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Procurement organisation in project-based setting: a multiple case study of engineer-to-order companies

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ABSTRACT

Procurement decisions have a pervasive impact on supply chain performance and market success. This is particularly true in supply chains operating to deliver projects, such as construction and engineer-to-order companies, where a focal firm's procurement decisions need to be coordinated with production activities to effectively satisfy customer orders. This study focuses on how the procurement department can be organised in order to support the needs of project-based supply chains better. Starting from a review of the procurement organisation literature in the context of project supply chains, we use a multiple case study methodology and discuss the procurement organisational choices in 11 project-based companies. Within and cross-case analyses allow identifying two possible archetypes, i.e. the procurement—focussed and the project-focussed organisations, as extremes on a continuum that also includes hybrid solutions. The characteristics of each model are discussed, and results are articulated in three propositions connecting procurement organisational variables and contingent factors.

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management; contin-
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1. Introduction

Modern society is increasingly characterised by the global trend of projectification (Schoper et al. 2018; Maylor and Turkulainen 2019), where most company operations require people to work in projects. Projects enable companies to develop innovations and ideas for new products and services, create marketing campaigns, and improve internal processes in organisations (Jensen, Thuesen, and Geraldi 2016; Maylor et al. 2018). This growth in project management to handle typically process-based initiatives has put pressure on project-based organisations to develop tailored and more innovative managerial approaches to compete in the market (Bergman, Gunnarson, and Räisänen 2013). Project-based companies are characterised by variable, uncertain and complex supply chains, where procurement plays a strategic role (Dubois and Gadde 2000; Dainty, Millett, and Briscoe 2001; Canonico et al. 2013; Jelodar, Yiu, and Wilkinson 2016).

Procurement activities are increasingly recognised as critical for the achievement of market success, and they influence financial performance (Hartmann, Kerkfeld, and Henke 2012; Luzzini and Ronchi 2016; van Hoek et al. 2020) and the efficiency and effectiveness of production activities (Mukhopadhyay and Ma 2009; Thrulogachantar and Zailani 2011). The importance of procurement is particularly true for project-based contexts, where the supply network has a key impact on the project outcome, and a strong steer is required to coordinate suppliers' activities to meet project

needs (Morledge et al. 2009; Gosling et al. 2015; Wong, San Chan, and Wadu 2016).

Several studies have explored procurement organisation using specific units of analysis - such as comparing private and public organisations (e.g. Patrucco et al. 2019a), service and manufacturing companies (e.g. Kotabe and Murray 2004), or studying specific industries such as the high-tech sector (e.g. Luzzini and Ronchi 2011) or healthcare (Klasa, Greer, and van Ginneken 2018). However, project-based industries have rarely been the focussed of procurement organisation studies (e.g. Bemelmans, Voordijk, and Vos 2013; Ferreira, Arantes, and Kharlamov 2015).

There is a gap in the literature regarding how procurement should be organised in order to support strategic project management (e.g. Zhu and Mostafavi 2017). Suppliers represent one of the greatest sources of uncertainty for project-based industries (Behera, Mohanty, and Prakash 2015), and flexible procurement organisational configurations are needed to adapt. This need for a "responsive" approach reflects the contingent view of the organisation, a perspective which has been adopted in supply chain studies investigating the influence of contingent variables on procurement department organisation (e.g. Glock and Broens 2011; Johnson et al. 2002; Bals, Laine, and Mugurusi 2018; Patrucco et al. 2019b). Exploring how procurement is organised in project-based companies represents an opportunity to expand the application of contingency theory in this context, and provide recommendations for practitioners facing complex and uncertain project settings.

Our study seeks to contribute to the procurement organisation literature by answering the following research question:

How can procurement be organized in project-based firms under different contextual conditions?

To explore this question, we study 11 cases of procurement organisations in project-based companies from the Engineer-To-Order (ETO) industry and compare them in order to (1) identify exemplar archetypes of organisational structures, and (2) discuss their suitability when different contextual factors are present.

The paper has been organised as follows. In the next section, we review the main aspects of the procurement organisation, and outline the theoretical underpinning of our research by presenting the role of contingency theory and procurement dynamics in project-based companies. [Section 3](#) describes the research focus and the variables under investigation, and [Section 4](#) provides the details of the case study methodology. [Section 5](#) presents the case evidence, then [Section 6](#) discusses the main findings in the light of contingent factors. Finally, the main contributions of the paper and further developments are presented in [Section 7](#).

2. Theoretical background

During the last decade, there have been a growing number of studies focussed on procurement organisational design (Luzzini and Ronchi 2011; Schneider and Wallenburg 2013; Bals and Turkulainen 2017; Richter et al. 2019). According to Glock and Hochrein (2011) and Patrucco et al. (2019a), research on procurement organisation can be divided into three main streams (i) work studying the structural characteristics of the procurement organisation; (ii) work exploring the internal and external contextual factors affecting procurement organisational design; and (iii) work analysing the role of procurement in specific industrial contexts. Each of these are considered in more detail next.

2.1. Structural characteristics of procurement organisation

The first group of studies acknowledge that procurement's contribution to value creation depends upon the status of the procurement department within the organisation (e.g. Luzzini and Ronchi 2016), and a suitable design at macro and micro level is required in order to define roles, responsibilities, and how tasks are executed.

2.1.1. Level of centralisation

The degree to which procurement is (de)centralised concerns where responsibility is concentrated within an organisation or buying unit (e.g. McCue and Pitzer 2000; Johnson, Leenders, and Fearon 2006). The degree of (de)centralisation has been studied by contrasting procurement activities that are consolidated in a single and central organisational unit, with procurement that is dispersed across multiple units (e.g. Johnson and Leenders 2004, 2009; Trautmann et al.

2009; Jia et al. 2014; Lidegaard, Boer, and Møller 2015; Richter et al. 2019).

2.1.2. Level of authority

This concerns the procurement authority structure and span of control (Pearson, Ellram, and Carter 1996; Glock and Hochrein 2011), and can relate to the hierarchical position of the procurement department (Tchokogué et al. 2017), or its reporting lines. Chief Purchasing Officers are increasingly reporting to top executives (e.g. Johnson and Leenders 2006), which is an indicator of the increased importance and status that procurement has within the organisation.

2.1.3. Level of standardisation

The degree to which organisational activities or routines are precisely defined (Bals, Laine, and Mugurusi 2018). Several studies have considered how to standardise the procurement process and its benefits and drawbacks, which can include increased efficiency and effectiveness, but may reduce employee motivation and creativity (e.g. Sánchez-Rodríguez et al. 2006).

2.1.4. Level of formalisation

This concerns whether procurement tasks/roles are defined by formal documents describing procedures and policies (Johnson and Leenders 2006). Formalisation comes from establishing specific rules that regulate processes, and it has frequently been used as a measure to counter uncertainty. Formalising processes can help procurement to reduce variability and increase control, although very high levels of formalisation could determine more rigidity in the execution of activities (Hartmann, Trautmann, and Jahns 2008).

2.1.5. Level of specialisation

The degree to which procurement activities and competencies are conducted within the firm by specialised groups (Carter et al. 2000; Johnson and Leenders 2006). This is often referred to as "grouping criteria," as specialisation comes from how procurement resources and skills are grouped, such as by product line divisions, geographic area, spending categories, or procurement sub-processes (Johnson, Leenders, and McCue 2003; Bals, Laine, and Mugurusi 2018).

2.1.6. Level of participation

The extent to which procurement organisational members are involved in strategic decision making (Lakemond, Echtelt, and Wynstra 2001; Luzzini and Ronchi 2016). Participation depends on how procurement is integrated with other departments and, the higher the involvement of procurement in decision-making, the higher the need to coordinate with other members of the organisation (Foerstl et al. 2013).

Despite this rich literature, the question remains of how to organise the procurement department in an optimal way to fulfil supply chain management goals. Schneider and Wallenburg

(2013), in their review of 50 years of research on organising the procurement department, conclude that:

future research will need to consider especially (a) how to support purchasing's growing importance and enlarged set of responsibilities by (more) effective and (more) efficient organisational structures. (b) how to deal with increasing market dynamics and volatility by providing purchasing with the structural adaptability and flexibility necessary to support the company's overall market responsiveness and competitiveness. (p.152)

These research challenges remain, particularly if we focus attention on those supply chains characterised by high complexity and uncertainty, which require the procurement organisation to adapt to the environment and external contingency factors.

2.2. Organising procurement in project-based industries

Project-based industries represent an interesting setting for considering how procurement is organised. In project-based settings, procurement is usually assigned the triple role of (1) scouting and contracting the most suitable partners for the project activities, (2) establishing and managing relationships between the suppliers and the project team, and (3) controlling the allocated budget for procuring goods and service (Ferreira, Arantes, and Kharlamov 2015), thus becoming a key driver of project performance. Some scholars have focussed their attention on the contribution of procurement to project success (e.g. Wong, San Chan, and Wadu 2016) and on best practices to procure complex performance in big projects (Caldwell, Roehrich, and Davies 2009; Lewis and Roehrich 2010). Less attention has been paid to the characteristics of the procurement organisation, and its ability to achieve an effective integration with project operations.

Project-based companies have supply chains where activities are conducted both centrally as well as locally for each project (Gosling and Naim 2009; Love, Irani, and Edwards 2004; Miterev et al., 2017), and procurement resources are present both in the permanent structure (i.e. supporting day-to-day procurement activities) and in the temporary project organisation (i.e. supporting the project team). An appropriate organisational design approach is needed to guarantee an effective interplay between these two levels, and ensure that projects and procurement work together in the same direction of travel (Hillebrand and Biemans 2003; Briscoe and Dainty 2005; Lakemond and Berggren 2006; Gluch and Räisänen 2012; Bildsten and Manley 2015).

Misalignment between projects and procurement may occur. On the project side, mismatches can arise due to the decentralisation of authority, where a central procurement department tries to orient supply decisions for local operations (Dubois and Gadde 2000; Oyegoke et al. 2009), creating possible tensions between cost, quality and delivery time for individual projects. On the procurement side, the inability to influence local project decisions can represent a barrier to achieve traditional central procurement objectives such as overall savings, quality, and the creation of long-term and sustainable supplier relationships (Gann and Salter 2000; Thiry and Deguire 2007; Eriksson and Westerberg 2011;

Bygballe, Håkansson, and Jahre 2013; Bemelmans, Voordijk, and Vos 2013). In designing the procurement organisation and its structural variables, project-based companies need to ensure that duplication of activities and inefficiencies at project level are minimised, and central procurement people require local information to understand project requirements so that they can satisfy them efficiently and effectively (Chan, Scott, and Chan 2004).

Project management literature suggests that project-based companies should build a single-use project organisation depending on the project features (Arto and Turkulainen 2018). Supply chain management literature indicates that procurement organisations should be designed with a certain level of stability (Richter et al. 2019), depending on the procurement resources available, rather than the project features (e.g. Lakemond, Echtelt, and Wynstra 2001; Luzzini and Ronchi 2011; Bildsten and Manley 2015; Hans Voordijk, Plantinga, and Dorée 2016). This raises the problem of how to reconcile these two perspectives, as we consider how to organise procurement in project-based companies.

3. A conceptual model for procurement organisation in project-based companies

Contingency theory suggests that an organisation's structure should reflect its strategy, and that organisations perform better when their structures are properly aligned with the context in which they operate (Zeithaml, "Rajan" Varadarajan, and Zeithaml 1988). Changes such as market growth or firm expansion imply that organisations should adjust their structure and resources in order to adapt to the new circumstances (Pennings 1992). Organisational design characteristics need to match both the external and the internal context to ensure strong organisational performance (Duncan 1972; Mintzberg 1980).

Within the organisation, procurement—like every department—needs to adjust to contingencies, and several studies have considered how specific factors affect procurement organisations (e.g. Bals, Laine, and Mugurusi 2018; Patrucco et al. 2019a, 2019b). The way procurement departments are organised varies, and different configurations are appropriate contingent upon different circumstances (Johnson, Leenders, and Fearon 2006; Cousins, Lawson, and Squire 2006; Trautmann et al. 2009; Glock and Broens 2011; Mikalef et al. 2015).

To investigate how procurement can be organised in project-based environments, we propose a conceptual model that considers contingent factors, adapted from models proposed in the procurement organisational design literature (e.g. Glock and Hochrein 2011; Bals, Laine, and Mugurusi 2018; Patrucco et al. 2019a). This framework is presented in Figure 1 and detailed as follows.

To the right we have the typical structural variables which characterise procurement organisation structures, which include *centralisation*, *configuration*, *specialisation*, *formalisation*, and *participation*. We chose to exclude the level of standardisation, given the low likelihood of standardisation that characterises complex projects. We added *supplier*

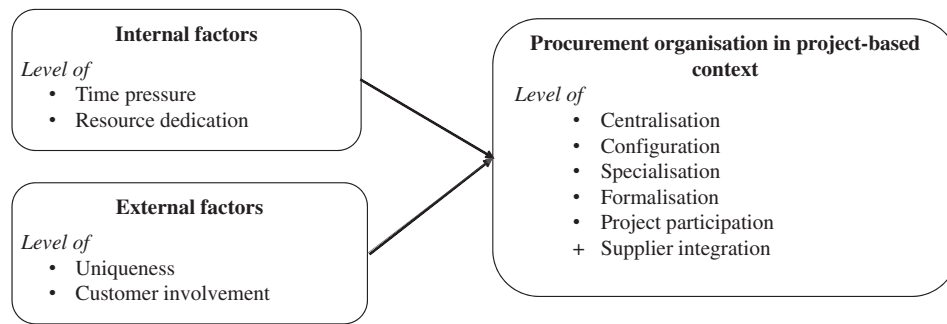


Figure 1. Conceptual model for procurement organisation in project-based companies.

integration to our framework. A supplier's level of involvement in project activities affect the design of the procurement structure, as different levels of supplier integration (e.g. white, grey, black; Petersen, Handfield, and Ragatz 2005) require different procurement organisations. Conversely, different procurement organisation characteristics can enable different levels of supplier integration (Schiele 2010).

These structural variables can be influenced by internal and external contingent variables. Duncan (1972) suggests that the influence of certain factors on organisational structure are traditionally divided into two main groups. These factors, which determine the structure, aims and activities of the organisation, can be grouped into external factors and internal factors. External factors are those factors from the enabling environment which are not under the control of the organisation, but which affect its structure and development. Duncan's external factors include a customer component. Internal factors are those organisational characteristics which create a basis for measuring and comparing organisations, such as organisational objectives and goals, integrative processes, and the nature of the organisation's product or service. In our context, such factors can be related to the strategic project management features that characterise the company, which influence procurement organisation needs.

For the purpose of this study, we focus on those contingent variables that are specific to a project-based context. For the first internal factor, we include the level of *time pressure* on the project. A high time pressure suggests that in order to be successful, the project must be completed on time, suggesting that an organisational structure that is internally integrated is required. A low time pressure occurs when project duration is a second-order priority for customers compared to other aspects (e.g. design details, functionalities, innovation, quality), and consequently the organisational structure will be oriented to meet those priorities.

For the second internal variable, we include the level of *resource dedication* to the project, which considers how the nature of the project impacts on the organisation of resources and activities (e.g. if full-time teams are allocated to the project, if teams need to be redesigned for every project, if activities are unique, how much the supply chain needs reshaping for the specific project etc.). High resource dedication occurs when the company needs to redesign the project organisation and supply chain network for each project. Low resource dedication is when the company is still able to

maintain a (partial) process-oriented approach (e.g. with resources only partially allocated to the project).

For the external environment, customer roles and needs can significantly influence project organisational choices (Turner, Ledwith, and Kelly 2012). To conceptualise the customer role, we use two different variables. We include the level of *customer involvement*, which represents the customer participation and integration in different project phases (Cui and Wu 2017). We assume that a high customer involvement is present when the customer participates in most of the project phases, while a low involvement is when the customer provides the initial specifications and is only involved in key decisional steps (i.e. milestones).

Our second external variable is the level of *uniqueness*, representing the degree of differentiation requested by the customer. It concerns the amount of customised project activities realised for the specific customer, which can have different cost implications (Turkulainen et al. 2013; Arto and Turkulainen 2018). We assume that a high uniqueness is present when most of the systems, parts and components of the final outcome have been uniquely designed and developed for this project and customer. A low uniqueness occurs if the final outcome includes systems, parts and components that are similar to previous projects.

4. Research methodology

This study contributes to theory elaboration (Fisher and Aguinis 2017) about procurement organisation structures in the context of project-based companies. As the objective is to explore existing concepts (procurement organisation and contingent variables) in a new area of investigation (project-based companies), a multiple case study methodology was considered as the most suitable approach (Baxter and Jack 2008). This methodology has been widely adopted in the procurement organisational design literature (e.g. Lakemond, Echtelt, and Wynstra 2001; Luzzini and Ronchi 2011; Jia et al. 2014; Bals, Laine, and Mugurusi 2018; Patrucco et al. 2019a), and previous studies were used as benchmarks for a robust and rigorous design of the study.

4.1. Sample design and data collection

Among the possible project-based organisations, we chose engineer-to-order (ETO) companies as the unit of analysis of the study. ETO firms manufacture unique and complex

products, such as buildings, machine tools, industrial cranes, aerospace and defence vehicles. ETO organisations are particularly interesting, as they are characterised by high demand variability, complex environments, multifaceted design stages, and intensive project life cycles to satisfy client's requests (Eriksson 2015; Willner et al. 2016). In ETO contexts, companies need to work with a broad range of supply chain actors to realise complex engineering projects (McGovern, Hicks, and Earl 1999; Meng, Sun, and Jones 2011; Mello et al. 2017), and coordination between departments is necessary in order to meet customer technical requirements. More than other project-based settings, the successful achievement of project objectives for ETO companies depends on the effective design and management of the supply network which, in turn, depends on an appropriate procurement organisation. This makes them particularly interesting for exploring procurement organisation in project-based settings.

Potential companies to be included in the study were selected using the following criteria. First, we sought ETO companies and their supply chain operations, defined as "temporary endeavours, undertaken to create a unique product, service, or result" (PMI 2020). Second, within that project supply chain, we identified focal companies as our unit of analysis, with the most comprehensive view of the customer and the network. Third, in order to explore contingent factors, we selected heterogeneous ETO companies in terms of size, the characteristics of projects, and type of customers. Fourth, we limited the sample to companies located in one

geographical area (Italy), to avoid the cultural impact on procurement organisational design. Finally, the focal company needed to have a formal procurement organisation in place (i.e. evidenced in an organisational chart) and a clear procurement strategy to support project management.

To identify the target companies, we conducted preliminary phone calls to seek participation and ensure the companies met the selection criteria. We initially contacted some of the biggest Italian ETO companies, and then switched our attention to other potential interesting organisations. We identified a sample of 11 organisations, which were all focal firms in the project supply chain they operate within. This sample was considered large enough to reach theoretical saturation (Yin 2017). Table 1 summarises characteristics of the sample, where company names are anonymized for confidentiality purposes; we provide revenues, cost of purchases, number of employees, type of industry, type of customers and type of product manufactured (all coded according to the Global Industry Classification Standard—GICS 2018).

We sought heterogeneity across the cases to represent the multifaceted ETO setting. With regard to size, three companies can be classified as small (i.e. revenues <10 Million € and employees <50), 5 as medium (revenues <50 Million € and employees <250), and 3 big companies (revenue >50 Million € and employees >250). Concerning project features, 4 companies operate in the Industrial machinery sector, 4 in Construction and Engineering, 2 in Aerospace and Defence, and 1 in Maritime transportation. Finally, they all deal with

Table 1. Company characteristics.

	Revenue (mln €)	Purchases (mln €)	Employees	Industry	Role in the supply chain	Customers (industry type)	Interviews
New Pie	3800	3100	5300	Construction & Engineering	Manufacturer of turbo machines solutions (turbines, compressors, pumps)	Oil, Gas & Consumable Fuels	General Manager Procurement Director Buyer
Star Eng	3400	2900	12,000	Construction & Engineering	Designer and manufacturer of onshore and offshore platforms and equipment	Oil, Gas & Consumable Fuels	Project Manager Category Manager Buyer
Nova Zen	250	190	730	Construction & Engineering	Manufacturer of metallurgic machines for mines and mineral extraction	Metal and Mining	Procurement Director General Manager Category Manager
SLY	230	170	180	Marine transportation	Manufacturer of different models of private yachts	Private customers	Procurement Director Project Manager
Foma	75	40	420	Aerospace & Defence	Manufacturers of avionics structure and hydraulic systems for civil and military helicopters	Aerospace & Defence	General Manager Procurement Director
Inno Mac	45	29	150	Industrial machinery	Designer and manufacturer of high-technology grinding machines	Automobiles & Components; Transportation; Energy Equipment & Services	General Manager Procurement Director Buyer
Cosmos	37	27	120	Construction & Engineering	Manufacturer of platform and machineries for oil and gas extraction and transportation	Oil, Gas & Consumable Fuels	General Manager Project Manager Buyer
Second System	35	25	260	Aerospace & Defence	Manufacturer of fuel systems for acrobatic, defence and training aeroplanes	Aerospace & Defence	General Manager Project Manager Category Manager
Bet Co	20	11	144	Industrial machinery	Manufacturer of assembly machines for medical products	Pharmaceuticals	Project Manager Category Manager
Mat F	4	1.5	30	Industrial machinery	Designer and manufacturer of industrial machines for vehicle assembly	Automobiles & Components	Buyer Category Manager
Mac U	3.5	2	13	Industrial machinery	Designer and manufacturer of assembly lines for white goods products	Electrical Components & Equipment	Project Manager Procurement Director

several type of industries and customers—both private and public—with the Oil, Gas and Consumable Fuels industry being the most recurrent.

For each company, data was collected during 2015 and 2016 through direct interviews with a minimum of two interviewees for each company. Interviews were conducted by following a semi-structured protocol that explored themes from our research framework and was sent in advance to the interviewees (Brinkmann 2014). The interviews lasted about 90 min and were recorded and transcribed in order to better analyse the data gathered. Interviewees were initially with general managers and project managers, to gather information about the company profile, product characteristics, project organisation, departmental involvement in project planning and execution, and relevance of procurement. We then interviewed procurement professionals and category managers, to deep dive into the procurement role in project management along the project life cycle, and procurement's organisational characteristics. Information was discussed having the focal firm as the level of analysis, rather than a specific project.

4.2. Data coding

We used within-case and cross-case methods to analyse the case data (Eisenhardt and Graebner 2007) and to confirm or modify relationships and constructs presented in previous studies. We began by building individual case studies from transcripts and [supplementary data](#). To ensure inter-

researcher reliability, two authors read through the original interviews and formed an independent view of each case and scrutinising the case data to explore themes from our research framework. We also followed up with informants to fill in details, clarify events, and resolve discrepancies. Data collected through the interviews were also triangulated with other secondary sources (newspapers, websites, additional documents provided by the companies).

Cross—case analysis was conducted by comparing cases across each dimension included in the framework in [Figure 1](#), and positioning each case using the coding approach reported in [Table 2](#). We categorised each focal firm using the coding descriptions for each variable, to classify their degree of centralisation, specialisation etc.

In line with Fisher and Aguinis (2017), we first used the contrasting method for the identification of the organisational configurations, by applying theories and models developed for process-oriented organisations to project-based companies and identifying potential sources of contrast. We then adopted the structuring approach to understand the influence of the different contingent variables on the choice of a specific configuration.

5. Case analysis: results

[Table 3](#) reports the case analysis results using the contrasting method. The following section discusses the evidence emerging from the cases in more detail.

Table 2. Data coding.

Macro-variable	Variable (Level of)	Coding used to categorise interview data
Procurement organisation	<i>Centralisation</i>	<ul style="list-style-type: none"> Centralised—Procurement categories are managed at central procurement unit level Hybrid—Procurement categories are managed at both central procurement unit and project level Decentralised—Procurement categories are managed at project level
	<i>Configuration</i>	Design of procurement authority structure <ul style="list-style-type: none"> Buyers are evaluated by the functional manager Buyers are evaluated by the project manager Buyers are evaluated by both functional manager and project manager
	<i>Specialisation</i>	Span of control <ul style="list-style-type: none"> Type of activities directly managed by procurement and/or for what activities procurement has decisional power Procurement people are organised by type of activity performed Procurement people are organised by type of item bought Procurement people are organised by type of project
	<i>Formalisation</i>	<ul style="list-style-type: none"> Standard procedures are not in place Procedures evolve over time and they adapted depending on the situation Standard procedures with changes over time Standard procedures stable over time
	<i>Project participation</i>	<ul style="list-style-type: none"> Marginal involvement of procurement in the project Ad-hoc involvement in specific project activities Full involvement in all or most of project activities
	<i>Supplier integration</i>	<ul style="list-style-type: none"> Level of responsibilities (no integration; white-box; grey-box; black-box) Type of mechanisms used (structured vs. unstructured)
	Internal factors	<i>Time pressure</i>
<i>Resource dedication</i>		<ul style="list-style-type: none"> A process-oriented approach is mostly adopted for resources management and organisation A project-specific approach is needed in exceptional cases, and a process-oriented approach is still adopted where possible A project-specific approach is needed for all or most of the projects
External factors	<i>Uniqueness</i>	<ul style="list-style-type: none"> Amount of customised project activities realised for a customer (continuous variable)
	<i>Customer involvement</i>	<ul style="list-style-type: none"> Customer is not involved in the project Customer is involvement at specific milestones Customer involvement in several project activities

6. Discussion

Through cross-case comparison, we were first able to identify two main typologies for procurement organisation in ETO companies named the “procurement-focussed organisation” and the “project-focussed organization.” Cases show that these two configurations represent the extremes of a continuum. We found that some companies have “hybrid” models between the two extremes, by adopting some of the features of both typologies. Characteristics of these configurations are summarised in Table 4 and discussed below.

6.1. The procurement-focussed model

The *procurement-focussed organisation* is adopted when the procurement organisation is designed with a strong focus on efficiency, such as in Nova Zem, SLY, Mat F and Mat U. In this typology, procurement is managed with a permanent structure at a central level that buys materials for all projects, with a clear focus on demand management, requirements standardisation and minimisation of total costs. Buyers are evaluated by the procurement manager and people specialise depending on the project activities required, with an emphasis on centralised management. There is great standardisation of the procurement process, as companies tend to maintain formalised and stable procurement procedures. One interviewee stated:

The steps followed to process a procurement order are sequential and driven by specific requests

(Buyer, Mat F)

This confirms how the procurement process is standardised and not opened to changes. The aim is to ensure consistent buying choices over time, regardless of whether projects require different approaches. Along the project lifecycle, the procurement department is rarely involved in decision-making; some ad hoc involvement in manufacturing can happen, but only once the design phase is finished,

It is the technical department that executes the entire design phase and, once finished, procurement will manage operational activities with suppliers

(Procurement Director, Mac U).

The reason of implementing such an approach is explained by the Procurement Director of SLY:

Procurement decisions are very similar between projects, and there is no need to integrate our people from the beginning (...) this process standardization and late involvement can contribute to reach higher organisational efficiency. Our department mainly plays a supportive role, being actively involved in the development team only in cases of necessity. However, to optimize costs and commonalities between projects, procurement is managed through a central structure, in order to exploit economies of scale.

In most of the cases, suppliers’ integration practices are quite limited, as suppliers do not need to be involved during the early project stages, and coordination and integration are just based on informal meetings, often having the development team as the primary interface. However, this is not perceived as a critical issue:

Standard procurement procedures and high repetitiveness of purchases allow us to manage a stable supply base [and so, stable relationships]

(Procurement Director, Nova Zen Global).

In cases where the level of product customisation is higher (like in Mat F and Nova Zen), supplier integration practices can happen in the form of white-box, and mechanisms are well formalised (and they can include company and supplier co-location to assure alignment).

In conclusion, the cases show that procurement-focussed organisations are designed to be stable permanent structures, existing at the company level beyond the lifecycle of a single project, with tools, methods and teams dedicated to this organisational structure. This is possible because the approach to procurement appears to be similar across the projects within the same company, a situation which is consistent with what happens in process-oriented organisations, where a stable procurement configuration is able to support internal customer needs over time.

6.2. The project-focussed model

The *project-focussed organisation* is adopted when the main focus is on project-level effectiveness, such as in companies Innomac, BetCo, and Second System. With this configuration, the procurement department is decentralised, and procurement activities are mostly managed at the project level, with a lifecycle of each procurement team corresponding to those of the project. Buyers are involved full-time in the project team, and constantly interact with the development team and the other technical departments. Procurement is an active participant in project decision-making, and procurement people have the dual role of facilitating communication with external suppliers, and analysing requirements in the light of design and manufacturing decisions. For these reasons, buyers are located at the project level, and directly report to the project manager, who is in charge of evaluating their performance and establishing their priorities.

Procedures are not formalised for each project, as they need to evolve over time in order to meet the specific requests of different projects. Each project has its specific rules. Some standard procedures can last for several projects, but exceptions must always be allowed, in order to assure a flexible response to requests. For these cases, procurement is no longer a lever to create efficiency, but becomes a key factor in a project’s success:

It is essential to involve procurement people as soon as possible (...) they help the development team to better understand customer’s requests, gaining better knowledge on market trends and characteristics

(Category manager, Bet Co.)

Procurement actively participates in the project from the first contact with the client. The procurement department’s power to influence decisions is comparable to technical and commercial departments, as it is responsible for several project supply chain management aspects:

Procurement is not only involved from the beginning, but it also interacts with the technical departments and the sales

Table 3. Organisation of the procurement department: case characteristics.

	Star Eng	Nova Zen	Cosmos	New Pie	SLY	Mat F	Mac U	Innomac	Bet Co	Second system	Foma
Degree of centralisation	Mostly centralised	Centralised	Mostly decentralised	Mostly centralised	Centralised	Centralised	Centralised	Decentralised	Decentralised	Decentralised	Mostly decentralised
Degree of configuration (Procurement authority structure)	Buyer evaluated by both functional manager and project manager	Buyer is evaluated by functional manager	Buyer is evaluated by the project manager	Buyer is evaluated by functional manager	Buyer is evaluated by functional manager	Buyer is evaluated by functional manager	Buyer is evaluated by functional manager	Buyer is evaluated by the project manager	Buyer is evaluated by the project manager	Buyer is evaluated by the project manager	Buyer is evaluated by functional manager
Degree of configuration (Span of control)	Negotiation and selection; contract-related activities; performance measurement and control	Requirements rationalisation; negotiation and selection; contract-related activities	Requirements analysis; negotiation and selection; contract-related activities	Negotiation and selection; contract-related activities; performance measurement and control	Requirements management and rationalisation; negotiation and selection; contract-related activities; performance measurement and control	Requirements management and rationalisation; negotiation and selection; contract-related activities; performance measurement and control	Requirements management and rationalisation; negotiation and selection; contract-related activities; performance measurement and control	Requirement analysis and definition; supplier scouting; supplier integration; configuration; performance measurement and control	Requirement analysis; integration; configuration; contract-related activities; performance measurement and control	Supplier scouting and integration; configuration; negotiation and selection; contract-related activities	Requirement analysis; negotiation; contract-related activities; performance measurement and control
Level of Specialisation	By activity executed	By activity executed	By project type	By item purchased	By activity executed	By activity executed	By activity executed	By project type	By project type	By project type	By item purchased
Level of formalisation	Stable standard procedures	Stable standard procedures	Adapted and evolving procedures	Stable standard procedures	Stable standard procedures	Stable standard procedures	Stable standard procedures	Adapted and evolving procedures	Adapted and evolving procedures	Standard procedures with changes	Adapted and evolving procedures
Level of project participation	Ad hoc involvement in product design, engineering and production planning	Ad hoc involvement in research, product design, engineering, use and maintenance	Marginal involvement in product design; ad hoc involvement in engineering and maintenance	Marginal involvement in product design; Ad hoc involvement in manufacturing and use and maintenance	Ad hoc involvement in manufacturing	Ad hoc involvement in manufacturing	Ad hoc involvement in manufacturing	Ad hoc involvement in research, product design, engineering, production planning, and manufacturing	Ad hoc involvement in product design, engineering, production planning and manufacturing	Ad hoc involvement in research, product design, engineering, production planning, manufacturing	Marginal involvement in product design and production planning; ad hoc involvement in engineering and manufacturing
Integration with suppliers	White or grey-box	White-box	Grey or black-box	Grey-box	No integration or white-box	White-box	No integration or white-box	Black-box	Black-box	Black-box	Grey or black-box
Mechanisms	Informal meetings; Co-location	Informal meetings; Co-location	Co-design platforms	Formal reports; periodic meetings; Co-design platforms	Informal meetings	Informal meetings; co-location	Informal meetings	Formal reports; periodic meetings	Informal meetings; co-design platforms	Co-design platforms	Co-design platforms

Table 4 . Typologies of procurement department in project-based companies.

	Procurement-focussed organisation (Nova-Zen, SLY, MatF, MacU)	Hybrid organisation (StarEng, NewPie, Foma, Cosmos)	Project-focussed organisation (Innomac, Bet co, Second System)
Degree of centralisation	Procurement categories are managed at central procurement unit level	Procurement categories are managed at both central procurement unit and project level	Procurement categories are managed at project level
Degree of configuration— Procurement authority structure	Procurement people are evaluated by their functional manager	Procurement people can be evaluated by both functional and project manager	Procurement people are evaluated by the project manager
Degree of configuration—Span of control	Responsibility on typical procurement process activities, with emphasis on cross-project demand management and rationalisation	More or less balanced responsibilities between typical procurement process activities and specific project-procurement decisions	Responsibility on project procurement process activities, with emphasis on project-level requirements analysis and supplier relationship management
Level of specialisation	Procurement people are specialised on specific activities and/or type of goods/service purchased	Procurement people are specialised on specific type of goods/service purchased, and a specific project-focus for strategic purchases can occur	Procurement people are specialised on buying for specific type of projects
Level of formalisation	Procedures exist, and they are stable over time	Procedures exist, and some of them are stable and consolidated, while others can be adapted according to project characteristics	Procedures exist but they are flexible, and they can evolve and adapted according to project characteristics
Level of project participation	Procurement is rarely involved in project-specific activities	Procurement can be part of the core team and/or participate to project-specific activities	Procurement is part of the core team and they are involved in several project-specific activities
Type of integration with suppliers Type of integration mechanisms with suppliers	No integration or white-box Mostly informal tools are used; formal mechanisms in case of supplier integration	White-box or grey-box Both informal and formal mechanisms are used to support supplier integration	Grey-box or black-box Mostly structured tools are used to support supplier integration

office in order to design a proposal for the customer which is as accurate as possible.

(General manager, Second System)

We need to be involved in materials and supplier decisions from the early stage, and it is our responsibility to validate or amend these aspects, which may generate problems during the project lifecycle

(Category manager, Second System).

In these situations, projects usually require suppliers with high technical knowledge, and supplier integration practices are implemented as soon as the project design is finalised and confirmed by the customer. Suppliers are involved from the design phase and represent the primary source of innovation. Integration with suppliers can happen in the form of grey or black-box, and is coordinated with structured mechanisms such as shared web-platforms for product design, with the company and the supplier working together until the final product release.

We prefer to establish a trustful and collaborative relationship (...) we believe this is the way to boost innovation

(Procurement Director, Innomac).

These cases show that project-focussed organisations are designed with the purpose of being dynamic and temporary structures supporting the needs of a specific project. The structure, people, rules, and integration mechanisms are designed and adopted for the duration of the project itself. The approach to procurement seems to be variable from project to project, and so different arrangements are needed in order to effectively support project operations. This model strongly differs from the traditional models of procurement organisations in process-based companies, and it is typical of project-based settings where each project is unique. The greater effort required to build a specific procurement

approach for each project is repaid with more effective decision-making at project level.

6.3. The hybrid model

Some project-based companies do not implement a procurement organisation with characteristics fully consistent with the two typologies described, but instead are configured as something in between these two ends of the continuum.

The cases of Star Eng and New Pie, for example, have many aspects in line with the procurement-focussed model, with some characteristics also reflecting the project-focussed approach. For both companies the procurement organisation is central and permanent, and purchasing of goods and services is mostly managed at a central level. However, some localisation of procurement decisions is allowed, especially for those items particularly strategic for the project execution. In these cases, the procurement process is managed at project-level, with the central procurement unit providing ad-hoc support (especially on operational activities). This support is considered particularly relevant in the Star Eng case, where the project managers are also responsible of the annual evaluation of buyers' performance. This support is also required because, compared the other companies using pure procurement-focussed models, Star Eng and New Pie implement structured supplier integration more frequently, thus requiring a higher level of participation from procurement people.

By contrast, with the cases of Cosmos and Foma, the procurement organisation mostly reflects the project-focussed approach, but with some aspects in line with the procurement-focussed model. In both cases, the management or goods and service purchased happens at project-level, and a

specific procurement organisation is created ad-hoc to support project needs. A central procurement department also exists, responsible for buying all the general and standard services required by all project's operations (and other business processes). However, while in the Cosmos case the local and central structure are independent (and the local buyers are evaluated by the project manager), in the case of Foma the central procurement department is actively involved in the local buyers' evaluation, with the aim of keeping an eye on project cost savings and efficiency. In this case there is also buyer specialisation in the type of goods/service purchased (and frequent rotation between projects), as an attempt to manage project requirements more efficiently. For both companies, a local procurement organisation is also needed for supporting intense supplier integration initiatives.

In summary, hybrid organisations combine the efficiency of the procurement-oriented model with the effectiveness in supporting projects of the project-oriented one. For this reason, these configurations are designed in a way that some aspects are designed to be permanent across projects (e.g. the degree of centralisation, configuration, and formalisation), while others are supposed to be temporary and can evolve from project to project (e.g. the level of participation and the integration mechanisms).

6.4. The role of contingent variables

The procurement organisation structures were analysed next by considering the internal and external contingent variables from our conceptual framework (Table 5).

If we look at internal factors, the first variable is the level of resource dedication, which measures the strategic impact that the management of projects has on the company organisation and its resources. For Nova Zen, SLY, Mat F and Mat U, all the operations are designed to be managed by projects but, whenever possible, the companies try to replicate organisational approaches, activities, and procedures across projects, from a "process – oriented" perspective. For this reason, SLY defined itself as a company "*closer to automotive companies than to competitors in the marine transportation industry.*"

By contrast, for companies like Innomac, Betco, and Second System, each project has its own specificities no matter how tailored the customer requirements are, and resources and activities are always organised and dedicated to maximising project management effectiveness. This contingency reveals a clear tendency in our sample, as all the companies that dedicate a high level of resources to projects decide to adopt the project-focussed model, while companies with lower resource dedication opt for the procurement-focussed organisation.

This result is in line with the traditional literature on procurement organisation in manufacturing companies (e.g. Thruogachantar and Zailani 2011; Mugurusi and Bals 2017), which suggests that the more that organisations are product and production-centric, the more it is likely that departments (including procurement) are structured in line with specific

production needs. In project-based contexts, we can formulate the following research proposition:

Proposition 1. Project-based companies characterised by a higher level of resource dedication to projects are more likely to adopt project-focused models for the procurement organisation

The role of time pressure is only partially confirmed by the companies in our sample. For some cases (i.e. Star Eng, New Pie, SLY, Mac U), project duration is not recognised as a first-order ranking priority by customers. For Star Eng and Mac U, this is because projects have very long execution times (2–3 years on average), due to the high complexity of the output, and customer primary interests are in the quality of the product and flexibility in managing specification changes, rather than the ability to shorten the delivery time. All these companies are adopting a procurement-focussed organisation, with procurement usually responsible for identifying best-in-class suppliers, able to provide high quality and innovation, through selection processes that are not particularly constrained by the project timeline.

For Nova Zen and New Pie, time is recognised as being an issue, although representing more of a market qualifier rather than a critical success factor. For example, Nova Zen customers always expect an estimation of the project time-to-market in the quotation, but the key criteria to win the projects are "*quality, flexibility, innovation, and reliability.*" Nova Zen decided to implement a procurement-focussed organisation while New Pie, in a similar situation, adopted a hybrid model that was more procurement-focussed oriented.

For all the remaining companies (i.e. Innomac, Cosmos, Second System, and Bet Co) high time pressure exists, and time represents a key competitive factor on the market. Their customers are interested in short design and development time, and being responsive is crucial. All these companies introduced a project-focussed model, where the procurement organisation is tailored to project activities, with the main objective being to manage supplier relationships to avoid delays. The influence of time in driving the procurement organisation design is in line with literature in manufacturing settings, which promotes the need for responsiveness as a driver of more localised models (Arnold 1999). In project-based contexts, we can formulate the following research proposition:

Proposition 2. Project-based companies characterised by a higher level of time pressure in their projects are more likely to adopt project-focused models for the procurement organisation

Switching our attention to external factors, the first variable is the level of customer involvement. Our cases show that this variable does not influence the procurement organisation decisions in project-based contexts, as only four out of six companies characterised by low customer involvement (i.e. limited to specific milestones) adopt a procurement-focussed organisation. Only two out of five companies characterised by a high customer involvement (i.e. in the whole process) adopt a project-focussed organisation. As mentioned by the New Pie case "*no matter the characteristics of procurement organisation, we involve the customer during all the project phases as co-design is implemented.*" We can

Table 5. Characteristics of contingent variables in the cases.

	Internal factors		External factors	
	Level of resource dedication	Level of time pressure	Level of uniqueness (%)	Level of customer involvement
Procurement-focussed				
Nova Zen	A project-specific approach is needed in exceptional cases, and a process-oriented approach is still adopted where possible	Relevant, but not a critical success factor	20	Specific milestones
SLY	A project-specific approach is needed in exceptional cases, and a process-oriented approach is still adopted where possible	Not a primary performance dimension	20–40	Specific milestones
Mat F	A process-oriented approach is mostly adopted	Not a primary performance dimension	20	Specific milestones
Mac U	A project-specific approach is needed in exceptional cases, and a process-oriented approach is still adopted where possible	Not a primary performance dimension	40	Specific milestones
Project-focussed				
Innomac	A project-specific approach is needed	Critical success factor	70	Specific milestones
Bet co	A project-specific approach is needed	Critical success factor	100	Most/all project activities
Second system	A project-specific approach is needed	Critical success factor	80	Most/all project activities
Hybrid				
Star Eng	A project-specific approach is needed in exceptional cases, and a process-oriented approach is still adopted where possible	Not a primary performance dimension	40	Most/all project activities
New Pie	A project-specific approach is needed in exceptional cases, and a process-oriented approach is still adopted where possible	Not a primary performance dimension	20	Specific milestones
Foma	A project-specific approach is needed in exceptional cases, and a process-oriented approach is still adopted where possible	Not a primary performance dimension	60	Most/all project activities
Cosmos	A project-specific approach is needed	Critical success factor	80	Most/all project activities

conclude that this variable does not influence decisions about procurement organisation for project-based companies.

Finally, with regard to the level of project uniqueness, we can note that all the companies characterised by low levels of uniqueness (i.e. New Pie, Nova Zen and Mat F with 20%; SLY with 30%; Star Eng and Mac U with 40%) adopt more procurement-focussed models. SLY, for example, decided to manage product design and engineering in a modular way, thus limiting the level of customisation and the degree of freedom of customer requests. This allows efficiency gains and aggregate volume of components and materials, increasing bargaining power, which is ideally suited to the procurement-focussed model. This result is consistent with existing procurement organisational design literature (e.g. Jia et al. 2014). If the percentage of reuse is high, components become quite standard, and companies pursue economies of scale and replicability of existing procedures in order to pursue efficiency, by designing centralised and stable procurement organisations.

On the other hand, companies with a relatively high level of uniqueness (i.e. Innomac with 70%; Cosmos and Second System with 80%; Bet Co with 100%) tend to use more project-focussed organisations. For example, Bet Co has full customisation, where almost all components and design activities are totally new for each project. High investments are made to increase buyers' technical competences on functional requirements and improve their ability to execute activities in line with project critical success factors. In these cases, temporary organisations are more suitable, as procurement needs to be redesigned to be consistent with the need of each project.

For companies where the level of customisation is moderate (i.e. Foma, with 60%), the need to balance the trade-off between efficiency and effectiveness results in the adoption of hybrid models. This result is consistent with existing literature about organisational models, suggesting that hybrid approaches are preferable when there is the need to manage conflicting objectives.

In project-based contexts, we can therefore formulate the following research proposition:

Proposition 3. Project-based companies characterised by a higher level of project uniqueness are more likely to adopt project-focussed models for the procurement organisation

7. Conclusions and future developments

This paper analyses the characteristics of the procurement department organisation in project-based industries, which represents an underdeveloped area of investigation so far. We conduct interviews with procurement and technical experts in 11 ETO companies, and we are able to identify the characteristics of specific archetypes for the procurement department in project-based companies and, consistent with contingency theory, the main factors that influence these organisational choices. The overall results of the study are represented in Figure 2.

Two main typologies of procurement department organisation have been identified. The procurement-focussed model is oriented to optimise project procurement through a central management of procurement activities. The project-focussed model is oriented towards the effectiveness of the project procurement, and procurement activities are

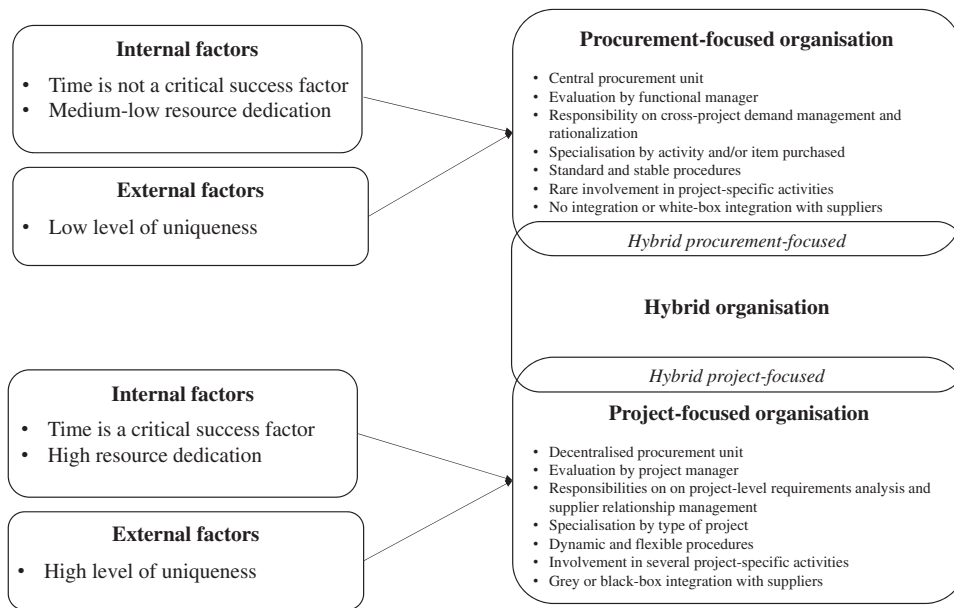


Figure 2. Procurement organisation in project-based companies: revised research framework.

decentralised at the project level. Hybrid options also exist, as a result of the combination of the previous two typologies.

The adoption of one or the other model depends on specific contingencies, respectively: whether the time pressure on the project is a key factor in competing in the market; the level of resource dedication to projects; and the level of uniqueness of project design and development activities. The more these factors have a high incidence, the more the project-based company is likely to adopt a project-focussed model. As these contingencies characterise project-based settings (and not ETO companies), these findings can be generalised to other project-based industries, and have several theoretical and managerial implications, which are described below.

7.1. Theoretical contributions

Our findings first contribute to the existing research on procurement organisation structure literature (e.g. Bals and Turkulainen 2017; Patrucco et al. 2019a, 2019b), as we are able to provide evidence of possible organisational archetypes in a project-based context. In line with some recent studies in process-based companies (e.g. Bals, Laine, and Mugurusi 2018), our results propose procurement models that consider the whole set of organisational design variables, without limiting the focus to specific aspects (e.g. the centralisation vs decentralisation pendulum; Richter et al. 2019). Further, we enrich the literature about the projectification of operations (Maylor et al. 2018; Maylor and Turkulainen 2019), by discussing the role of procurement organisation in managing project supply chains in an integrated way, and complementing previous studies focussed more on project management-related aspects (e.g. Lakemond and Berggren 2006; Bildsten and Manley 2015; Adrodegari et al. 2015; Miterev et al. 2017). We are also able to bridge a connection between the supply chain management literature and the project management literature, by using specific project management factors

(Turkulainen et al. 2013; Arto and Turkulainen 2018) to interpret procurement decisions. Our three research propositions seek to formalise these relationships, providing an innovative connection between these two research fields.

A further contribution concerns theory elaboration, with the extension of the contingency view of the organisation of procurement (Bals, Laine, and Mugurusi 2018), by introducing new variables specific to the project-based context, that have not been considered in previous research. In doing so, this paper paves the way for the development of new theories, about the contribution of project features on procurement organisation choices.

7.2. Managerial implications

The study has several implications for managers of project-based companies, who now have a specific framework to inform their decisions about how to organise procurement to support projects in the best way. This framework provides them with a taxonomy of possible procurement configurations and contingent factors, to help them consider what might be the most appropriate model depending on company characteristics. This represents a relevant contribution from a managerial perspective, considering that procurement is recognised as more critical in project-based settings. Procurement can contribute to the cost, time and quality of projects, thus being a key driver of final performance.

7.3. Limitations and future developments

The study has also several limitations, that could also open some opportunities for future research. First, the case study methodology necessitated a small sample size to maximise the completeness and accuracy of our findings, with case organisations from Italy to limit the impact of country of origin on configuration choices. This may limit the possibility of generalising

our results and conclusions to all project-based industries in different countries. Secondly, there are numerous internal contingent variables that might influence the adoption of organisational structures (e.g. the overall procurement strategy; the global dispersion of the company; the link between the organisation structure and the procurement structure) that, for the purpose of this study and our small and qualitative sample, have not been considered. Finally, as our analysis is at focal firm level, our study is not able to provide any evidence about the relationships between contingent variables, procurement structural dimensions and their impact on different project performance metrics.

Future research could expand on this study by introducing further contingent variables. The interplay between the procurement structure and the existing organisational structure could further extend knowledge about the dynamics of procurement organisation in project-based companies. It would be also prudent to expand the sample, across countries and other type of project industries, to validate the configurations and to check if the research propositions are still valid under different settings. Operations management is increasingly undergoing “projectification” (Schoper et al 2018), and more research is needed to understand how procurement can best be organised to support different project contexts.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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