# A Lifecycle Analysis of Complex Public Procurement: An Agency-Institutional Theory Perspective


## Abstract

**Purpose:** The study sets out to demonstrate how a lifecycle perspective on complex, public-sector procurement projects can be used for making qualitative assessments of procurement policy and practice and reveal those procurement capabilities that are most impactful for operating effectively.

**Design/Methodology/Approach:** An agency-institutional theoretic perspective and a lifecycle analysis technique are combined to abductively develop a framework to identify, analyse and compare complex procurement policies and practices in public sector organisations. Defence is the focal case and is compared with cases in the Nuclear, Local Government and Health sectors.

**Findings and practical implications:** The study provides a framework for undertaking a lifecycle analysis to understand the challenges and capabilities of complex, public-sector buyers. Eighteen hierarchically-arranged themes are identified and used in conjunction with agency and institutional theories to explain complex procurement policy and practice variation in some of the UK's highest-profile public buyers. Our findings provide a classification of complex buyers and offer valuable guidance for practitioners and researchers navigating complex procurement contexts.

**Originality/Value:** The lifecycle approach proposed is a new research tool providing a bespoke application of theory by considering each lifecycle phase as an individual but related element that is governed by unique institutional pressures and agency-theoretic relationships.



Keywords: Procurement lifecycle analysis; Procuring complex performance; Complex procurement; Agency theory; Institutional theory

Paper type: Research paper

## 1. Introduction

This paper concerns public-sector procurement, an area where there are increasingly very large amounts of funds flowing through complex projects (Infrastructure and Projects Authority, 2023) yet systemic weaknesses in public procurement policies and practices persist (Barrett, 2016; Calvo *et al.*, 2019; Casady *et al.*, 2023). A plausible but under-studied explanation for this is the inherent difficulty in investigating such a complex area and the lack of an accessible toolkit for researching complex procurement domains. By their nature, complex procurement projects, like all complex systems, are difficult to investigate empirically. The purpose of this paper is to utilise a lifecycle approach to partition complex procurement systems into investigable phases in order to help overcome the difficulty of undertaking meaningful empirical work, and provide contextually-appropriate comparisons across different procurement systems, elucidating relative policy, practice and performance variances and revealing the most impactful capabilities for operating effectively.

The unique focus of this paper is the use of the concept of lifecycle to examine complex procurement processes. Our premise is that all processes associated with a complex procurement project are constrained or enabled in their effectiveness by the lifecycle within which they are embedded and the procurement processes' appropriateness are largely determined by their integration into the overall lifecycle rather than as functioning standalone elements. Therefore, we investigate the wide range of concepts captured by Procuring Complex Performance (PCP) (Caldwell *et al.*, 2009; Spring and Araujo 2014; Santos and Cabral, 2022) and Complex Product Systems (COPS) (Davies and Hobday, 2005; Raddats *et al.*, 2016) as a-priori areas of interest from a lifecycle perspective in order to provide an integrated understanding of the phenomena and inform Operations Management researchers and practitioners. We use the term 'complex procurement', defined by Lewis and Roerich (2009), as *"inter-organisational arrangements that are characterised by significant levels of performance complexity (i.e. must include numerous knowledge intensive activities) and infrastructural complexity (i.e. must include substantial bespoke or highly customised hardware and software elements)" (Lewis and Roerich, 2009, p.2).*

*Theoretical lens*

Our research findings are interpreted using a combination of agency and institutional theories. In this context, agency theory defines the explicit arrangements between two parties, for example, buyer (principal) and seller (agent); institutional theory defines the origins of emergent practices (isomorphisms) within institutions (Eisenhardt, 1988). The complementary nature of the theories is used to provide a robust examination of buyer-supplier relationships in complex procurement projects. The validity of this approach has been widely cited in a range of contexts (Kuhn, 1970; Clark, 1984; Stiles, 1993; Choi and Wacker, 2011), with some literature employing both agency and institutional theories concurrently (Eisenhardt, 1988) but, in a departure from Eisenhardt (1988), the purpose of our invoking the two theories is not to generate hypotheses from the two viewpoints but to use both viewpoints as a means to derive a comprehensive set of interrogatable constructs that codify meaningful strategic practice within buyer–supplier relationships and their associated governance processes. Each theoretical lens offers a different explanatory perspective over different phases of the procurement lifecycle. In order to understand lifecycle procurement, we leverage the concepts

from both a-priori categories of interest (PCP, COPS) to inform our understanding of each lifecycle phase.

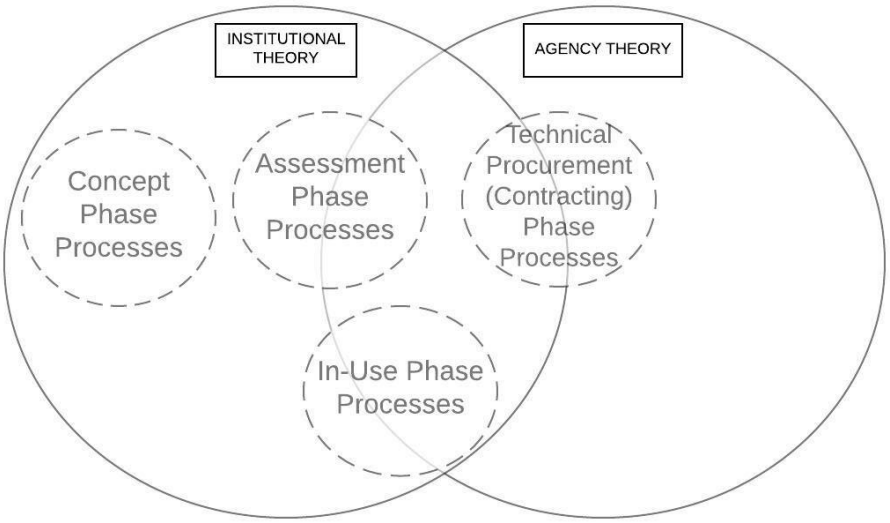


**Figure 1.** Theoretical positioning

Figure 1 illustrates the relative positioning of applying each theory to different phases of the overall procurement lifecycle. In the technical procurement (contracting) phase, there is a distinct principal (contractor) and a distinct agent (supplier). Thus, the organisational processes of the principal are naturally examined with reference to the agency-theoretic factors such as information asymmetry, power dynamics, risk aversion and self-interested behaviour (Eisenhardt, 1989), whereas within the concept and assessment phases, the stakeholders with direct effect over process creation are largely internal ones, with some external influencers. This does not suggest a principal-agent relationship, however, it may be interrogated through an institutional-theoretic perspective, with a number of mimetic, normative and coercive isomorphisms being readily apparent. Processes and capabilities developed within the front-end phases are influenced by principal-agent phenomena but are more directly influenced by institutional pressures such as organisational standards, government and legislative standards, mimetic pressures from non-similar industries and the unique normative pressures of the organisation.

Williams (2017) introduced the term 'systemicity' within complex projects - a concept that refers to the difficulty in establishing a clear line of causality within complex settings because actions and results cannot be observed in isolation. This is addressed by the concurrent application of agency and institutional theories, thus artificially bounding the limits of what is to be considered to be within a single lifecycle phase, reducing the inherent complexity that theory is attempting to explain. The combination of these theoretical perspectives rooted in a lifecycle view offers a novel approach to address the inherent difficulty in researching complex settings.

Partitioning the overall procurement lifecycle into its conceptually and practically distinct elements (Concept, Assessment, Procurement, In-Use) provides three advantages over perceiving the process as a whole. Firstly, cross contamination of irrelevant data from one phase with different objectives and skill-sets to other phases is avoided. For example, a tight

control of performance metrics might be prohibitive in the Concept phase but best practice in the Procurement phase. This partitioning helps address the inherent systemicity problem in complex procurement systems by reducing the ambient complexity at the point of initial analysis (Williams, 2017). Secondly, research can derive more comparable data across cases, allowing for the characteristics of one phase to be considered in opposition to the same phase in a different case. This provides more actionable insights, reducing the risk of insights being overly generic. Thirdly, the concurrently-applied theories can be better tailored, allowing the capabilities of both to be applied to the unique phases thus offsetting the weaknesses of each.

This work seeks to achieve the following objectives:

- use the lifecycle concept to develop an approach capable of making qualitative comparisons of organisations buying in complex contexts;
- contribute to knowledge in designing and managing procurement systems in complex domains;
- contribute to the empirical body of knowledge concerning complexity in public procurement by providing the 'state of practice' across some of the UK's highest-profile public buyers.

The remainder of the paper is structured as follows: firstly, a review of relevant literature is undertaken, its results are then presented and organised around the key themes used to guide the lifecycle investigation as a list of a-priori constructs. Next, the methodology and results are presented. Lastly, we discuss the emergent categories of complex procurement situations and the implications for practice and future research.

## 2. Literature Review

The literature review comprises three components adapted from systematic approaches by Denyer and Tranfield (2009) and Colicchia and Strozzi (2012). First, there is a general narrative review in order to establish the relevant topics, second is a systematic component used to identify papers that acutely fit the areas of interest, the papers from which are used to inform the protocol and the concepts under investigation establishing a foundation of key authors and concepts that 'snowball' into an in-depth, third-stage, concept review.

### *2.1 The Lifecycle View*

Variations on the lifecycle concept have been used in a number of related fields, for example, organisational change (Van de Ven and Poole, 1995), infrastructure procurement performance (Prasad, 1999), maintenance (Tsutsui and Takata, 2012) and supply chain agility (Roscoe *et al.*, 2020). The lifecycle concept is often used as an analogy to the biological context of a developing organism. It is this same analogy that applies within this paper:

*"The typical progression of change events in a life-cycle model is a unitary sequence (it follows a single sequence of stages or phases), which is cumulative (characteristics acquired in earlier stages are retained in later stages) and conjunctive (the stages are related such that they derive from a common underlying process). Each of these events contributes a piece to the final product, and they must occur in a prescribed order, because each piece sets the stage for the next."* (Van de Ven and Poole, 1995:515).

The above quotation underpins the fundamental logic of investigating a complex operations management phenomenon through a lifecycle perspective, where each functional practice such as governance, contracting or procurement is interrelated along a linear timeline, initiated and refined at different stages and influenced by different pressures. Developing an in-depth understanding requires that these factors be observed in relation to each other. This concept has precedence: within the context of organisational change, lifecycles have been used to show how change is *"mediated by the immanent logic, rules, or programs that govern the entity's development"* (Van de Ven and Poole, 1988, p. 37). This study considers that these rules change starkly depending on the procurement phase, and so each phase of a lifecycle with its unique set of pressures and objectives should be considered in sequence (Santos & Cabral, (2022). A similar point is made by Liu *et al.* (2018), within the context of infrastructure procurement, who recommend that it is necessary to understand an even wider lifecycle view that accommodates the antecedent processes prior to the formation of a business partnership and through to its subsequent servitised phases. This variation on the suitability of competencies and capabilities across lifecycle phases is also discussed by Aaltonen and Turkulainen (2018), but from a perspective of relational capital which in turn dictates appropriate governance mechanisms. This breadth provides the capability to understand the range of interdependent contextual elements at play.

From a theoretical perspective, each phase of a complex procurement lifecycle has a different set of institutional isomorphisms (Eisenhardt, 1988) that influence process formation. In early phases, these may be largely internal pressures, in later phases they may be heavily influenced by legislative compliance or external pressure. This provides an opportunity to cross examine each phase using a combination of theoretical viewpoints demonstrated here through the concurrent application of institutional and agency theories.

### *2.2 COPS and PCP*

COPS pertain to large-scale, capital-intensive projects often based in highly-servitised, manufacturing-intensive contexts such as Defence. PCP is concerned primarily with the procurement activity of organisations operating within COPS environments. The PCP literature acknowledges a number of interacting phenomena that define the problem landscape such as: oligopolistic supplier environments (Caldwell and Howard, 2014), product and service bundling (Stremersch *et al.* 2001), extended servitised product lifecycles (Wieland *et al.*, 2017) and diverse performance-based contracting (Hypko *et al.,* 2010). PCP was described extensively by Lewis and Roehrich (2009) who referred to it as "inter-organisational arrangements that are characterised by significant levels of performance complexity and infrastructural complexity". The notion of performance complexity in this context can be thought of as the interrelatedness of knowledge-intensive activities required to ensure an effective outcome to relevant parties (Wieland *et al.,* 2017). This definition keeps PCP broadly aligned to the classification of COPS proposed by Ren and Yeo (2006). Infrastructural complexity refers to the systemic complexity in the tools, processes, infrastructure, and technologies required to execute any particular action (Brady *et al.*, 2005). PCP in a servitised environment is a concept that straddles the traditional view of both procurement and outsourcing and can be described from either perspective. It is principally the procurement of goods and services within the domain of COPS. COPS typically deal with highly-integrated and complex asset and service acquisitions but does not cover procurement specifically, rather focusing on innovation. Technical complexity necessitates that COPS and PCP require

competencies more closely aligned to strategic outsourcing than to high-throughput purchasing. The lifecycle view of procurement is critical to PCP, as major procurement projects in complex environments mimic the complexity and practices observed within megaprojects, where it is understood that a whole lifecycle perspective is necessary (Gil and Fu, 2021).

We propose that there is an interplay between contract management (Bloomfield *et al.*, 2019), relationship management (Roehrich *et al.*, 2019, 2020; Kalra *et al.*, 2021), project management, procurement (Chen *et al.*, 2022), governance and performance management (Bourne *et al.*, 2018; Haq *et al.*, 2018; Kapsali *et al.*, 2019) that can only be understood through an analysis of the entire procurement lifecycle. Focusing on only a subset of these factors omits the emergent properties of the complex procurement system. In previous work, research has often focused on one or a small number of dimensions of complex environments (see Caldwell and Howard, 2014). This research attempts to perceive the process holistically.

### *2.3 Key areas of interest from the literature*

While the mechanics of the literature review are not the key contributing element of this paper, a review is a necessary first step required to identify a-priori areas of interest to focus the empirical aspect (see section *3.2 – Empirical research design*). An initial narrative review used an iterative back and forth process of mind mapping and keyword searches to reveal a comprehensive set of papers relevant to complex procurement lifecycles which consisted of 31 highly-relevant articles. These articles were categorised in accordance with their conceptual coverage, and were used to derive a synthesis of key areas which were subsequently explored during data collection and analysis. These areas were identified by applying an agency and institutional-theoretic view to the emergent set of concepts featured in this body of literature. The content of the articles was analysed using NVivo and the key concepts were identified, separated and combined through thematic reduction (Miles *et al.*, 2019) into their different lanes ascribed to agency and institutional theories until four areas emerged as a consolidated representation of the relevant concepts. The third and final phase of this approach utilised a snowball review to update the literature with the latest relevant research. The final outputs are four superordinate themes that were used as the primary input to the empirical enquiry. Two of the four themes – risk management and performance management - aligned closely with the explanatory frame and properties attributed to agency theory such as the presence of a natural principal (buyer) and natural agent (buyer); and two – organisational alignment and technology management – aligned closely with institutional theory interpreted by their more internal properties derived from a process of evolving professionalisation over time.

Each of these superordinate themes and their relationships to agency and institutional theories are discussed with reference to previous applications.

### *2.4 Key Themes*

#### *Theme 1 - Organisational Alignment*

Organisational alignment concerns the intra-organisational arrangement of governance structures, individuals and teams that constitute the procurement function and its extra-organisational relationships with partners, suppliers and governing bodies. It is an amalgam of concepts broadly viewed as 'how the system is set up'. Previous research has examined organisational alignment for the enhancement of organisational capabilities to learn from experience and to accumulate knowledge over time (Bresnen and Marshall, 2000; Brady *et al.,*

2005), and for the development and exploitation of tangible and intangible relationship-specific assets (Dyer and Singh, 1998). Intangible assets propagate a common normative context through which organisations can enhance the efficiency of any collaborative undertaking (Seal and Vincent-Jones, 1997) and organisational alignment and relationship structures are vital intangible assets. Organisational alignment also acts as a proxy for infrastructural complexity as discussed by Lewis and Roehrich (2009) and Hartmann *et al.* (2014), as it encapsulates the processes that relate to how organisations and their supply chain partners are organised in terms of their governance structures and coordination mechanisms. Numerous papers point to the importance of coordination efforts through structural choice in hierarchical arrangements (Johnsen, 2009; Tate and Ellram, 2012; Tanskanen, 2015). Roehrich *et al.* (2020) discuss the need for research exploring the emergent asymmetries of combining organisations with different organisational structures.

*Theoretical View*

The concurrent application of institutional and agency theories allows each key theme to be interrogated in a bespoke fashion juxtaposing the insights from both theoretical viewpoints within lifecycle phases. The lifecycle view allows us to consider the intra-organisational governance practices that form as a result of specific institutional pressures that are at play during intra-organisational negotiation, but to also differentiate these from the pressures at play at points earlier in the lifecycle. Agency theory can and has been used to examine the inter-organisational relationship used by the principal to control the agent (supplier) (Shevchenko *et al.*, 2020) but can also be exercised in earlier phases to examine how internal actors structure their relationships.

It has already been noted from an institutional theory perspective that organisational practice and, critically, 'organisational structure' become isomorphic over time (Eisenhardt, 1988). Therefore, the normative pressure to support the acquisition process leads to practices that are legitimate but not necessarily efficient (Meyer and Rowan, 1977; Tolbert and Zucker, 1983). Equally, the organisational practices inherent in supply chain partners may cause a coercive effect on the behaviour of the organisation. To meet these expectations, structural changes may occur internally. Organisational structures necessary to support complex procurement capabilities are regarded as largely non-transferable between contexts. Thus, from an institutional theory perspective, there is no 'institutional blueprint' from which to extrapolate an appropriate structure. Institutional theory reveals that isomorphisms form over time (Eisenhardt, 1988), yet with each complex acquisition being partially unique such norms continue to be established. An exploration of the variation of organisational alignment between the case organisations is therefore critical in building a profile of organisational types, and in suggesting effective pathways to improvement.

*Theme 2 Contract and Performance Management*

Contract and performance management concerns the set of activities used in identifying, undertaking, assessing and monitoring the effectiveness of internal and external processes. It is related to the previous theme, as performance management works most effectively when embedded within an appropriate governance structure (Yong, 2010; Bourne *et al.*, 2018). The role of governance mechanisms on performance is a persistent theme in the literature yet is still considered underdeveloped: "Further studies should explore the possible influence of institutional legal and cultural contexts on the relationship between governance mechanisms

and performance" *(*Roehrich *et al.,* 2020, p. 459*)*. Performance systems have attracted attention from scholars interested in both public-private partnerships and the lifecycle of such arrangements (Caldwell and Howard, 2010; Liu *et al.*, 2018). The literature also points to the need to understand contract performance more generally and performance management has been noted to be a fundamental component of contract management and the effective through-life-management of an asset (Bititci *et al.*, 2012). There is no general consensus on how to best manage performance in this field but researchers have noted the importance of developing appropriate metrics and applying them to contracting frameworks within the context of the unique and complex public-sector domain (Brown *et al.*, 2018).

*Theoretical view*

The utility of each theory changes across a lifecycle as each phase consists of different processes seeking different outcomes with different measures applied. From an institutional theory perspective, the performance tools applied in the early phases of the procurement lifecycle are informed more directly by mimetic isomorphism to mimic the metrics applied elsewhere in the organisation or within the industry (Eisenhardt, 1988). While there is a range of institutional pressures applied at the point of a formal outsourcing relationship, earlier phases may have some institutional pressures (Silvestre, 2015; Wu and Jia, 2018) leading to a significant difference in the approach to performance management.

The contract and the various mechanisms embedded within the contract are the central means through which the buying organisation (principal) brings to bear control of the supplier (agent). There is significant precedence in the application of agency theory to exploring this relationship (Eisenhardt, 1988; Sumo *et al.*, 2016; Odongo *et al.*, 2019). The existence of performance measures within earlier lifecycle phases can be interpreted through an agent model to demonstrate how internal control is exerted. In each case, agency theory may be used to derive a complementary explanation of the performance management system when juxtaposed with institutional theory, providing a more robust rationalisation.

*Theme 3 - Technology Management*

This theme concerns the arrangement of information systems used to support complex procurement processes. The literature highlights the unambiguous importance of technology management in the execution of effective procurement practices with some researchers highlighting the importance of particular sub-categories such as knowledge management (Roehrich and Lewis, 2014; Gobbi and Hsuan, 2015; Schniederjans *et al.*, 2020), e-procurement systems (Chen *et al.*, 2022) and extra-organisational collaborative systems (Liu *et al.*, 2016; Aben *et al.*, 2021). Systems integration and the mechanisms for exchanging information have long been recognised as core capabilities for the execution of successful, complex projects (Davies and Hobday, 2005). This theme relates to theme 1 in that information systems are a means of enabling collaboration through the coordination of information across partnerships (Howard *et al.*, 2019; Roehrich *et al.*, 2019; Kalra *et al.,* 2021). Hagel and Brown (2005) conceived the notion of process orchestrators within extended supply chains to describe those organisations which account for the majority of the organisational effort. Given any coordination effort will be technologically mediated, an exploration of the technology functions is used as a proxy to understand the process of network orchestration.

The literature suggests that there are categories of ICT use that typify highly-capable procurement systems. An example is the 'learning from experience' system. This function is often cited within the literature as a key component of competitive advantage, leading to what Davies and Brady (2000) have called 'economies of repetition' in undertaking complex procurement capabilities. Juxtaposing the different technological capabilities and interpreting these capabilities through both theories offers a means of understanding the variation in the application of technology.

*Theoretical View*

Given the prevalence of ICT within organisational processes, the coercive, normative and mimetic pressures to adopt systems through 'legitimacy' and not 'efficiency-seeking' behaviours strongly impact technology adoption (Eisenhardt, 1988). Consequently, previous works often employ institutional theory in explaining the adoption of technologies relevant to the procurement lifecycle process e.g. SCM technologies (Liu *et al.*, 2010), e-commerce (Huang *et al.,* 2010), and auto-tagging technologies (Barratt and Choi, 2009). Agency theory also has an impact in the selection of technology management as a superordinate theme and positions information asymmetry between the principal and the agent as a core consideration in defining a contract (Eisenhardt, 1989).

*Theme 4 - Risk Management*

Risk management was prominent in the initial loading of superordinate themes. In this context it concerns the means by which buyers of complex goods and services identify, analyse and manage internal and external uncertainty. Risk management is of critical importance to the successful execution of large-scale projects and complex procurement projects (Johnsen, 2009; Caldwell and Howard, 2010; Roehrich and Lewis, 2014; Gobbi and Hsuan, 2015; Mahapatra *et al.*, 2017) and is prominent in the contracting relationships of complex procurement projects, with risk aversion often cited as the deciding variable in the selection of contract type (Kapsali *et al.,* 2019). Risk underpins the governance, performance and technology-related themes which may be regarded as the 'levers of control' that can be used to help manage risk (Simons, 1994). Understanding the interplay of these factors on risk has been called for in recent literature (Roehrich *et al.*, 2020).

Within COPS environments, the economic and organisational burden of sharing and managing risk requires alliance partners to garner trust, generate effective information sharing mechanisms and possess a mutual sense of accountability (Mayer and Argyres, 2004; Dyer and Singh, 1998). Uncertainty and risk are deemed critical in the examination of the process along the entirety of the procurement lifecycle (Caldwell and Howard, 2010).

*Theoretical view*

Agency theory has been used to examine risk in public-private partnerships, governance structures, performance management and contracting relationships (Zsidisin and Ellram, 2003; Haq *et al.*, 2018; Bloomfield *et al.*, 2019). Institutional theory is applied more generally to the risks faced in complex contexts (Park *et al.*, 2014) proving to be a valid lens in examining similar contexts such as megaprojects (Biesenthal *et al.*, 2018) and the effect of governance practices on change (Badewi, 2016). Institutional theory allows us to understand the motivations behind the emergence of risk management practices (Eisenhardt, 1988) within the context of a particular lifecycle phase. We are therefore able to interpret the emergent process

in accordance with the varying pressures innate to each phase, and derive a more insightful map of how these pressures manifest over time.

## 3. Research Design

### *3.1 Abductive data maps*

The abductive data mapping technique, inspired by the Zachman framework (Lapalme *et al.,* 2018), organises qualitative data along a chronological map of processes, in this case using the procurement lifecycle of each case organisation. Data is recorded according to lifecycle sequence with a separate map constructed for each major phase of the lifecycle (Concept, Assessment, Procurement, In-Use). In order to scrutinise each phase, the researcher ensures a series of primary interrogatives are addressed (what, why, when, where, who, how) (see Figure 2).

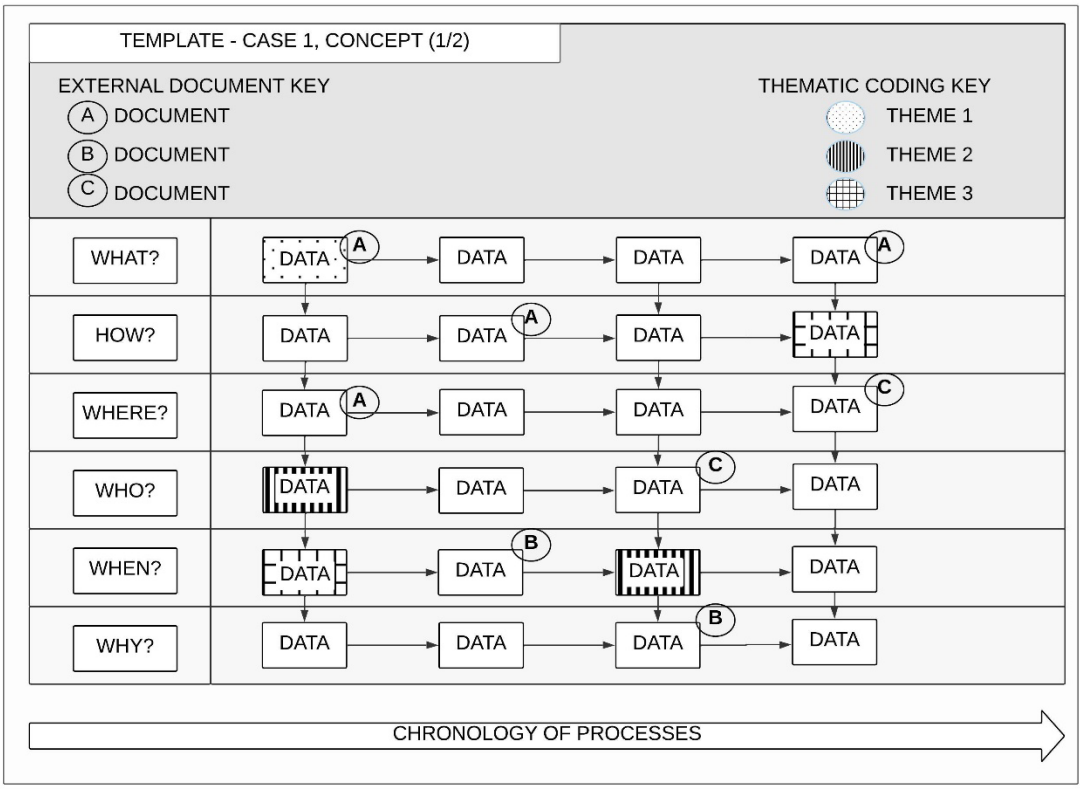


**Figure 2.** Abductive data map example

The original Zachman framework has traditionally been used within information systems' research but is often adapted to operate in a variety of contexts (Neaga and Harding, 2005; Hernandez *et al.*, 2014). The method relies on building up a picture of a system by taking multiple perspectives, making it particularly suitable for qualitative research utilising data triangulation. Data is summarised as responses to the primary six questions (vertical axis) and coded against any of the four themes to which a particular data point pertains. Furthermore, each data point is associated with relevant documents (shown as A, B, C). Nvivo was used in conjunction with the maps in order to organise the empirics. Each case study has four of these

templates to organise the data, one each for the Concept, Assessment, Procurement and In-use phases. This provides the cradle-to-grave view of the entire procurement lifecycle.

The "What" question is often the title or description of an internal process. This may, for example, be the identification of a procurement request. The framework then encourages the researcher to continue scrutinising this process until all six questions are answered. The "When" question could concern procurement requirements being issued as and when a need arises, or in accordance with an annual budget. After all queries are answered, the framework prompts the researcher to query the next process in the lifecycle. After a first iteration, any omissions in the data sheet become conspicuous and can be queried in subsequent interviews or document analysis. Additionally, data points are coded in accordance with the a-priori themes and the original data sources are referenced on the diagram (as shown in figure 2).

Organising qualitative research in this way is exceedingly time-consuming but provides three key advantages that are particularly important in this context: (1) the researcher is prompted to follow up if any of the six questions is left unanswered ensuring a breadth of knowledge is captured (i.e. it is a dynamic data collection method as well as an analysis tool); (2) the researcher can more easily compare the bigger picture of procurement lifecycle practice across case organisations, as the whole picture is presented in a comparable fashion prompting further enquiries if there are conspicuous divergences; (3) individual processes cannot be separated from their surrounding context providing the researcher with the means to facilitate the exploration of contextual depth.

### *3.2 Empirical research design*

The empirical research design (see figure 3) comprises a number of different elements to explore the complex procurement lifecycles of the four selected UK cases: a major defence sector buyer (DSB), a major health sector buyer (HSB), a nuclear sector buyer (NSB) and a grouping of local government sector buyers (LGSB). The four key themes are used to inform the case study enquiry by broadly defining the interview topics, which in turn help identify relevant interview participants, organisational sub-units and relevant documentation. It is this iteration that defines the abductive design (Shani *et al.*, 2020) as insights are developed, revised and re-revised in continuous consultation with emergent data (Dubois and Gadde, 2002).

Cases were selected based on their adherence to Davies and Hobday's (2005) definition of complex product systems. Their list of complex organisation characteristics was used to inform our case selection. Abductive data mapping was used to guide both interviews and document analysis (Eisenhardt and Graebner, 2007; Yin, 2014) and the application of the lifecycle approach revealed data omissions throughout the procurement process. These omissions are clarified in a secondary data collection stage. With each data collection, the theory and empirics are re-evaluated in the light of new evidence thus bringing the empirics and theory into closer alignment as more of the lifecycle maps are compiled. After completion of the cases, a cross-case analysis was undertaken, and the resulting thematic architecture was used to modify the case study protocol to include those emergent themes not included in the abductive iterations.

### *3.3 Data collection*

The nature of abductive research is typified by engagement, analysis, and then re-engagement, repeated until saturation of a line of enquiry. This entailed forming enduring relationships with key interview participants with the data mapping reaching a state of increasing completeness

after each re-engagement. The data mapping, therefore, functions as the principal means of coding from which theoretical saturation is derived. As an example, in the DSB case, 12 staff were interviewed and, for most cases re-interviewed, over a four-year period. While each case company's hierarchy of procurement personnel was different, interviews were primarily undertaken with the personnel occupying equivalent positions to: Head of Procurement – heads of the organisation's procurement unit; Head of Commercial Department – those responsible for the contracting practice; Project Team Head – participants with intimate knowledge of specific large-scale procurement projects; Project Team Group Head – participants overseeing groups of large-scale procurement projects for a more holistic strategic perspective of practice; Special Project Heads – those involved with issues of critical importance to the organisation (for example, ICT capability provided to the procurement function). Figure 4 illustrates how quotes from interview transcripts and content from documents are coded for specific lifecycle positions and against specific themes in the data map. Each of the remaining cases were undertaken over a period of a single year with between 4 and 6 people interviewed.

*3.4 Data analysis*

The data analysis step concerns the thematic reduction of qualitative data (Voss *et al.,* 2002; Miles *et al.*, 2019). Whereas traditional thematic analysis involves the creation and re-creation of themes from case data, an abductive approach requires re-engagement with primary data sources during this analysis process (Dubois and Gadde, 2002). Therefore, the bulk of the data analysis is sub-divided into four components: (1) the first is referred to by Eisenhardt (1988), as the 'within-case' analysis and acquaints the researcher with the case organisation as a single and separate activity so as to allow the distinctive properties of that case to emerge (Barratt and Choi, 2009); (2) the second component is also 'within-case' and involves re-interviewing participants in order to fill any gaps identified by the abductive data mapping; (3) the third component is the cross-case analysis, the purpose of which is to compare and contrast the individual insights of cases across the body of cases to derive further insights applicable to the group (Ketokivi and Choi, 2014); (4) the final aspect of the analysis codifies each emergent thematic category according to 'prevalence' and 'perceived effectiveness', two cross-cutting themes derived by making comparative judgements across cases. Encoding is undertaken using a simple denotation of High, Medium (Med) or Low. These categories are comparative rather than absolute and, therefore, relevant only to this case set. The purpose is to provide relativistic statements to quickly unpick variances across the cases rather than to provide a universal typology of what is High, Medium or Low. The variances are the key phenomena of interest as these differences allow us to differentiate types without losing the nuance of the cases through the use of a rigid typology. In making a determination for each of the cross-cutting themes, we repeatedly triangulate several pieces of data. For 'prevalence', we consider the number of processes, the interconnectivity of the processes and the variety of actors and sub-units involved in the processes in order to make a relativistic judgement regarding the prevalence of that theme within that case in relation to other cases. For 'perceived effectiveness', we refer to two primary sources of information: the first is an analysis of the sentiment with which processes are described by participants in the primary data; secondly, senior personnel are asked to rate the overall effectiveness of a process grouping (for example, contractual techniques) during a final round of interviews. Once we established a set of themes, cases are compared across each of the lifecycle phases and the results interpreted.

The iterations involved here were extensive and rigorous as each map contains six reference points (What, How, Where, Who, When, Why) each of which links to various primary data. In the focal DSB case, this required working closely with staff within the organisation for sustained periods of time with multiple additional supplementary interviews and document analyses required in order to amass the evidence pertaining to all procurement processes across all four phases.

## 4. Findings

We investigated the procurement practices of each of the case organisations across each entire procurement lifecycle. Whilst there are variances in the exact composition and length of the steps of these lifecycles, each case could be generalised into four distinct phases, namely: Concept, Assessment, Technical Procurement and In-Use. The approximate composition of these four phases across the case-set is illustrated in figure 3.

The research used lifecycle analysis and abductive data mapping to codify processes along a linear lifecycle. The four a-priori themes (organisational alignment, performance management, technology management and risk management) were used as inclusion criteria for identifying key processes and to guide the enquiry. Across these four superordinate themes, eighteen distinct, subordinate themes emerged. We first provide an overview of the DSB case and a summary of the remaining cases, and then use the thematic structure to interpret the implications of the whole case-set.

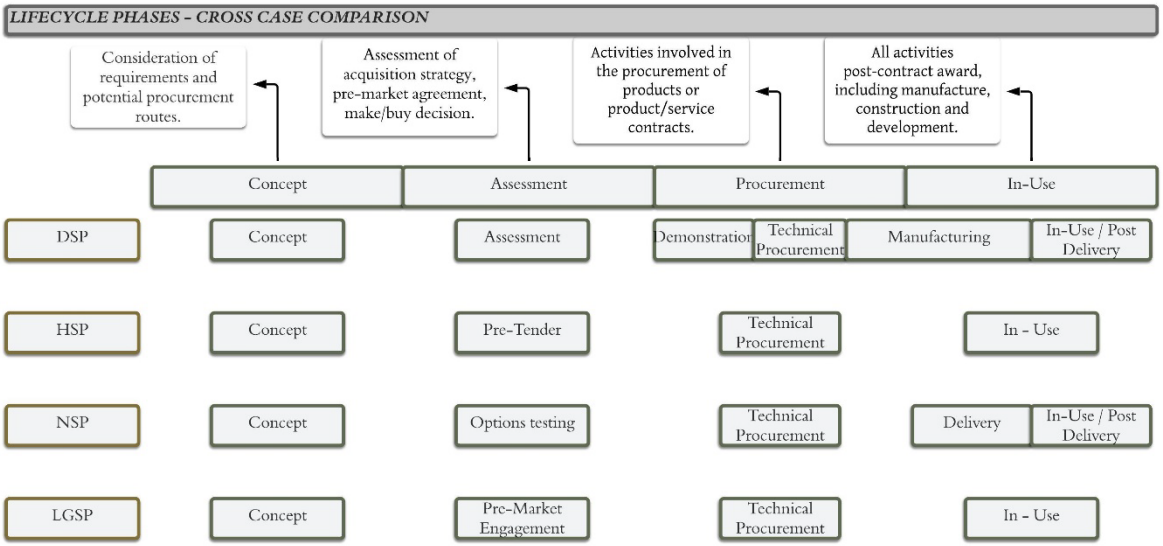


**Figure 3.** Procurement lifecycle phases

### *4.1 Case 1 – DSB*

Figure 4 provides an excerpt of the DSB abductive data map in order to illustrate the details and practicalities of mapping a case. Generalisations and redactions have been applied to effectively showcase the approach in practice.

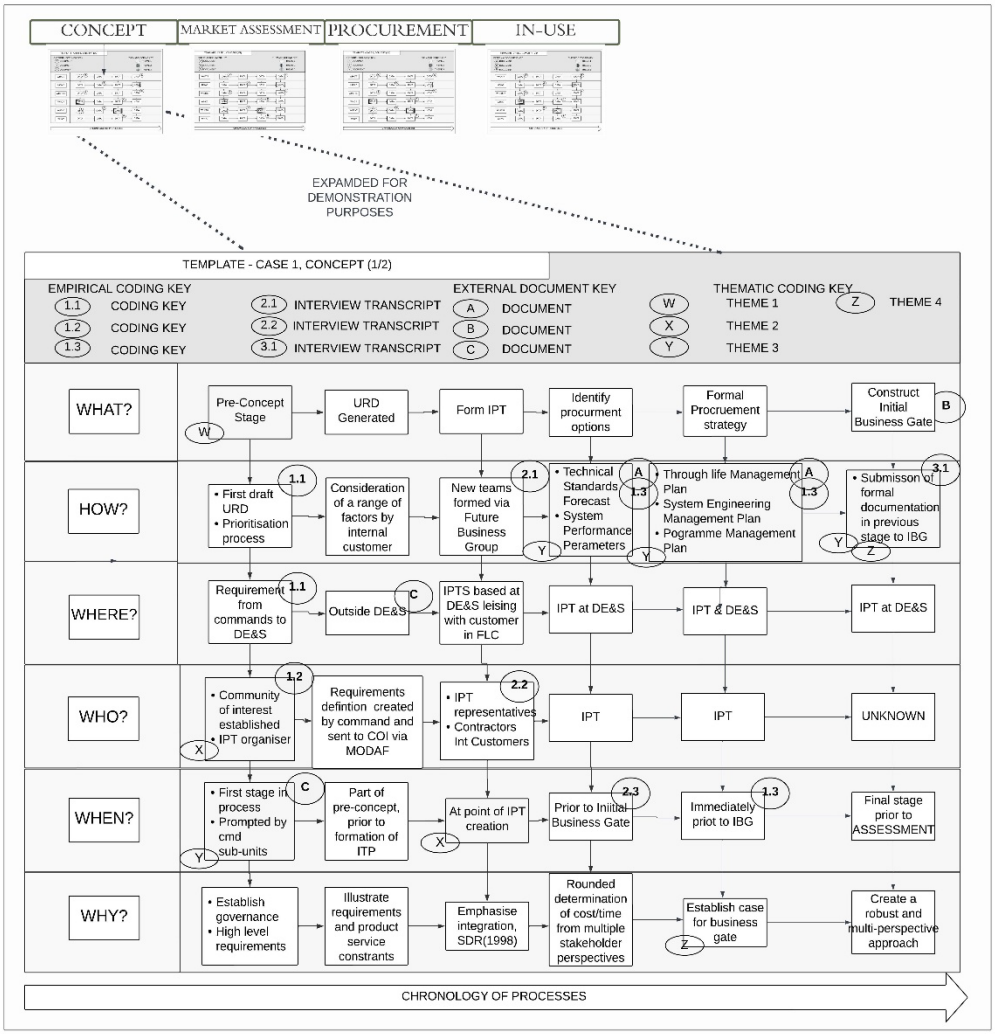


**Figure 4.** Concept example Defence Sector Buyer (DSB)

The abductive data map is an abridged version of one of six diagrams constructed for the DSB case. The map arranges the key processes chronologically along the lifecycle and in doing so links each process data point to empirical coding keys. The map is an interconnected web of logically-organised qualitative data that allows the case processes to be viewable as a snapshot and aids in theory building. This method of data collection and analysis has the advantages of:

- considering processes in relation to other contextually-relevant processes (i.e. within. concept, assessment, procurement and in-use phases);
- prompting identification of missing information to fill gaps in the map;
- better utilisation of interview time and engagement with practitioners as the maps are partially compiled in real time.

Defence is a well-featured sector in the complex procurement literature (Kalra *et al.*, 2021; Bloomfield *et al.*, 2019) and studies of the Defence sector have helped to form the current conception of PCP (Caldwell and Howard, 2010). The prominence of lifecycles and through-life management in a military setting is significant, and so the context lends itself to the lifecycle view and the abductive data mapping technique. Our outputs from the lifecycle analysis are commensurate with this depiction of the DSB as a particularly relevant context for

the study of complex procurement capabilities. The DSB case has the highest number and variety of processes used along the procurement lifecycle as well as having the most-varied organisation structure in comparison to the other cases. The complexity of the lifecycle maps created to depict the overall procurement process was significantly denser than the other cases, involving more organisational sub-units and interconnected processes. Its procurement is largely handled through its project arm which is organised into project teams that pursue large procurement contracts but with a number of central areas of expertise such as Commercial and Contracting. The hierarchical arrangement is overly complex, leading to repeated guidelines, policies and activities across sub-units rather than standardised across the whole or customised in accordance with previous efforts. Performance management and metrics are utilised inconsistently across these varied units, although there is some centralised expertise provided by specific departments regarding specific functions. The oligopolistic nature of the marketplace often causes a lack of performance management practices at the contracting stage, with the DSB often favouring contracts that transfer most financial risk to the contractor (for example, public finance initiatives). The ICT systems used vary in terms of function, ownership and age with wide acknowledgement of the systems' siloed nature. Across each of the four themes, the DSB's procurement practice tends to be decidedly uniform at the strategic levels, but the processes were bespoke to projects at the operational level; this is barring a few notable key exceptions such as the criteria for a project to pass 'main gate' stages which was broadly consistent.

The lifecycle mapping approach provides a snapshot of the context within which a particular process is being undertaken. This allows for secondary questions regarding the process to emerge prior to additional rounds of data collection. This abductive approach allowed the research team time to reflect and to probe further into any emergent considerations within the next round of data collection. For example, if a key piece of performance data is captured during one phase, we can project forward onto the lifecycle to see where this data is being used.

The DSB has a relatively high prevalence of processes encoded across the key themes compared to other cases, indicating that process variety and complexity are significant but the data often suggested a medium to low perception regarding their effectiveness. Holistic knowledge management, standardisation of practice, a learning-from-experience capability and the management of uncertainty are all features perceptible in the lifecycle and are particular features of the case. However, despite the prevalence of these capabilities they were frequently discussed as needing further development to be effective. A DSB project manager summed up colleagues' feelings by commenting "The lack of learning from past projects and standardising good practices are repeatedly highlighted as areas of weakness". Some elements of standardisation existed in the form of contract templates and assurance processes prior to 'stage gates' within the lifecycle. However, there is a conspicuous lack of standardisation outside of these processes, which is a revealing finding given the military's association with standardised processes. Knowledge management processes were also prominent across the lifecycle. Instead of entrenched systems' knowledge, the acquisition process relied upon the expert knowledge of the personnel - a particular problem within the military context as staff regularly rotate across different roles. A procurement lead bemoaned "we start over with a new project lead every two or three years losing vital knowledge and momentum as the former lead moves on". This was in vivid contrast to the NSB case, for example, which embedded the accumulation and dissemination of practice more explicitly in formalised processes.

Case results were reported back to the case organisation. In the case of the DSB, this took the form of a report and presentation to a Change Board headed by a Major General. The results were congruent with the perspectives of the senior personnel on the Board.

*4.2 Key features of comparative cases*

The remaining three cases concerned the HSB, LGSB and the NSB. Each of these differed from the DSB case in distinctive ways. They are briefly summarised and comparisons are made to arrive at a typology of complex procurement lifecycles.

The HSB has a complex procurement structure that involves budgetary control derived from central government and enacted through over 200 Clinical Commissioning Groups (CCGs) that act as devolved regional commissioning experts spread across the UK. These groups are supported in the procurement process by Commissioning Support Units (CSUs) that are also deployed on a devolved basis but do not align one-for-one with the CCGs. The CSUs act as the centres for procurement expertise and thus a majority of the interviews and document requests undertaken were with CSUs. The structure of the HSB is continuously evolving yet the lifecycle approach bounds the organisation into segments based on function so these insights are applicable beyond any future restructure. The organisational arrangement of units is novel in that it is decentralised to local CCGs with procurement expertise partially centralised within the CSUs associated with the CCGs in a non-uniform manner. A prominent factor that emerges from this distribution is a tension between the various organisational sub-units. An internal marketplace system allows the CSUs to 'sell' services to the CCGs which have a profound impact on the relationship between internal organisational units. Specifically, the establishment of a successful contract often relies strongly on interpersonal relationships between CCG and CSU personnel, rather than being contingent on normative procedures alone. In addition, the CCGs and CSUs have devolved powers to organise the practices as they see fit which is a cause of inefficiency through a lack of overall control. There are a number of novel performance management initiatives such as CQINs (Commissioning for Quality and Innovation) requiring mandatory metrics in the HSB standard contract. However, the ICT infrastructure is comparatively simplistic for sharing contract data. The lack of inter-unit coherence emerged prominently as a result of adopting the lifecycle view.

The LGSB case focused on the procurement activities of three local authorities (councils) in the UK. The procurement departments procure on behalf of local front-line services such as the fire service, refuse collection, local transport organisations, local infrastructure, social facilities and some health provision. With some substantial variation year-on-year, the annual budgets fall between £0.5 and £1.2 billion, with the majority being used on contracted services and procured infrastructure. The local councils are treated as one single composite case owing to similarities in their procurement practices and the comparatively consistent set of processes observed. The characteristics codified under the organisational alignment theme diverge significantly from the structures within the DSB and the HSB. Whereas these organisations offer a hybrid structure consisting of centralised and decentralised elements, the local councils are largely centralised both in terms of geography and organisational structure. Multiple procurement functions are undertaken by significantly fewer staff. This is, in part, to be expected owing to the relative differences in budget and organisational size. We observed significantly higher dependence on extra-organisational communication, often in the form of consultancy and collaboration. The communication between these parties is often ad-hoc and contingent on the individual persons involved. Performance management practices are centred

largely around the contract management aspects and aren't as prominent in other lifecycle areas as compared with the other cases. There are limited approaches to foster continuous improvement, and standard, off-the-shelf software packages are used. A number of contracting types are used aimed at sharing risk with collaborators. However, assessment tools are used without any formal risk profiling over time or policy guidance for risk management. In this case, the lifecycle approach showcases the disconnect across processes with few organising systems and procedures in comparison with the other cases.

The NSB operates across several geographically-dispersed sites. Its processes and procedures, encoded under the key themes, are unique amongst the body of cases in that they are connected and coherent across the varying sub-units of the organisation. From an organisational alignment perspective, the NSB operates a programme and project structure similar to the DSB, with each facility responsible for its own procurement. Its performance metrics are compiled across a centralised system that offers a consistent set of metrics and a bespoke interface to assess risk and evaluate supplier and project performance. The contracting processes use several novel approaches, notably cross-lot tendering and an innovative 'value transition point' for distributing contractor and organisational resources and responsibilities across different phases of a procurement lifecycle. Each of these approaches is directed and controlled by a uniform set of guidelines across the NSB's different projects. Cross-lot tendering allocates partial workloads to partner organisations and the value transition point provides a means of shifting primary ownership of a project to the contractor at the point when it is most capable of dealing with the risk. These processes were described as effective by practitioners. The 'learning from experience' system is also highly robust, enforcing documented explanations of variations from previous contracts, which then formed a body of well-organised knowledge that is used to guide all future projects. The lifecycle view is particularly effective at enabling comprehension of the NSB case as there is a high degree of formal procedural structure, and each process follows logically from the previous and onto the next.

*4.3 Results of Cross-Case Analysis*

A lifecycle map is constructed for each phase to assess the procedures and practices deemed relevant to the overall capability of the procurement process. The procedures and practices observed are thematically reduced into eighteen categories of procurement lifecycle capability (see table 1). The subordinate themes were derived from the abductive data maps. Each map highlights data points that aligns to one of the four key themes. The process involved coding each data point on a map as aligning with theme 1,2,3,4 or 0 (not relevant to key themes). These areas were then combined and discarded until a representative spread of key themes were apparent.

| | | **DEFENCE (DSB)** | **HEALTH (HSB)** | **LOCAL GOVERNMENT (LGSB)** | **NUCLEAR (NSB)** |
|---|---|---|---|---|---|
| **Super-ordinate theme** | **Subordinate theme** | **Prevalence versus Perceived Effectiveness** | | | |
| ORGANISATIONAL ALIGNMENT / GOVERNANCE FACTORS | Sub-contractor engagement | Low/High | Med/Med | Low/Not found | High/High |
| | Spread of organisational control | High/Low | High/Med | Med/Med | Med/Med |
| | Internal coherence / Communication | Low/Low | Med/Med | High/High | High/High |
| | Fit of normative and observed | High/Med | High/Med | High/High | Med/Med |
| | Geographical spread of stakeholders | High/Low | Med/Med | Med/Med | Low/High |

| | | | | | |
|---|---|---|---|---|---|
| PERFORMANCE MANAGEMENT | Quality filters and KPIs. | High/Low | High/Med | Low/Low | High/High |
| | Contractual techniques | High/Med | Med/Med | Low/Low | High/High |
| | Collaborative practice | Med/Low | Low/Med | Med/High | High/High |
| | Coherence of internal project control | Low/Low | Med/Med | High/Med | High/High |
| | Predictive analytics | Med/Med | Med/Med | Low/Low | High/Med |
| TECHNOLOGY MANAGEMENT | ICT system variety | High/Low | Med/Med | Low/Med | Med/High |
| | E-procurement systems | Med/Low | Low/Med | Low/Low | High/High |
| | Knowledge management systems | Low/Med | Med/Med | Low/Low | High/High |
| | Coherence created across organisations | Low/Low | Med/Med | Low/Not found | High/High |
| | Extra-organisational systems | Med/Med | Low/Med | Low/Low | Med/High |
| RISK MANAGEMENT | Use of avoidance/reduction transference strategies | High/High | Low/Not found | Low/Med | High/High |
| | Density of risk management practices throughout acquisition lifecycle | High/Med | Med/Med | Low/Low | High/High |
| | Risk reporting / Information gathering | High/Med | Med/Med | Low/Low | High/High |

**Table 1**. Cross-case analysis

The assignment of the final determinations as to whether a process is High, Med or Low is principally a relativistic assessment within and across the cases and not an attempt to be an absolute typology. For example, the prevalence of sub-contractor engagement per procurement project in the NSB case is materially higher than it is in the HSB which in turn is materially higher than the DSB and LGSB (see table 1), whereas the effectiveness of sub-contractor engagement was regarded as being significantly better than the effectiveness of the spread of organisational control within the DSB based on the perceptions of relevant case interviewees (see table 1). Sub-contractor engagement was codified across 9 major processes along the procurement lifecycle within the DSB case, relatively few compared with the case set. These interactions were highly formal (ITTs etc) and based disproportionately in the latter stages of the lifecycle (8/9 instances during the In-Use, Contracting phases). This suggests a comparative opportunity to bring in engagement with sub-contractors earlier in the procurement process, and some opportunity for less formal interactions. This approach was deemed appropriate, however, and was not associated with any concerns at interview thus producing a relatively high perceived effectiveness. This seems to fit with the overall case trend of increased tendency to formalise procedures as complexity grows (normative isomorphism).

## 5. Discussion

Lifecycle mapping provides a practical approach to aid in the identification of categories of complex procurement situations. Processes are assessed against each of the four procurement lifecycle phases (Concept, Assessment, Procurement, In-use). This provides a solid basis for making relativistic statements about case divergences, and to better contrast the theoretical interpretations of the results. For example, Defence displayed a significantly higher prevalence for performance evaluation tools within the Procurement phase, whereas Health and Nuclear had significantly higher prevalence in the In-use phase.

In making these determinations there is a necessary reliance on the judgement of both the research team in their view of the data and the senior personnel associated with the case. However, any absolutist determinations of the effectiveness of a given process would be near impossible in a complex system because a clear chain of cause and effect is extremely difficult to validate. For example, contract and performance management practices may appear to be effective viewed by their output, despite it being known that incorrect elements are being recorded and reported, masking an underlying flaw. The lifecycle approach and the use of the abductive data map is a critical tool in investigating this fuzzy, complex set of processes, particularly with regard to their interpretation. The total set of 16 qualitative data maps assist

in guiding the empirical enquiry alerting the research team to knowledge gaps. The maps present the whole lifecycle of processes in an accessible format and thus allow agency and institutional theoretic interpretations of the data to easily reference the origins and interrelationships between processes across a lifecycle. This mapping approach provides a means by which the inherent complexity and systemicity (Williams, 2017) of the context can be unpicked.

We were able to identify process combinations distinct to each theme by using either agency or institutional theories but the concurrent application of the two allowed for a clearer delineation of the procurement practices. The detail of some of the agency and institutionally-driven insights that help in understanding case differences would have been at a lower resolution if they were not individually applied to each of the phases across the case set. While the two theories produced different explanations for the characteristics of the buyers, these explanations were entirely compatible, thus providing a richer picture of how complex procurement practices vary across the lifecycles of different organisations.

The mapping approach allowed us to propose a matrix of buyer types by relating procurement lifecycle capability to procurement lifecycle complexity. Comparisons are made on the basis of theoretically-driven reflections in order to define positions on the matrix (Figure 5). The four cases occupy three of the matrix positions:

- Type 1 - LGSB. The LGSB operates in the least-complex context. Processes are often created reactively (coercively) as a response to legislative pressure. There is a markedly lower number of sophisticated procurement lifecycle capabilities (see table 1) yet the introduction of more sophisticated capabilities would likely outweigh the benefits given the comparative lack of lifecycle complexity. A type 1 organisation is likely to only be viable if the complexity of its procurement demands do not increase. Its relatively limited capabilities are appropriate to its context.
- Type 2 - DSB/HSB. Type 2 organisations are positioned off the lifecycle capability-complexity diagonal and behave sub-optimally. They are typified as 'practically coping' with the highly-complex demands on their procurement systems. These organisations have a high prevalence of sophisticated procurement lifecycle processes but their perceived effectiveness is markedly less than other types. Processes are derived through a range of mimetic, normative and coercive pressures to practically cope with the circumstances, and are not necessarily the most effective to satisfy the underlying need. Explaining why one process is in place as opposed to another is often difficult.
- Type 3 - NSB. The type 3 organisation's lifecycle capabilities are derived from a purposeful and deliberate design effort. The reasons for process and practice adoption are easily explained and the logic is clear. These organisations have both a high level of process capability and reported effectiveness. The system is able to cope with diverse and highly-complex procurement requirements.

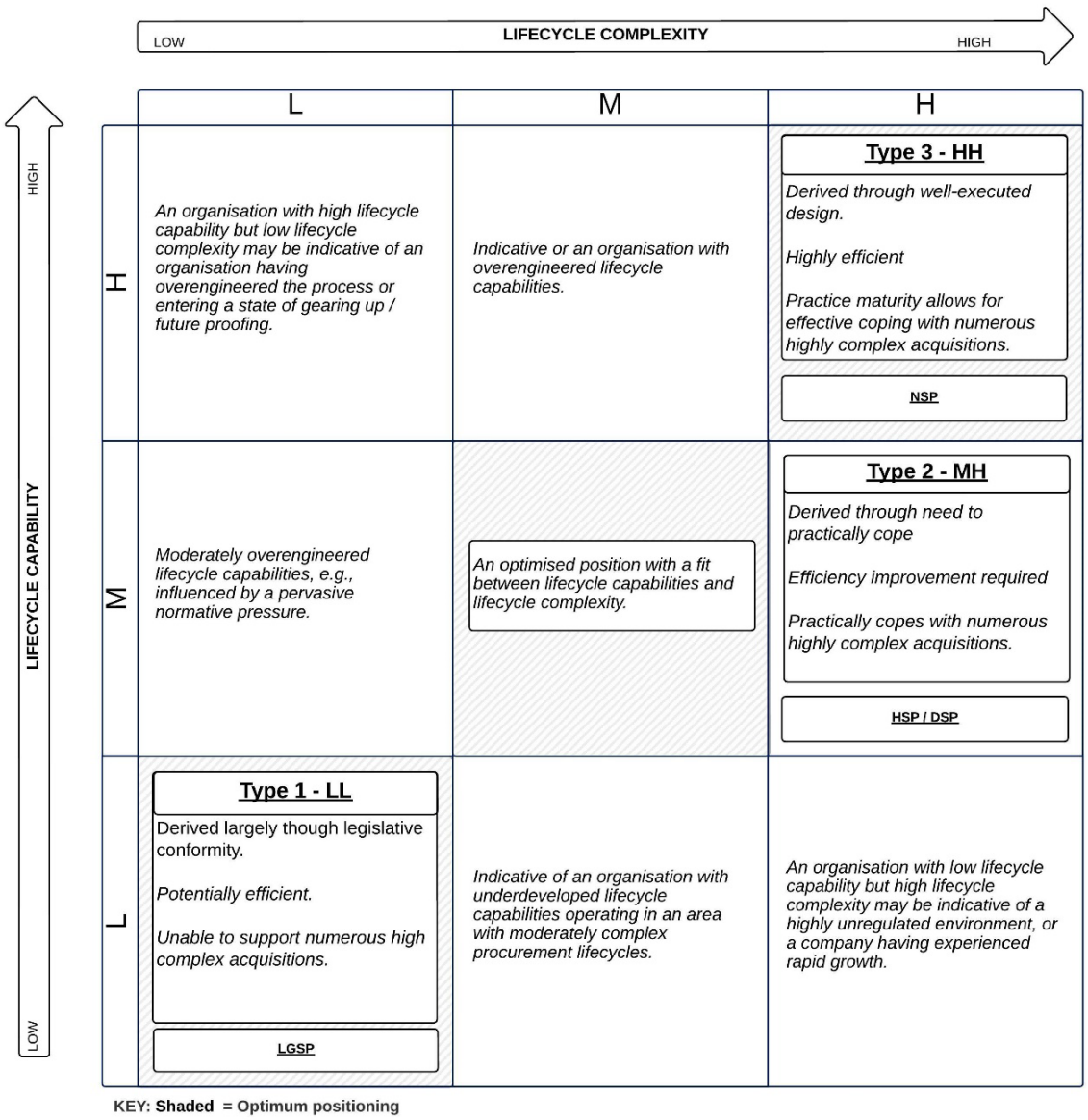


**Figure 5.** Types of complex procurement situations

The matrix is intended not as a single figure summary of the findings or theoretical contributions of this work, but rather as a visualisation to aid in understanding the implications of the work. The matrix offers an insight into future research by depicting the cases on a matrix of lifecycle capabilities versus lifecycle complexity, positing that there could be many additional organisational types incorporated into this model after undertaking further empirical work. The key contribution here is the conceptual framing rather than an exhaustive typology of organisational archetypes.

The cases were analysed by invoking the institutional and agency-theoretic views that accounted for the differences across the cases in conjunction with the thematic comparison. A key contribution of this paper is the use of a lifecycle framework as a methodological tool allowing for the concurrent application of theory to unique phases in a lifecycle across a range of themes. Considering the lifecycle in this way facilitates comparisons across the cases yet enables exploration of the processes that are unique to each phase. Whilst both theoretical viewpoints offered some explanatory power, institutional theory proved particularly effective

in the exposition and assessment of the Concept, Assessment and In-use phases. In contrast, agency theory was instructive in evaluating the Technical Procurement activity, given its naturally-defined principal and agent in the form of the case organisation and contractor.

The institutional lens revealed that the processes adopted across the case-set are distinctly different. In Type 1, the adoption of particular processes was driven explicitly by the coercive pressure to conform to legislation (for example,. Official Journal of the European Union) and other government guidance. Whilst not the exclusive pressure, this is a clear driver of the majority of processes. In the case of the Type 3 organisations, processes across the lifecycle are driven by a range of normative and mimetic pressures. The NSB case exhibits strong, normative isomorphisms which are present across a majority of its processes. For example, the management of contractual risk is tightly controlled. Normative pressures for rigorous control filter through to commercial and procurement practices. Equally, there is a tendency for the mimetic pressure to lead to a diffusion of innovation, as practitioners are quick to adopt proven practices for providing positive outcomes. The Type 2 organisation is driven by a significant range of coercive pressures, understandable in the contexts of health and defence both being tightly-governed sectors. Informational asymmetry and sensitivity to isomorphisms in procurement system design were key factors in differentiating the systems of Type 2 and Type 3 organisations. While both possess significant lifecycle complexity, theory-driven insights demonstrated a clear distinction between the alignment of lifecycle capability and lifecycle complexity. The agency theory perspective also reveals conspicuous variances across the different categories. The Type 1 organisation is typified by a reluctance to manage and control contracts beyond the initial procurement. Consequently, the effect of information asymmetry is amplified, which causes these organisations to be susceptible to agents providing non-optimal outcomes. In contrast, the Type 3 organisation specifically attempts to address information asymmetry in contracting through a variety of initiatives. These two explanatory theories suggest that organisations that concentrate on outcomes, information sharing and coherence tend to be more effective buyers than those that focus on addressing the coercive pressures enforced by legislation.

While we propose a holistic framework for comprehending the whole complex procurement lifecycle in diverse industries based on a capability/complexity assessment, there are other industry specific frameworks using different criteria for assessment in sub-areas such as ‘contracting’. A prominent example in the military context is Performance-Based Logistics (Glas *et al*,. 2013) but such a consideration is out of scope for this paper but may have synergies in industry-specific initiatives in the future. Equally, the focus of this research is to define the most ‘complex’ procurement projects within an organisation, accepting that there will be procurement projects within a complex organisation that are amenable to a simplified procurement process and so multiple strategies and process-sets may sit alongside the most complex (see Elstrom *et al*., 2020). This matrix is for use in defining the upper bounds of the capability and complexity dimension.

## 6. Conclusion

This research provides new insights concerning the state of complex procurement capabilities in public-sector organisations. It demonstrates that organisational capabilities, practices, policies, tools and techniques are varied and have significant scope for improvement. Complex public-sector buyers have been shown to have common processes but highly-variable process

capabilities. Certain processes and systems are profoundly more impactful than others, namely, learning from experience, risk profiling and risk sharing, scenario planning, dynamic flexible contracting procedures and tightly controlled and standardised practices. A mastery of these capabilities leads to a marked increase in the ability to operate effectively. This finding provides a strong rationale for organising future strategic development focused towards these capabilities over others and is of interest to researchers looking to further discern the optimal process arrangement for complex public-sector buyers, and expand and critique the categorising of complex buyers provided here. It also has important implications for practice and will be of use to senior executives of public buyers in planning future capability investment. This matrix in conjunction with the set of 18 themes allows practitioners and managers to assess where their capabilities may be amenable to improvement by making more focused comparisons with other complex buyers. These insights can frame discussions around where potential value-adding capability may be derived and direct future efforts and further research to investigate the capabilities of complex buyers. Furthermore, managers can use the matrix (Figure 5) as an accessible heuristic to consider the suitability of their own procurement practices.

In summary, the contributions of this article are threefold: firstly, a method for making qualitative assessments of the procurement lifecycles of complex buyers; secondly, a thematic architecture to better understand complex procurement practice; finally, a matrix of public-sector buyer types where procurement effectiveness is shown to be contingent on the convergence of procurement lifecycle complexity with procurement lifecycle capability.

As is indicative of in-depth qualitative research, generalisability cannot be guaranteed beyond the case-set explored here, and therefore is a limitation of the study. Additionally, four cases do not provide sufficient breadth to identify all common characteristics of complex public procurement organisations. It is our hope that researchers examine complex procurement effectiveness and complex procurement arrangements in a wider variety of contexts, utilising research designs that address the limitation of this first but important step in reinvigorating complex public procurement research.

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