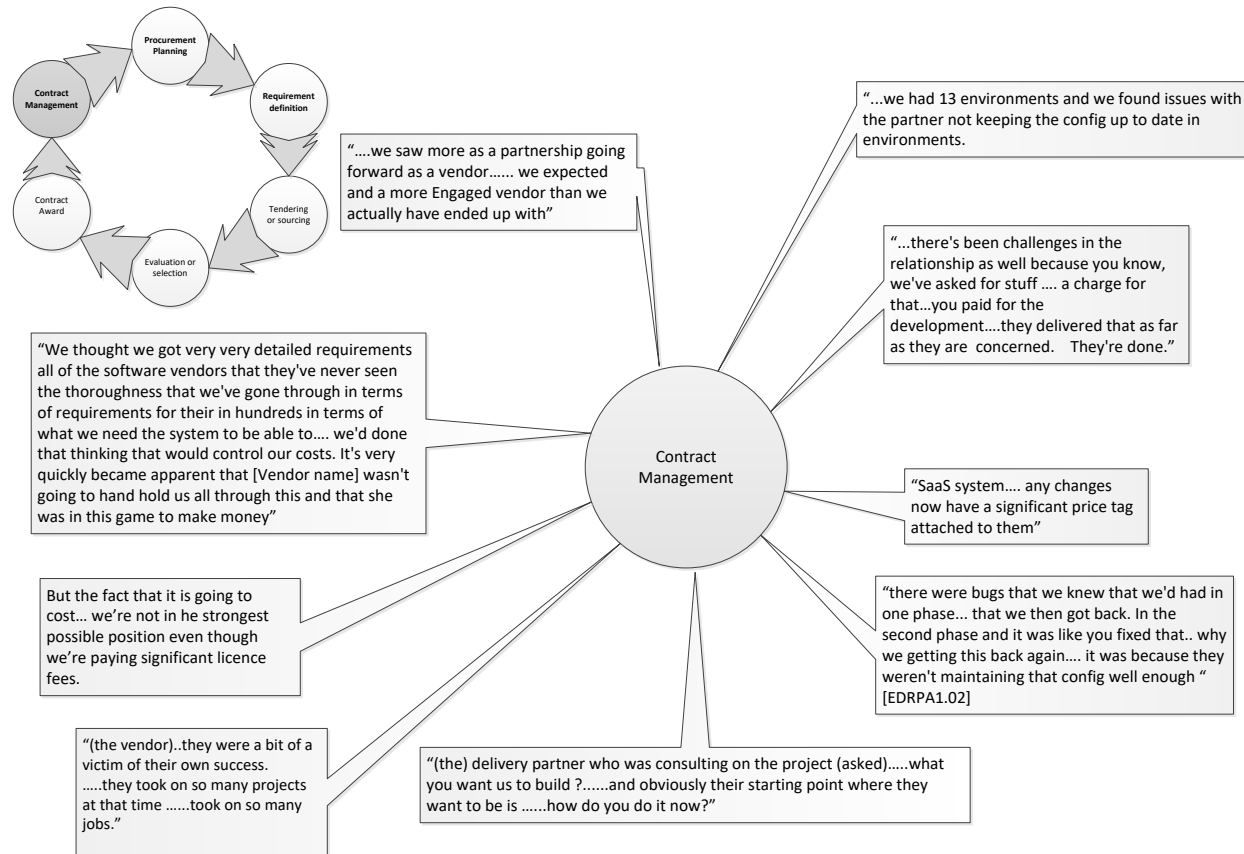
No issues were expressed over this phase of the procurement cycle.

Contract management

For this category of procurement, contract management was deemed to cover the implementation of the technology and its transition to live and associated ongoing support. A sample of the data from this stage is in Context Diagram 4.

This phase saw the emergence of a wide range of often complex difficulties with both vendors and staff. Both ERP sites particular had chosen differing project routes to implement the new technology. One site had been required, due to the business model of the software development company, to deploy a consulting system integrator. Integrators are effectively third-party implementation partners who may specialise in implementation of specific software applications.

The other ERP site procured a system from an overseas company and found that only limited skill and expertise was available within the organisation once the project was underway- which appeared to have severely inhibited their progress.



Context Diagram 4 – Contract Management – post implementation.

However, both organisations shared a similar, though common range of issues. Firstly, the resource effort and complexity of user acceptance testing had not been identified early. Under the SaaS model, it is likely that their contract would specify that customisation and upgrades operation is likely to be dependent on the organisation testing and validating technical integrity via its own testing regime. Both sites had experienced extensive user customisation of the application and had found challenging the efficacy of the implemented change requests difficult. One ERP site had formally challenged the integrator on the interface and integration effort from a recruited project resource - and had been found wanting on the integrity of the estimates.

Discussion

The data gathered in this study suggests that organisational focus on requirements early in the project lifecycle and a traditional approach to procurement may induce considerable commercial risk. Kumar (2017) recognition of traditional procurement approaches is supported. The data from this study suggests that participating organisations had more focused, during the project phase, on the execution of a standard methodological approach to the procurement process. In general, they appeared to not have given much detailed attention to the procurement planning phase and subsequently had not designed a sourcing strategy that would ensure vendors were robustly evaluated. Study sites also seemed focused on extensive analysis and documentation of requirements and selection criteria - a factor that has considerable focus early in the development of enterprise solution products (Illa et al., 2000, Uta et al. 2007). Research by Damsgaard and Karlsbjerg (2010) also tends to focus heavily on criteria-based analysis. Howcroft and Light (2010) take a very different perspective in that package selection may be part of a social constructivist process through organisational actors. Whilst a longitudinal study of an SME, how this perspective works with larger, more complex organisations and often sophisticated technology vendors is unclear. Jadhav and Sonar (2008) also focus heavily on selection criteria and evaluated using AHP or Analytic Hierarchy Process; however, the focus still remains on criteria-based analysis. This study accessed participating sites where long term; comparatively stable incumbent technologies were required to be decommissioned to allow for the introduction of new ES capabilities. There are several key high-level conclusion in this study.

Firstly, both ERP participating organisations had ageing ERP software, both over twenty years old, that had limited functionality and were highly customised to meet local needs. Bridger (2021) suggests that a lack of user experience with modern accounting technology may often create an environment where their focus is on existing processes often to the detriment of a more efficient, newer capability. To quote an old adage, “you don’t know what you don’t know”. The data in this study suggests that stakeholders often focused on existing system functionality as the basis for selection criteria; stakeholder engagement specifically focused on gathering and often defining “as-is” functionality and processes. Early pre-project test demonstrations by vendors may also create anxiety for users as the systems may be very different to their incumbent system, though, as Tersch (2021) suggests, this is part of a soft market test environment. As one senior participant in the study observed, often with replacement systems in particular, users cannot identify what they need in the future as they are very much tied to the status quo.

Secondly, traditional procurement approaches, using market testing and request for proposal have been used for complex technologies that the organisation often has little knowledge of, and

subsequently, may have no means to identify whether pricing/functionality is competitive. From direct experience on both the buy and sell side, from a capability, pricing, cost to deliver and support; the vendor has a commercial advantage having previously undertaken this process with an often-wide range of clients. One key finding across all sites is that their initial budget is often exceeded as was evident in the data; vendors cannot easily define accurate costs for customisation and change without a clearly defined specification. However, this study posits that in many cases in the study, vendors were keen to encourage customisation as a source of revenue. Noticeable also on one of the key sites was the use of a consulting integrator. Many major ERP software vendors, at least the top three global vendors, see their market as software driven and may not necessarily have any associated implementation services. They may also only provide services to large global accounts. Several sites had procured platforms with both application and vendor provided integration services. Both ERP sites had also rejected incumbent vendor bids as mid-range vendors comparatively quickly.

As one participant site suggested, the use of an integrator created a second complex transaction environment. However, one site appeared to avoid these complexities by having the implementation manager focus, under steering committee control, on extensive research, market evaluation and understanding organisational need. This removed the need for a market test and eliminated vendors quickly who did not perceive they could deliver the right outcomes.

The combination of product complexity and integration services technically creates two complex procurement transactions. This study suggests that the use of selection criteria and requirements is not an inconsistent approach – however, as this study data demonstrates, the process of evaluating the product may become distorted and inaccurate. Again a lack of detailed market research product knowledge is evident from participant discussions. This study suggests that a key component in ensuring the right procurement approach is in being able to disrupt the standard procurement and project methodological approach. This study proposes that a pre-project, organisationally managed phase that focuses on vendor technology knowledge development is a crucial element in procurement planning. Given the level of organisational investment in this type of ES technology, it is suggested that an understanding of market packages early in the evaluation phase is critical. At the pre project stage, vendors are at their most commercially vulnerable; the organisation has not made any commercial decisions at this stage. Vendors could be paid for a structured three-to-five-day knowledge development phase where key staff have the capacity to learn and understand the vendor specific package capability. The relative cost of this compared to failure and over-customisation is a considerable saving and risk reduction investment. For vendors who decline to participate, this study suggests that the commercial ramifications may be considerable.

The logical conclusion of this phase may be to rule potential vendors in – or out of the process. As one SME in this study discovered, a detailed, carefully structured, methodical approach to individual vendor capability prior to project initiation obviated the need for a market test phase. However, research over the last ten to twelve years in to project scenario-planning may help improve the acquisition and implementation of enterprise technologies. Effectively, scenario planning at the pre project or front-end stage would allow a knowledge driven approach to potential project scenario issues. It is suggested that “Scenarios are built to help decision-makers in their choices and choices are influenced by how they are framed in terms of risk

acceptance or risk avoidance” (Martelli, 2014, p.210). It is also suggested that ”By accepting the reality of uncertainty and making it a part of how planning happens, decision makers can widen the scope of what is assumed to be true about what the future holds” (Chermack, 2011, p.xv).

This study suggests that as Turner (2021) highlights, scenario analysis could be a robust first step in not only the pre-project - but also the procurement planning process. Considerable research guidance is available to organisations on how scenarios are designed, structured and managed (Chermack, 2011; Favato and Vecchiato, 2017; Goodspeed, 2019; Martelli, 2014; Spaniol and Rowland, 2018). Carefully designed scenario management analysis could encompass organisational approaches to customisation, change management, system cutover, system testing, resourcing, training and a range of other often interdependent project variables. A summary of the key focal points is at Table 2.

Key focal points for practitioners	Actions
Consider extensive procurement planning prior to project initiation.	Procurement planning/strategy needs to be decided at a strategic level and not at project level.
Seek knowledge transfer early	Extensive market and product research required – seek to eliminate unsuitable vendors early. This should reduce project procurement effort.
Scenario evaluate negative impacts	Organisations should evaluate a range of scenarios (delays, vendor issues, negative user reactions) early in the lifecycle.
Recognise and acknowledge the complexity of the buying transaction.	From study data, there is a suggestion that organisations totally underestimate the advanced nature of new capabilities – and the contractual arrangements that support them. Effort is required to separate staff perceptions of complexity from what may be a basic incumbent technology.

Table 2 – key focal points for practitioners

Previous research focus on market testing, tendering and extensive requirements definition creates a rigour that is the result of two comparatively complex methodologies that interact during the project lifecycle that of procurement and project management methods. Data in this study hints that this methodological rigour may potentially be ill-fitting and detrimental to outcomes. As Einstein suggested, “madness is doing the same thing repeatedly and expecting a different result”.

Conclusion

This study concludes that Enterprise Systems are complex systems to source, contract and deliver and that careful procurement planning strategies are often absent or poorly developed.

Previous research suggests that the traditional procurement approach that is often deployed for goods and services has a poor commercial fit. Vendors have considerable experience with these processes and are able to adapt their bids accordingly – and often to the detriment of their potential clients or customers. A more thorough pre-project strategic procurement planning strategy and is crucial. This leverages initial vendor unease as to the organisational commercial approach and helps generate instability as to the appropriate sales process and selection outcomes. For those site participants interviewed at the pre project stage, all were focusing on standard project procurement, bid based approaches and may therefore experience the same outcomes as post-project study sites. Organisational innovation on how to evaluate and assess market offerings in this domain are crucial – and may relate to extended pre project evaluation and product knowledge development.

This study would have benefited from a larger sample of industrial site data particularly at a mid-range level where significant vendor implementation services are incorporated with the software. As this study is cross sectional, it was difficult to ascertain the accountability and involvement of internal organisational procurement and relationship to project sourcing activity. This study could not easily separate whether internal service and support was to the project – or managed and delivered as an organisational function.

There is considerable scope for further research on longitudinal evaluation of ES procurement decision making and the contributing factors to that process. This would yield considerable insight on how projects manage poor knowledge, software complexity, vendor evaluation and decision making.

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