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Improving Productivity through Strategic Alignment of Competitive Capabilities

Abstract

Purpose: This study investigates productivity performance at the firm-level from the perspective of manufacturing capability development at the process-level. Moreover, it reveals how alignment of manufacturing capabilities with market requirements has influenced a firm's productivity over a period that includes the 2008 global recession.

Design/methodology/approach: A conceptual framework was derived from established theories and employed as part of a case study design encompassing a multiple methods research approach. The case of a UK SME was selected to reflect some of the issues associated with the wider productivity stagnation experienced by the UK economy in recent years.

Findings: The firm's manufacturing strategy had become incrementally misaligned with market requirements due to external changes in its business environment. The complex relationships between capabilities such as quality, speed and cost were characterised. Realigning the firm's manufacturing strategy to regain productivity performance required a range of prioritised actions including capital investment and changes in management practices concerning bottom-up process improvement and regular, top-down strategy review.

Research limitations/implications: The findings of the case study cannot be generalised and the outcomes are specific to just one firm. However, the approach lends itself to replication, particularly within SMEs.

Originality/value: Prior studies have focused on capability development at higher levels of abstraction. Our study operationalized established theoretical perspectives at the firm-level to derive context based outcomes that can be used to improve manufacturing strategy alignment and productivity. Furthermore, our study contributes empirical evidence from the SME sector to the ongoing debate regarding the UK's productivity puzzle.

1. Introduction

The manufacturing sector is essential to the UK economy and provides a substantial role in driving productivity (Foresight, 2013). Productivity is a useful determinant of economic growth and improvements in standards of living (Barnett et al., 2014). In addition, productivity growth permits the UK to remain competitive on a global scale. However, since the global recession of 2008, UK organisations have not recovered productivity at the expected rate (Barnett et al., 2014). As of Q3 2017, UK output per hour was 16.6% lower than the pre-recession trend (Office of National Statistics, 2017). Furthermore, between Q1 and Q3 2017, the manufacturing sector output per hour was 1.3% higher than the same period in 2011, demonstrating a distinct lack of productivity improvement over this period (Office of National Statistics, 2017). This suggests UK manufacturing organisations might need to reconsider how they should respond strategically to the productivity challenges they currently face. The manufacturing strategy has been found to have a positive relationship with performance (Machuca et al., 2011). Competitive capabilities such as quality, delivery, flexibility, and cost, are fundamental to any manufacturing strategy. Aligning a manufacturing plant's capabilities with its competitive priorities is vital to an operations strategy for achieving a competitive advantage (Boyer and Lewis, 2002). In other words, firms should aim to increase competitive strength through the development of competitive capabilities (Koufteros et al., 2002).

There are established models for the development of competitive capabilities. For example, the trade-off model recommends focusing on developing a limited range of capabilities based on market requirements (Skinner, 1974) which implies that improving one capability will be at the expense of one or more of the others (Hayes and Wheelwright, 1984; Boyer and Lewis 2002; Singh et al., 2015). Alternatively, the cumulative capabilities model suggests developing all capabilities in a sequential manner and avoids trade-offs (Ferdows and De Meyer, 1990). Both models have found some support in subsequent research conducted at high levels of abstraction, however, the empirical evidence does not fully support either of these models (Hallgren et al., 2011). Indeed, several authors have asserted the need for case-study research on capability development as a method of enhancing understanding of existing models (Rosenzweig and Easton, 2010; Sarmiento and Shukla, 2011).

The aim of this paper is to examine capability development at the level of an individual firm using a case study approach. Initially, a framework for capability development is constructed from the existing models outlined earlier. This framework is subsequently applied in a real organisation with particular focus on how, in practice, individual competitive capabilities can influence each other and together, be aligned with market requirements in order to develop a manufacturing strategy. The outcomes of this approach are discussed in the context of the existing literature and also in the current UK manufacturing productivity context.

2. Literature review

In this section, we introduce the theoretical perspective adopted, and define several constructs used throughout this research. Subsequently, the context of productivity in UK manufacturing is outlined prior to a discussion of existing manufacturing strategy and capability development research and its implications. Finally, a conceptual framework is developed to guide further research in this area at the firm level.

2.1 Theoretical perspective

The role of the manufacturing strategy in supporting higher level business strategies is well documented (Leong et al., 1990; Kim and Arnold, 1996; Slack and Lewis, 2011; Gonzalez-Benito and Lannelongue, 2014), and has been found to have a positive relationship with performance (Machuca et al., 2011). In order to improve organisational performance, manufacturing organisations should aim to develop manufacturing capabilities that align with market requirements (Hayes and Wheelwright, 1984; Vickery et al., 1997). The development of internal resources that are valuable, rare, inimitable, and not substitutable can provide a source of sustainable competitive advantage (Barney, 1991; Hayes and Pisano, 1996). This resource-based view of the firm has a strong theoretical foundation (Boyer et al., 2005) and complements market-based perspectives by examining the link between internal characteristics and organisational performance. If a firm's operational capability exceeds the market requirement then there may be a failure to exploit market opportunities (Lewis, 2003). Conversely, if the market requirements become greater than the firm's operational capabilities then any prior competitive advantage will erode (Lewis, 2003). The capabilities associated with performance that have been consistently used in earlier research include quality, delivery, flexibility and cost (Ferdows and De Meyer, 1990; Kristal et al., 2010; Schroeder et al., 2011; Sum et al., 2012; Narasimhan and Schoenherr, 2013). This study uses the terms resources and capabilities interchangeably which is consistent with the definitions suggested by Barney et al., (2001).

We distinguish dependability and speed as two separate types of delivery capability in correspondence with the individual manufacturing firm where this study is based. Our capability definitions are based on prior research. Quality is defined as being able to consistently manufacture products that conform to specifications and are fit to use *(*Rosenzweig et al., 2003; Kristal et al., 2010). Dependability is the ability to deliver products on-time and in full (Hayes and Wheelwright, 1984). Speed is the duration of time it takes for materials to be processed from start to finish (Größler and Grübner, 2006). Flexibility is the ability to accommodate changing customer requirements in terms of volume and variety *(*Rosenzweig et al., 2003; Kristal et al., 2010). Finally, we define cost as the financial expenses incurred to manufacture a product for a customer, which directly influences a manufacturer's capability to compete on cost, making our definition consistent with Rosenzweig et al (2003) and Kristal et al., (2010).

2.2 Productivity and the UK context

Productivity is defined as the ratio between inputs such as raw materials, and outputs such as finished goods and services (Office of National Statistics, 2007), and is frequently measured using Gross Value Added (GVA). One key challenge UK organizations currently face is associated with the unprecedented lack of productivity improvements since the economic downturn of 2008. This challenge is not specific to any single industry and has remained broadly flat since the economic downturn. However, Office of National Statistics (2016a : p8) reports *"The weakness of manufacturing productivity since 2011 has been a defining feature of the UK productivity puzzle"*. Furthermore, manufacturing is essential to the UK economy and provides a substantial role in driving productivity (Foresight, 2013). The UK government recognises the importance of increasing productivity, which appears as a key element of the UK's emerging industrial strategy (Department for Business, Energy and Industrial Strategy, 2017). The Office of National Statistics (2016b) classify the productivity issues facing the UK into two categories. First, output per hour has been unusually weak since the economic downturn, resulting in a much slower recovery. Second, the other G7 economies on average are significantly more productive than the UK, which has been documented as the 'productivity gap'. Whilst the productivity gap with some of these economies has been persistent, it appears to have increased in recent years.

Several explanations exist for the recent lack of productivity improvements in the UK. Some of which include weak investment, a lack of lending to more productive firms, the movement of employees to less productive roles, and slowing rates of innovation and discovery (Harari, 2016). However, the same author concedes none of these theories alone provide a sufficient explanation of when productivity will return to pre-crisis growth rates. A complementing view by Barnett et al., (2014) suggests the sharp fall in productivity can be explained by factor utilization in response to weak demand and firms holding spare capacity. The same authors suggest firms have shifted staff from revenue generating to business development activities. Therefore, once developments materialise into revenue generating activities, one would expect to experience productivity improvement. However, Barnett et al ., (2014) also suggests capacity utilization has returned to pre-crisis levels and despite employment growth, productivity has remained lower than expected.

The influence of management practices on productivity has also been considered. A study by Syverson (2004) of US manufacturers found, within the same industry sector, some organizations were producing twice the output using the same inputs. This could be a consequence of firms achieving greater alignment between competitive priorities, supply chain structure and the business environment, that has been found to increase business performance (Chi et al., 2009). However, Syverson (2011) subsequently investigated how internal factors can influence productivity. The same author suggests productivity can be influenced by coordinating the application of labour, capital, intermediate inputs, and the organization of production units. Although these studies provide insight into management practice and productivity, they are associated with the management of day to day operations and consequently, neglect the effect broader strategic initiatives could have on productivity. It is possible higher level strategic planning as a management practice can also influence productivity. For example, organizing production units to facilitate the development of the capabilities required to support the market requirements.

2.3 Manufacturing Strategy and Capability Development

Competitive capabilities are developed and determined through a manufacturing strategy (Koufteros et al., 2002). An early view of manufacturing strategy development is provided by Hayes and Wheelwright (1984) in their four-stage model to evaluate the contribution of the manufacturing function to an overall business strategy. The overall emphasis of this model was a progressive development of manufacturing from a neutral to supportive role within an organization. However, later research by Barnes and Rowbotham (2004) asserts the model has little testing in practise, and subsequently question the model’s validity.

An alternative view developed by Platts and Gregory (1990) suggests: first, develop an understanding of market position, second, evaluate manufacturing capabilities, then finally, develop the relevant manufacturing strategy. This procedure employs competitive capabilities as a criteria to evaluate market requirements and manufacturing capabilities. A similar view developed by Hill (1997) suggests the role of operations management consists of two tasks: efficiently managing operational activities, and prioritising investments and developments in line with market requirements. To increase market share through the manufacture and sale of products, identifying what customers value in products helps to reveal the link between market requirements and operational capabilities. To understand market requirements, Hill (2005) suggests a classification of competitive criteria as order qualifiers and order winners, with the latter providing a competitive edge and being capable of influencing customers to purchase a product. The criteria for order winning factors are situational but closely linked to the manufacturing performance capabilities of cost, dependability, speed and quality (Chase et al., 2004). However, as products and processes develop, the costs associated with providing order winners may reduce for competing firms and order winners may become qualifiers and erode any competitive advantage. Similarly, markets are dynamic, and customers and competitors are unpredictable (Slack and Lewis, 2011) making it difficult to anticipate competitor offerings in the future. Consequently, as recommended by Da Silveria (2005), the firm should regularly review its manufacturing strategy, enabling the fit between markets, products, manufacturing, and investment to be re-evaluated. This evaluation could encompass the procedure advocated by Platts and Gregory (1990) or Hill's five step framework (Hill, 2005) in which competitive priorities link marketing and operational strategies.

Subsequent to the identification of improvement priorities, operational strategies can focus on developing the relevant capabilities. However, views on whether capabilities should be developed in cumulative manner or traded-off is not clear.

2.4 The Trade-off Theory

The trade-off theory originated in 1969, after Skinner published an article that argued managers should consider trade-offs between competitive dimensions during manufacturing strategy development. Several interpretations of the trade-off theory exist, and more recently, Skinner (1996 : p.3) elaborated on his earlier articles stating "Choices must be made; tradeoffs are inevitable; one system cannot be outstanding enough at meeting all criteria to create competitive advantage" (cited in Sarmiento et al., 2018). The trade-off criteria include the key competitive capabilities of quality, delivery, flexibility, and cost (Rosenzweig and Easton, 2010). The implication is that performance to a market-leading level in one competitive criteria, can only be achieved by sacrificing some level of performance in a different criteria (Sarmiento et al., 2013).

After originally suggesting trade-offs exist, Skinner (1974) developed the concept of a 'focused factory'. The focused factory provides the opportunity to build on competitive strengths, by focusing manufacturing plants physical features, processes, technology, and infrastructure on a limited and concise set of business priorities (Brumme et al., 2015). The recent trend towards globalisation and customisation (Jordan and Michel, 2001; Anderson, 2006) has resulted in manufacturers attempting to serve customers with varying requirements. One issue with adding more products to existing plants can result in competing and conflicting variables causing the plant to operate at lower capacity (Skinner, 1974; Berry and Cooper, 1999; Brumme et al., 2015). However, the response of focusing the entire manufacturing system on a limited set of tasks could prove problematical to manufacturers serving an existing customer base with varying requirements. Additionally, the costs involved in setting up manufacturing plants to serve different performance objectives would be significant. This led to the concept of a 'plant within a plant', which organises existing facilities into autonomous facilities specialising in different performance objectives (Skinner, 1974). The result is complexity reduction in each plant, and a more competitive manufacturing function.

Although the trade-off theory has received some support (Boyer and Lewis, 2002), the universality of the model can be contended due to lack of support from empirical studies (Rosenzweig and Easton, 2010; Avella et al., 2011). One frequently cited example that challenges the existence of trade-offs is associated with the success of Japanese automotive manufacturers during the late 1970s, who outperformed competitors on nearly all performance dimensions (Schmenner and Swink, 1998; Rosenzweig and Easton, 2010). However, this can be explained by the existence of performance frontiers, which consider the maximum performance of a manufacturing unit that can be achieved with a specific operational configuration (Schmenner and Swink, 1998). Performance frontiers form as a result of choices associated with design and investment, and plant operation, which can be further classified into asset and operating frontiers (Schmenner and Swink, 1998). The same authors propose that fixed assets such as buildings and machinery represent the asset frontier, and decisions made aside from those represent the operating frontier. Later research by Sarmiento and Shukla (2011) suggested the existence of zero-sum and frontier trade-offs, both of which consider dyadic relationships between capabilities. A zero-sum trade-off represents a near linear reduction in performance of one capability as the other is improved. A frontier trade-off represents a differential in performance after some level of compatibility has been achieved (Sarmiento and Shukla, 2011).

2.5 Cumulative Capabilities

Another stream of research on manufacturing capabilities was developed by Ferdows and De Meyer (1990) who argued lasting manufacturing capabilities are built in a sequence, and improvements can be cumulative. This theory was conceptualised by the sand-cone model, that suggests initially focusing on quality improvement, followed by delivery, then flexibility, and finally cost (Ferdows and De Meyer, 1990). The same authors emphasise the importance of continually improving preceding capabilities throughout all stages of the sequence. This intuitively attractive approach to building capabilities using the sand-cone sequence has received some support throughout the literature (Rosenzweig and Easton, 2010; Singh et al., 2015; Tamayo-Torres et al., 2017). However, the 'one size fits all' sequence recommended by Ferdows and De Meyer (1990) raises some questions. The entire concept contradicts the outward looking approach to competitive strategy that prioritises different competitive dimensions, in addition to order winning and qualifying criteria (Hallgren et al., 2011). Adopting the sand-cone model as a basis for capability development, would suggest all organisations use the same approach, which is clearly questionable. In fact, several studies have failed to find support for the universality of the sand-cone sequence (Flynn and Flynn, 2004; Schroeder et al., 2011; Sum et al., 2012; Narasimhan and Schoenherr, 2013; Boon-itt and Wong, 2016). Moreover, recent studies in different industry settings found around half of organisations examined did not follow the sand-cone sequence (Schroeder et al., 2011; Narasimhan and Schoenherr, 2013; Boon-itt and Wong, 2016).

2.6 Integrative Model and Advanced Manufacturing Technologies

The lack of consistent empirical support for the trade-off theory and the sand-cone model has resulted in attempts to integrate both models. For example, Schmenner and Swink (1998) proposed that the models are not competing, but complementary. The integrative model suggests it is possible to build capabilities with cumulative effects effects when operating further from performance frontiers, and that trade-offs become more applicable in firms operating closer to performance frontiers (Boyer and Lewis, 2002). It is possible the adoption of advanced manufacturing technologies (AMT) can extend the asset frontier, subsequently facilitating the development of cumulative capabilities. However, in the same study, Boyer and Lewis (2002) found evidence of trade-offs in firms that recently adopted AMT. Contrastingly, Chung and Swink (2009) found the adoption of AMT was consistent with cumulative capability development. This inconsistency could be a consequence of the type of AMT utilisation (e.g. design, manufacturing, administrative) relative to the specific industry. This concept is supported by the suggestion that contingent approaches to capability development are worth exploring (Flynn and Flynn 2004; Narasimhan and

Schoenherr, 2013; Singh et al., 2015). These studies posit that alternative capability development sequences might be appropriate under different circumstances.

2.7 A Contingent Approach to Capability Development

The trade-off, cumulative, and integrative models are useful insights into the development of capabilities. However, conflicting views about the best methods to develop capabilities, suggests the relationship between capabilities are dynamic and need exploring in context. It has been suggested that divergent paths between some capabilities exist (Boon-itt and Wong, 2016). The relationship between quality and delivery (dependability) has been found to have cumulative effects (Hallgren et al., 2011; Boon-itt and Wong, 2016). Furthermore, several studies have suggested quality improvement directly improves all other capabilities (Avella et al., 2011; Boon-itt and Wong, 2016). The question of whether flexibility and cost should be developed exclusively or simultaneously was posed by Größler and Grübner (2006). Later research suggested the relationship between flexibility and cost was not cumulative and these capabilities can be developed in parallel (Hallgren et al., 2011). It has also been suggested that delivery, flexibility and cost capabilities can be improved independently (Sum et al., 2012). In the context of developing capabilities through the adoption of AMT, careful consideration should be paid to the multi-dimensional nature of flexibility (Chung and Swink, 2009). The same authors suggest a trade-off between flexibility and cost is not strongly reduced through AMT adoption. In order to gain a competitive advantage through flexibility, the process choice should support the manufacture of varying product volumes (Berry and Cooper, 1999). Proper alignment between marketing and manufacturing strategies is necessary to gain a competitive advantage in organisations competing with high product variety (Berry and Cooper, 1999). The key is to consider the capabilities of cost efficiency and flexibility simultaneously, and develop them in a balanced way (Hallgren et al., 2011).

One risk associated with developing new capabilities is the influence on existing capabilities, potentially diverting resources away from order winning capabilities. Da Silveria and Slack

(2001) argued some capability trade-offs are affected by resource constraints more than others, and the impact of those trade-offs can be reduced by reconfiguring resources and capabilities to facilitate the relevant performance attributes. This is supported by Berry et al., (1991) who explored market segmentation from an operations perspective as a method of characterising requirements placed on operations. The same authors recommended this approach to firms utilising a single plant to serve diverse markets. Through the use of segmentation it becomes possible to configure manufacturing in a way to support customer requirements whist reducing the effect of trade-offs. To illustrate this point, by identifying order-winning and qualifying criteria for customers, market segments can be grouped according to performance objectives. These groupings facilitate the development of manufacturing capabilities in a more focused way. This also reduces the risk of influencing existing capabilities by avoiding capability reconfiguration in a single plant to support heterogeneous market requirements. The key is to understand relationships between manufacturing capabilities, to inform the manufacturing strategy.

2.8 A Model to Operationalize Capability Development

Section 2.1 revealed the role of the manufacturing strategy in supporting higher level business strategies and organisational performance. Performance measures for this study were established to include quality, dependability, speed, flexibility, and cost. Section 2.2 revealed the productivity issues currently affecting UK manufacturing organisations, and the possibility that higher level strategic planning as a management practice can influence productivity. Section 2.3 identified order winning and qualifying criteria as a link between customer requirements and manufacturing capabilities. The criteria are situational, but correspond to the performance measures. Importance and performance metrics (Slack et al., 2013 : p654) can be used to guide and prioritise capability development criterion through the identification of performance requirements and corresponding organizational performance, using the performance criterion as a basis.

As a strategy for characterising operational requirements, Section 2.7 revealed manufacturing segmentation according to performance requirements. However, the most effective methods of capability development were unclear, indicating the need to investigate capabilities in context. Using the capability development criterion as a basis, and exploring relationships between those capabilities at the process-level, this will contribute to an understanding of how plant-level capabilities can be developed, whilst minimising potential trade-offs. Thus, guiding the manufacturing strategy as a means to enhance organisational performance and subsequently firm-level productivity.

In some competitive environments, quality is considered the most important competitive priority for both manufacturing and service firms (Bouranta and Psomas, 2017). Furthermore, the capability of quality has been associated with improved productivity and subsequently, firm performance (Prakash et al., 2017). Thus, highlighting the prominent role of this capability. The capability of flexibility is required to support manufacturing for heterogeneous markets (Berry and Cooper, 1999). The trade-offs between flexibility and cost (FC) should be developed in a balanced way (Hallgren et al., 2011). If a trade-off between flexibility and cost exists, a trade-off between flexibility and speed could exist, because speed of manufacture is a direct contributor to cost. The trade-offs associated with quality and speed (QS), and quality and cost (QC) provide the greatest offering of potential (Flynn and Flynn, 2004). Our study is at the level of an individual firm, which enabled further tuning of the criteria for investigating capability relationships. Therefore, investigating relationships between QS, QC, FC, and FS in this context offers the greatest insight into how manufacturing can be configuration to reduce the impact of those trade-offs.

The main objective of this research is to provide a framework that can be used to develop a manufacturing strategy, by aligning manufacturing capabilities with market requirements to improve organisational performance and subsequently productivity. Our conceptual framework (Fig. 1) adapted from the Platts and Gregory (1990) procedure makes use of importance and performance metrics (Slack et al., 2013 : p654) in conjunction with performance criterion, to determine importance and performance requirements of products. Then, by investigating relationships between capabilities in context, we determine how operations can be segmented (Berry et al., 1991) to most effectively support market requirements and subsequently guide the capability development process.

The application of our framework in an individual firm provides the opportunity to answer the question of how a UK manufacturing organisation can develop manufacturing capabilities to improve performance that will subsequently enhance productivity and create a sustainable competitive advantage. Furthermore, a study of manufacturing capabilities at the process-level facilitates an exploration into capability development whilst offering an alternative perspective to existing studies at higher levels of abstraction. It also provides an opportunity to establish whether contingent approaches to capability development exist (Flynn and Flynn 2004; Narasimhan and Schoenherr, 2013; Singh et al., 2015), and how manufacturing technologies can impact capability performance (Chung and Swink, 2009). Finally, our research provides insight into whether higher level strategic planning such as the organisation of production units (Syverson, 2011) can enhance productivity as a method of mitigating the effect of the productivity issues facing UK manufacturing organizations.

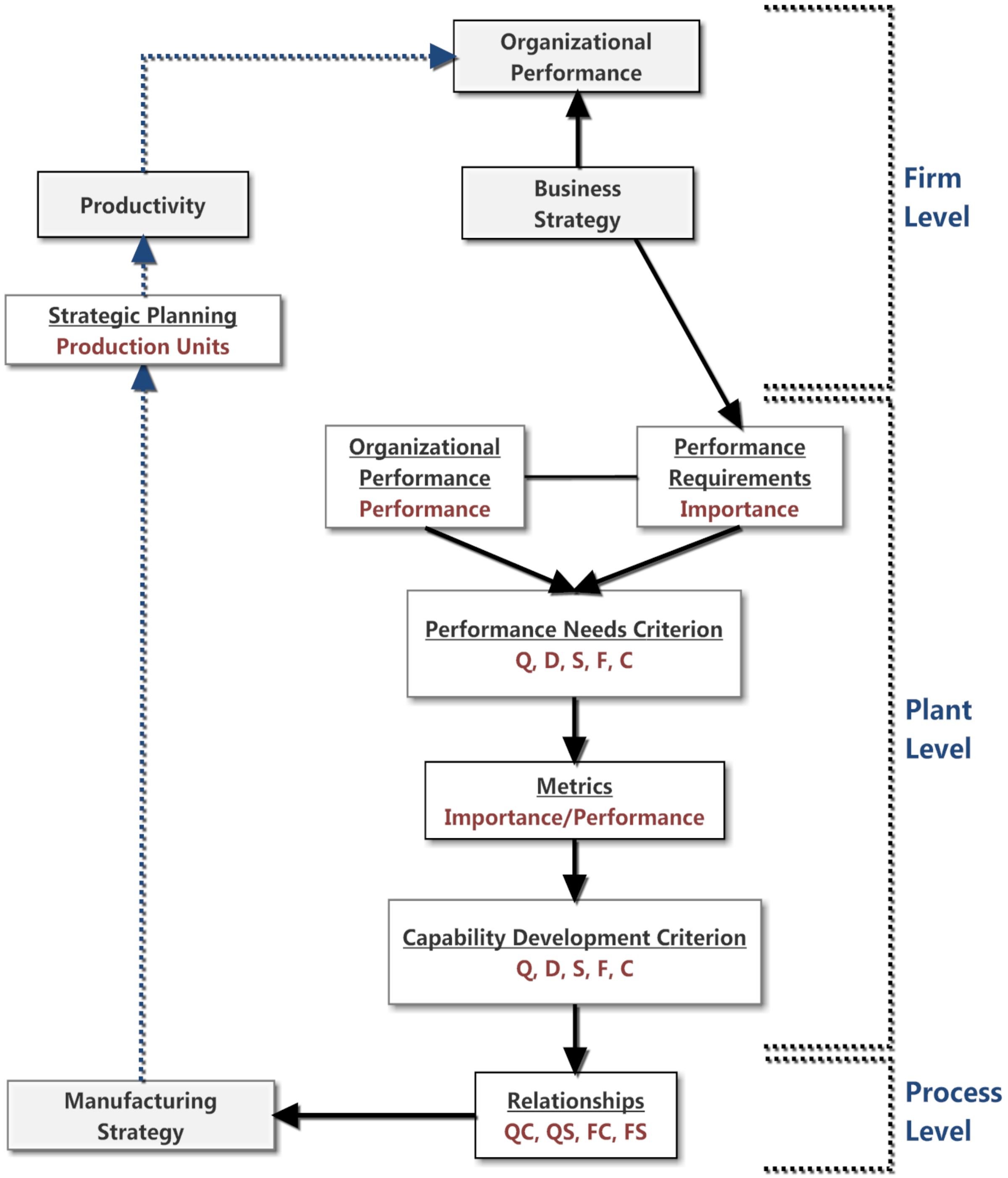

Figure 1 – Conceptual Framework

3. Research Method

The aim of this research was to investigate how a UK manufacturing organisation could develop manufacturing capabilities to improve productivity and create a sustainable competitive advantage. This required an understanding of market requirements and organisational performance, the relationships between capabilities in context, and how capability development would impact performance. The case study has been defined as an empirical enquiry into a phenomenon in a real world context (Yin, 2014). A case study was an appropriate choice for this research because it facilitated a detailed analysis of a single organisation over time, utilising an extensive range of data collection techniques (Bryman and Bell, 2003). The output was used to guide manufacturing strategy development and align manufacturing performance with market requirements.

Case Selection

The case selected for this research was a paint manufacturer specialising in the production of bespoke surface coatings for end user applications that include industrial, commercial vehicle, rail, defence, and toy and hobby. The case is a privately-owned SME operating at one location in the UK and was appropriate for several reasons: First, it represented an entity within the manufacturing sector of the UK economy. Second, the organisation was impacted by the 2008 recession and has experienced steady year-on-year growth since. In 2016, revenues had increased 60% from the values in 2009. However, despite this healthy revenue growth, the organisation had not experienced any accompanying growth in productivity. Its business strategy recognised the requirement for a complex product portfolio to serve new and existing markets with an ambition to grow both revenue and profitability by 40% by 2020. Improved productivity by aligning its manufacturing strategy with the market requirements is crucial to achieving these ambitions.

Increasing customer requirements requires a manufacturing configuration that can accommodate both higher volume batches of material and customisation in terms of colour, sheen level, pack-sizes and volumes whilst remaining competitive. Customised products represent 30% of the organizations total turnover and are highly integrated with higher volume production batches that make up the remainder. Owing to the complexities associated with manufacturing customised products, it has three specialised customisation departments which produce 21 types of customised product groups.

In this context, customisation relates to combinations of colour, sheen, quantity and packaging. Customisation department A1 has invested in automated dispensing equipment to streamline the manufacture of products based on historical market requirements. Customisation departments M1 and M2 adopt a manual approach to the manufacture of products. The unit of analysis is at the product group, where products can be further classified based on technical similarity. Product groups vary with respect to the stage of the product life cycle and GVA per group. We adopt life-cycle stage definitions from Anderson and Zeithmal (1984) to include introduction, growth, maturity, or decline. During introduction and growth stages, lower performance is experienced due to a focus on customer requirements and product performance (Anderson and Zeithmal, 1984). However, once products reach the maturity stage, the focus shifts to increasing efficiency, quality, and differentiation, which subsequently increases performance (Anderson and Zeithmal, 1984). Our measure of GVA is based on the Office of National Statistics measure of total output minus intermediate consumption (Office of National Statistics, 2007), which we provide as the percentage of total output as value added. Average figures for each product group are provided in Table 1.

Table 1 – Product Classifications

Classification	Products	Manufacturing Department	Average stage of product life cycle	Average GVA
Group A	Products A1 - A9	A1	Mature	52.11%
Group B	Products B1 – B5	M1	Mature	66.4%
Group C	Products C1 – C2	M2	Mature	58.5%
Group D	Products D1 – D5	A1	Growth	51.4%

Research Design

The research design adopted a sequential mixed-method approach, where preliminary quantitative data was collected to inform and direct subsequent qualitative data collection (Saunders et al., 2016). This approach helps enhance understanding and adds different perspectives to the data (Maylor and Blackmon, 2005). The survey is a valuable method for capturing data from a range of respondents by asking them questions (Maylor and Blackmon, 2005), making it a viable choice for investigating customer requirements and organisational performance. A cross-sectional survey approach was adopted to allow the process to be repeated and reassessed to determine whether improvements have been made. To enhance survey findings and support the implementation process, semi-structured interviews were conducted. Subsequent to obtaining customer requirements and performance, process flows were constructed to facilitate an investigation into the relationships between capabilities at the process-level. This was followed by obtaining quantitative data associated with manufacturing capabilities of quality, speed and cost. To enhance understanding of the manufacturing processes employed and relationships between capabilities, semi-structured interviews were conducted. We selected interview participants from varying levels of management. Thus, enabling a rich profile of customer requirements and manufacturing capabilities to be developed. Subsequent to interviews, focus groups involving interview participants were held to further develop preliminary findings and provide an opportunity for people to challenge viewpoints and collectively make sense of important issues that were revealed.

Data Sources

Table 2 summarizes the data requirements and collection methods employed to address the research objectives.

Initially, through the use of a questionnaire, data was captured to identify customer performance requirements of customised products and corresponding organisational performance. Questionnaire participants included 10 of the organisations sales representatives that represented the current sales force, and 35 customers. Customer participants were carefully checked and confirmed to be representative of market requirements in terms of product volumes and variety. Quantitative data was supported by semi-structured interviews conducted with all senior sales staff within the organisation that included the Sales Managers and Sales Director. Interview participants were carefully selected to ensure the greatest level of understanding of customer requirements.

Following this, process flows were constructed in iterations to enable an investigation into the relationships between capabilities at the process-level. During each iteration, the researchers observed the process to construct a model. The model was subsequently reviewed with the corresponding Departmental Managers, who were asked questions and provided with opportunities for feedback. During later iterations, questions were posed to determine whether process steps could be assigned to specific capabilities and further refine the model. Thus, revealing whether the process in its entirety or a subset of process steps were required to support specific capabilities. This process continued until all actors were in agreement that the models accurately reflected the processes.

Table 2 - Data requirements and collection methods

Primary data or information captured	Relevance to research objective	Source of data or method collection	Other comments
Customer performance requirements and relative manufacturing performance for the full range of customised products.	To check for alignment between customer requirements and manufacturing performance in the organisational context.	A questionnaire was adapted from Koufteros et al., (2002: p270-271) and distributed to the company Sales Director, Sales Managers and a range of customers. This was supported with qualitative data captured by holding structured interviews with the company Sales Director and Sales Managers.	Questionnaire analysis metrics adapted from: Slack, N., Brandon-Jones, Alistair, and Johnston, Robert. (2013), *Operations management (7th ed.),* Harlow: Pearson, pp653.
Process flows of customisation departments.	To facilitate an investigation into the relationships between capabilities at the process level.	Processes were recorded with the relevant departmental foreman by observing the process from start to finish.	Two process methods were identified. One method was highly manual, the other was semi-automated. Diagrammatic process flows were constructed.
Relationships between flexibility, cost and speed. Relationships between quality, cost and speed.	To guide the alignment process by establishing the effect improvement to one capability has on the others.	Departmental costs were obtained from the organisational Finance Director. The time to control quality was recorded at the process level. Manufacturing speeds at different volumes were recorded in each customisation department. This was supported with qualitative data obtained through structured interviews with the Factory Operations Director and Departmental Foreman.	The manufacturing speed data was sourced from the organisation's computerised production system, that records the start and completion time of each manufactured product. The data was averaged over a 24 month period for typical high, medium, and low volume batch sizes.

After constructing process flows, quantitative data pertaining to the manufacturing customisation departments was captured to gain insight into the relationships between capabilities of quality, speed and cost; and flexibility, speed and cost. We obtained data from the order system utilised by the organisation associated with the number of batches and total volume of batches manufactured over the previous 24 month period. Also, the manufacturing costs per batch and per litre in each customisation department were calculated in conjunction with the organisations Finance Director.

Data pertaining to quality and speed was captured by obtaining the length of time required to adjust the finished product to ensure it conformed to the customers' individual specifications for, say, colour shade or sheen. Data pertaining to flexibility and speed was determined by comparing the manufacturing time in each customisation department for typical high, medium, and low volume batches required by customers. Semi-structured interviews were held with senior staff to enrich the quantitative data used to measure the relationships between capabilities. Interview participants included the Factory Operations Director and Departmental Managers to reflect the greatest level of understanding of the manufacturing processes.

Finally, focus groups were conducted in two phases with staff from the highest level of management in sales and manufacturing. An initial meeting was held with the Sales Director, Factory Operations Director, and each Departmental Manager to validate the findings and analysis. Subsequently, three full-day meetings, each separated by two weeks were held with the same staff to validate the robustness of the recommendations for the manufacturing strategy and agree future action plans.

Data Analysis

Data analysis was conducted in 2 stages. During Stage 1, survey data was used to create an averaged profile of the current market requirements for each product group. Subsequently, this was compared with the averaged complementary profile for the current manufacturing performance to identify areas of misalignment. Interview data associated with market requirements and performance was transcribed and coded prior to thematic analysis to triangulate market requirements and performance. Subsequently, areas of misalignment were prioritised through a misalignment index measure for each capability/product group combination. This used the size of the gap between the perceived importance rating and current performance rating which was then weighted using the perceived importance rating to calculate a Misalignment Priority Number (MPN) (i.e., analogous to the Risk Priority Number used in Failure Mode and Effects Analysis (Dale et al., 2007)). During Stage 2, process flows were analysed to understand departmental manufacturing processes and the relationships between capabilities in each department. The manufacturing cost, manufacturing speed and volume, product groups (flexibility), and the time taken to control quality were analysed in each department in conjunction with the GVA of product groups to understand the impact of capability development on performance and productivity. Qualitative data associated with manufacturing capabilities was transcribed and coded prior to thematic analysis in order to enhance understanding of the relationships between capabilities and any subsequent improvement recommendations.

Reliability and Validity

The questionnaire approach has limitations due to the cross-sectional approach, sample size, and potential for non-response bias. One could argue the failure to capture past and future events reduces the effectiveness of this method. However, this limitation has been mitigated by adding longitudinal perspectives to the data captured, that were facilitated through the use of structured interviews and focus groups. The repeatable nature of the questionnaire enables customer requirements to be reassessed at a future date to increase sustainability. The reliability and repeatability was supported by the transparent approach towards questionnaire participant selection, interviewees, and interview transcripts. The question of sample size is determined by the need for precision and the constraints of time and cost (Bryman and Bell, 2003). Submitting questionnaires to every customer would have been precise, but impractical. Therefore, we selected a practical sample size to represent high, medium, and low turnover customers in each market segment. To address the issue of precision, sales representatives for each market segment were selected as participants. The quantity of customers associated with each representative provides a more complete profile, increasing validity. To address the limitation of non-response bias, questionnaire participants were mailed requesting feedback including whether or not the questionnaire had been completed. This allowed the turnover and segment of respondents to be reviewed for bias. However, no significant bias was observed.

The use of process flows to establish relationships between capabilities in conjunction with context specific measures of manufacturing capabilities raises the question of internal validity. The authors acknowledge this limitation, and endeavoured to mitigate it through the inclusion of non-organisational and organisational actors operating at differing levels of management in the study. To eliminate errors and consider alternative explanations, measures were discussed at length with actors during the research process until consensus was reached.

4. Findings and Analysis

4.1 Stage 1

The questionnaire responses were consolidated into rating profiles demonstrating for each capability for each product group, the current market requirements and manufacturing performance, prior to an analysis of current levels of misalignment. Interview data was included with the subsequent analysis to create a richer profile of requirements, performance, and misalignment. The data was then used to guide improvement priorities to enhance performance.

4.1.1 Analysis of Current Market Requirements

The perceived market requirement for each capability for each product group are presented as Figure 2.

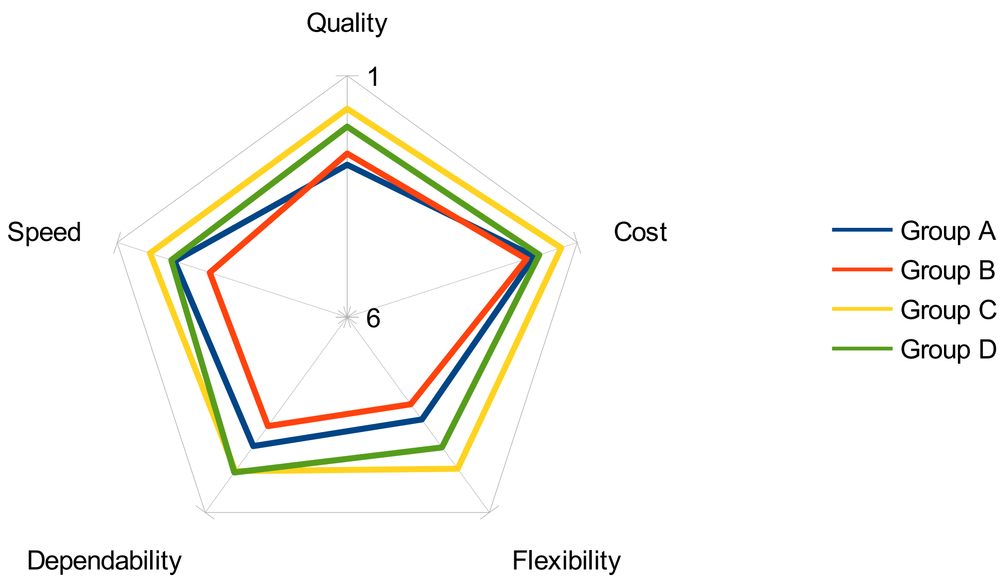

Figure 2 – Perceived market requirements for each manufacturing capability

As might be expected for product groups at different stages in their life cycle addressing different market segments (Anderson and Zeithmal, 1984), these results revealed a variety of importance ratings for each capability across the range of product groups. Overall, cost was the most highly valued capability while flexibility was of least importance. Group C products had particularly demanding customer expectations across all five manufacturing capabilities. Group D products had slightly less demanding requirements than Group C but dependability was of crucial importance while speed was important, as it was for Group A. Group B had generally the lowest levels of importance across the range. Interestingly, in this case, the position of each group in its product life cycle did not seem to influence the relative importance of the capabilities studied.

4.1.2 Analysis of Current Manufacturing Performance

Similarly, the perceived manufacturing performance for each capability for each product group are presented as Figure 3.

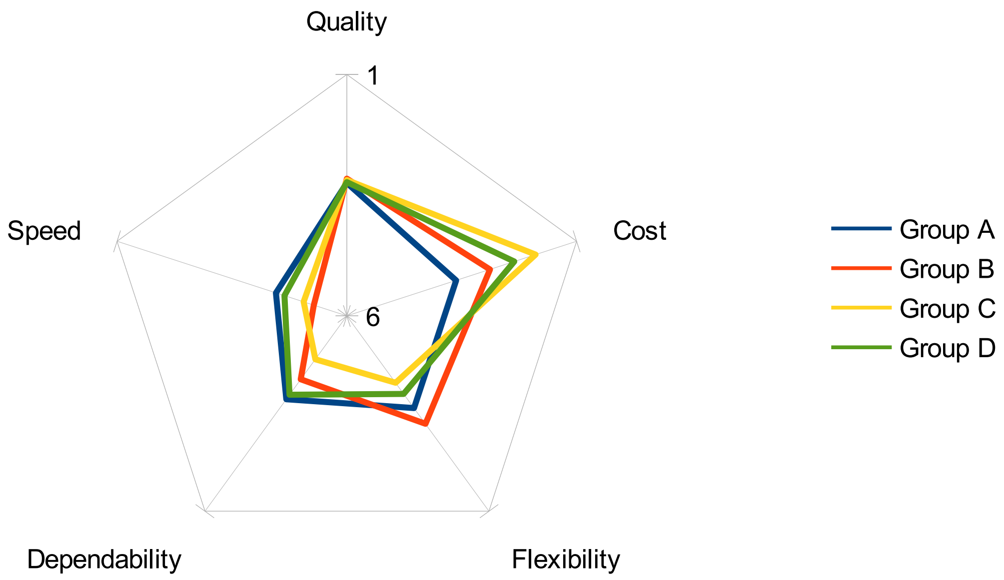

Figure 3 – Current manufacturing performance profile

The highest levels of cost performance were associated with Group C and D products and the organization was perceived to perform better than the competition in this area. Quality performance was consistent across most product groups and was marginally better than the competition. The other combinations of manufacturing performance for each product group presented a mixed picture though, overall, relatively low performance in speed was observed. This was particularly concerning for Groups B and C in which speed performance was perceived to be lower than competitor offerings.

4.1.3 Analysis of Misalignment

Unfortunately, categorising which capabilities represented order qualifiers and those which represented order winners (Hill, 2005) was perceived by the Sales Department respondents to be too black and white to be used to judge or prioritise areas of misalignment. In this case, customers were buying a product with various shades of grey across all performance requirements. Consequently, MPNs were used to identify the most significant misalignments between customer requirements and the current manufacturing performance. The resulting MPNs are presented in Table 3. Positive MPNs indicated performance less than the market requirement while negative MPNs indicated excessive performance.

Table 3 – Misalignment Priority Numbers for each Capability

	Group A	**Group B**	**Group C**	**Group D**
Quality	2.49	3.58	10.98	8.24
Speed	15.4	13.58	24.42	17.12
Dependability	7.39	6.73	19.64	13.68
Flexibility	1.5	-2.75	14.93	8.47
Cost	12.06	5.47	4.17	3.83

Collectively, the greatest misalignment was associated with the speed capability which would benefit from improvement across all product groups. This suggests the organisation may have a systemic problem in its manufacturing planning and control systems or its process technology is not conducive to shorter lead times required by the market. The misalignment associated with dependability, particularly for Groups C and D, could also have the same sources. Among the product groups, Group C exhibited the most severe misalignment. This was surprising because Group C is a mature product group that has been manufactured for over 10 years. It might be expected the organisation would have incrementally tuned its capabilities to match the market needs during this period. However, all product groups needed further tuning to a greater or lesser degree. At this level of analysis, the results suggested the following top ten priorities:

1) Improve speed for Group C
2) Improve dependability for Group C
3) Improve speed for Group D
4) Improve speed for Group A
5) Improve flexibility for Group C
6) Improve dependability for Group D
7) Improve speed for Group B
8) Improve cost for Group A
9) Improve quality for Group C
10) Improve flexibility for Group D

4.1.4 Formulating Improvement Priorities to Enhance Performance

In terms of dependability, improving performance for Groups A and D was viewed as the most important action which suggested they had concerns with Manufacturing Department A1 (which makes both Groups A and D). The organisation invested in this department to make the newly launched Group A products and was adversely affected by the recession in 2008. Consequently, increasing its capacity utilisation was an important factor in the decision to launch Group D products. It might be argued they were defending their role in two unfortunate business decisions. Interestingly, the dependability of Group C (number two in the top ten) was not seen as an issue.

However, there was consensus that the speed performance for Groups A, B and C was a major concern and customers often would not wait and would buy similar products elsewhere.

The prioritisation of flexibility performance for Groups C and D was interesting that they agreed with the need to increase the range of products available in these groups rather than pack sizes or order quantities/volumes. With respect to these latter dimensions of flexibility, the perception was the organisation offers too much flexibility across all groups. The definition of flexibility used in the data collection did not distinguish between these dimensions and unfortunately, this may be an important omission.

The prioritisation of improving the cost performance of Group A was confirmed. This may reflect observations made earlier about the decision to invest in Department A1. Nevertheless, price is very important for Group A products and they experience difficulties in competing, especially at lower volumes.

In summary, the analysis highlighted important misalignments between the existing manufacturing capabilities and the market requirements. There was a general agreement actions need to be taken to improve this alignment, which could subsequently lead to productivity improvements, though perceptions of priorities differed slightly. More importantly, it was necessary to consider how these capability improvement actions could be delivered and possible interactions between.

4.2 Stage 2

Initially, process flows were analysed to understand the underlying manufacturing processes that facilitate the manufacture of product groups from each department, and also, to establish relationships between capabilities. Subsequently, quantitative data associated with capabilities was analysed to understand the impact of capability development on performance and productivity. This is followed by the implications for manufacturing strategy development to create alignment and improve performance. Interview data was consolidated with the analysis to create a richer profile of manufacturing departments including assets and processes. Furthermore, interview data was used to enrich findings associated with the relationships between capabilities and the effects of capability development on performance.

4.2.1 Plant-level Manufacturing Configuration

The organisation manufactures the product groups using two configurations. One is labour intensive with manual transfer and control of the production stages (manual) while the other involves a degree of automation for similar tasks (semi-auto). Department A1 has the lowest manufacturing cost per unit (i.e., excluding material costs). This is followed by M1, and finally, M2. Considering manufacturing cost in isolation, department A1 is 50% more productive than M2, and M1 sits midway between them.

4.2.2 Process Overview

Paint manufacturing is a batch process. In a succession of steps, bulk raw materials are processed and additional ingredients added to obtain the appropriate properties such as colour shade and sheen using a product formulation. When a batch is judged to be ready, the properties of a sample are tested. Both raw materials and the ingredients are subject to natural variations which often result in the need to adjust the batch and retest until the batch conforms to the customer specification. The product is then packaged according to the customer's requirements.

4.2.3 Relationships between Manufacturing Capabilities at the Process-level

Quality and Speed

There is a variable relationship between quality and speed that is a consequence of the requirement to tightly control the colour of each product in each department. This variation can have a profound impact on the manufacturing speed of products. For example, if a paint system takes four hours to dry, and two colour adjustments are required, manufacturing time increases by 8-9 hours. Also, as the difference in perceptible colour is reduced, the margin for error is also reduced subjecting the process of controlling colour to diminishing returns. Department A1 and M1 reported 40% of colours need a single adjustment to bring product within tolerance. Department M2 reported most manufactured products need multiple adjustments to achieve colour tolerances.

However, Department A1 manufactures both Groups A and D. Group D has significantly tighter colour shade tolerances than Group A. Achieving these tighter tolerances takes a disproportionate amount of time for the reasons previously discussed, and this effectively reduces the speed capability for Group A products as well for Group D. Considering Group A and D products have similar speed and cost requirements, the manufacture of these products from the same department utilising shared assets has a reducing effect on the productivity of Group A products. Separating the manufacture of Group D products from Group A products would improve the manufacturing speed of both product groups and is an obvious way to address priority numbers 3 and 4. This separation would also facilitate a reduction in manufacturing costs through improved speed performance, that would contribute to increasing the GVA and productivity of the product groups. A supporting improvement across all departments would be to consider improving the storage and tightening the colour tolerances of the ingredients used in the process in order to achieve more accurate or right first time initial colours.

Flexibility and Speed

The relationship between volume flexibility and speed is provided in Figure 4. All departments offer the same range of colours and for equivalent colour tolerances, Department A1 is the quickest to manufacture the smaller batches facilitating higher productivity when manufacturing lower volume batches . Departments M1 and M2 are of similar speed performance. At higher volumes, Department M1 is quickest and A1's speed deteriorates markedly, indicating lower productivity when manufacturing higher volume batches. This is because A1 was purposefully designed to manufacture customised products in low volumes of a wider range of product types. M2 has the most limited product range and M1 sits between A1 and M2.

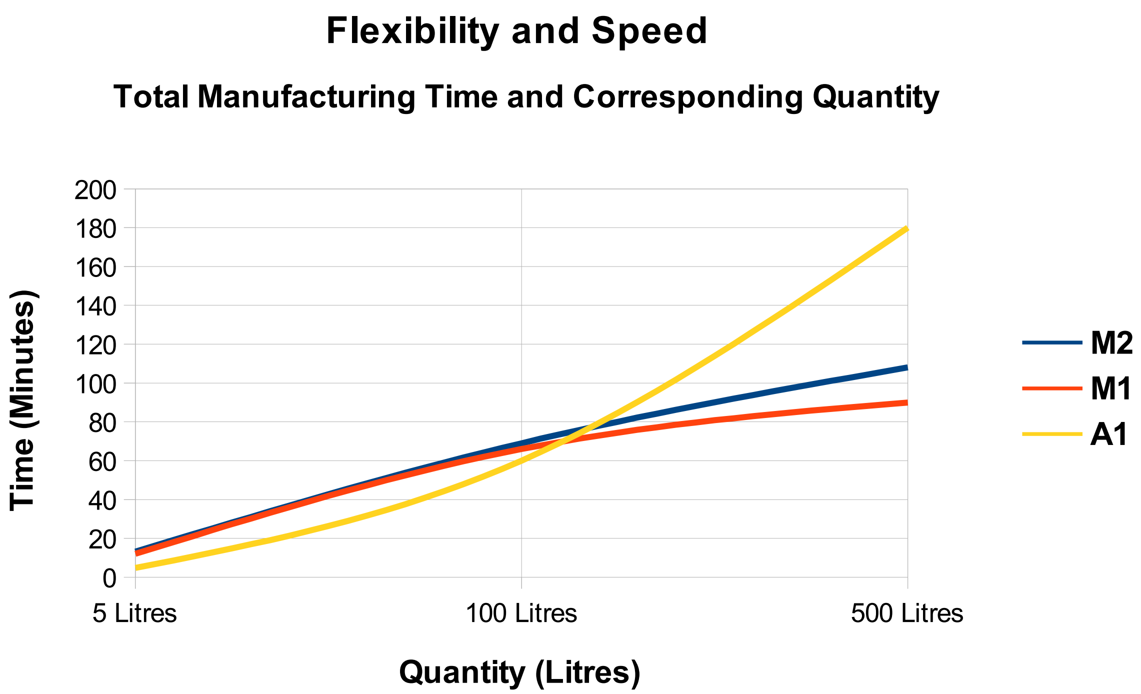

Figure 4 – Volume Flexibility, Speed, and Corresponding Department

Improving the flexibility of Group C and D products (priority numbers 5 and 10, respectively) suggests a need for a wider range of colours within the product groups. A larger range of colours would have no impact on manufacturing speed.

Dependability

The dependability of Group C products (priority number 2) is negatively affected by the condition of some stored ingredients. The total volume of products manufactured in department M2 is relatively high which means ingredients are stored in large tanks which are difficult to mix causing settlement and heterogeneity in the tank to supplement the natural variation in the ingredients. This affects the colour accuracy of the initial batch and the number of subsequent adjustments can be highly variable. Initial batch variation has a reducing effect on speed performance, and subsequently cost performance. Thus, detracting from the GVA of those products and subsequently reducing productivity. The dependability of Group D products is closely linked to the disruption to Department A1, described earlier in the context of quality and speed, caused by manufacturing Groups A and D together.

Cost

The cost of Group A and D products was viewed to have reduced significantly through the introduction of the semi-auto configuration in Department A1. This is indicative of increasing GVA and productivity as a consequence of the assets and process utilised in the semi-auto department. Interestingly, improving the cost performance of Group A now features as priority number 8. A further concern is that investment in a semi-auto configuration for Group B is being planned though the misalignment analysis suggests investment might be better directed towards Group C to address priority numbers 1, 2, 5 and 9.

4.3 Implications for Manufacturing Strategy Development

A comparison of the analysis of the misalignments between manufacturing capability and market requirements and the analysis of the underlying relationships between individual capabilities and the effects on productivity yields the actions summarised below:

1)	Improve speed for Group C	- Improve ingredient storage/consistency
2)	Improve dependability for Group C	- Improve ingredient storage/consistency
3)	Improve speed for Group D	- Separate from Group A
4)	Improve speed for Group A	- Separate from Group D
5)	Improve flexibility for Group C	- Extend colour range
6)	Improve dependability for Group D	- Separate from Group A
7)	Improve speed for Group B	- Improve ingredient storage/consistency
8)	Improve cost for Group A	- Separate from Group D
9)	Improve quality for Group C	- Improve ingredient storage/consistency
10)	Improve flexibility for Group D	- Extend colour range

Three areas were identified that warrant investment should the organisation wish to align itself with the market requirements and increase productivity:

- A separate manufacturing department for Group D (ie: new capacity)
- Improved storage facilities for ingredients (ie: tinters) across all departments to improve ingredient consistency/tighter tolerances on ingredients (ie: in-process improvement
- Extended colour range (ie: flexibility expansion)

5. Discussion

In this section, outcomes from application of the framework will be discussed in the context of existing literature and the current UK manufacturing productivity context.

5.1 The Manufacturing Strategy and Plant-level Capabilities

The procedure advocated by Platts and Gregory (1990) and Hill's 5 step framework (Hill, 2005) provide blueprints for organisations to increase market share and create a competitive advantage. This is achieved by exploiting linkages between marketing and operational strategies, through order qualifying and order winning criteria that closely correspond with competitive capabilities. Existing models of capability development are unclear about which approach is best. For example, the trade-off theory suggests organisations focus efforts on a limited number of capabilities to create a competitive advantage (Skinner, 1996), while the sand-cone model suggests organisations focus on developing all capabilities in a specific order to experience a cumulative effect (Ferdows and De Meyer, 1990). Attempts to find a universal model for capability development has seen studies performed at high levels of abstraction (e.g. Avella et al., 2011; Sum et al., 2012; Tamayo-Torres et al., 2017). In other words, examining capability development independent from plant-level attributes such as processes and assets.

Through the use of our model, we have been able to demonstrate the influence plant-level attributes can have on competitive capabilities. Furthermore, we suggest the lack of empirical support for existing models could be a consequence of failing to include these attributes. It is entirely possible the application of existing models in mature organisations will yield positive outcomes. However, we believe the key to developing capabilities in less-mature organisations is through the application of a bottom up approach. In other words, by examining the interactions between capabilities at the process-level, to develop industry specific or strategic competitive models of capability development that complement an organisation's capability profile. We therefore support the proposition of contingent approaches to capability development that have been suggested in several studies (Flynn and Flynn, 2004; Narasimhan and Schoenherr, 2013).

5.2 Underlying Process-level Capabilities

The underlying process-level capabilities ultimately determine plant-level capabilities. In this context, the relationships between quality and other capabilities appear more complex than suggested by Avella et al., (2011) and Boon-itt and Wong (2016). At the process-level, a reduction in speed and cost performance of multiple product groups was illustrated as a consequence of greater quality requirements of a single product group. However, it was possible to enhance the performance of the corresponding capabilities at the plant-level by separating the manufacture of those product groups. Therefore, the relationships between these capabilities are impacted by the organisation of production facilities, and the underlying process and assets utilised in this context.

The multifaceted nature of flexibility makes the relationship between flexibility and other capabilities complex. When considering the semi-auto department in isolation, the relationship between flexibility and cost complements Hallgren et al., (2011) that these are contesting capabilities. This is because a reduction in manufacturing speed increases cost, and speed reduces as volumes decrease and customisation increases. However, the findings also contrast with Hallgren et al., (2011) because lower volume customised products manufactured in the same department exhibit higher speed, and subsequently cost performance when compared to the manual departments. Therefore, a fundamental difference in assets and process change the underlying structure of the trade-off between flexibility, and speed and cost in this organisation. This supports assertions by Schmenner and Swink (1998) of the existence of asset frontiers. Also, it illustrates a variable effect between product range flexibility, volume flexibility, and the performance of speed and cost that is influenced by assets and the manufacturing process. Therefore, we agree with the assertion by Chung and Swink (2009) that careful consideration should be paid to the dimensions of flexibility during the adoption of AMT. Furthermore, existing studies at higher levels of abstraction might have failed to capture relationships between different dimensions of flexibility and the effect on other capabilities, supporting the assertion by Rosenzweig and Easton (2010:p137) that "*tradeoffs-related results may be obscured or confounded when using a higher unit of analysis"*.

Posing the question of how different manufacturing configurations can impact the trade-off between flexibility and cost yields some interesting considerations. The department with higher levels of manual processing experiences a more linear reduction in speed performance with increased customisation at lower volumes. Contrastingly, the semi-auto department increases compatibility between flexibility and speed at lower volumes, but the ability to manufacture high volumes at low cost reduces. Therefore, we are in agreement with Hallgren et al., (2011) that the capabilities of flexibility and cost should be developed in a balanced way. This highlights the need for careful consideration to the impact of developing different dimensions of flexibility on the capabilities of delivery and cost, contrasting the research by Sum et al., (2012) who suggest these capabilities can be developed independently. However, our study does demonstrate how a combination of different asset and process configurations can facilitate the development of multiple dimensions of flexibility (volume and variety) with relatively higher cost performance. Finally, these findings support the existence of frontier trade-offs, asserted by Sarmiento and Shukla (2011).

5.3 The manufacturing strategy and firm-level productivity

The literature highlighted the need for UK manufacturing organizations to increase productivity and we posed the question of how broader strategic initiatives could impact productivity. Our study reveals how productivity improvements can be made through the application of our framework to guide the development of a manufacturing strategy to improve market and operational alignment. The recent trend towards globalisation and customisation (Jordan and Michel, 2001; Anderson, 2006) has resulted in manufacturers attempting to serve customers with varying requirements. However, the limitations of manufacturing for disparate markets from the same manufacturing plant were discussed by Skinner (1974), and Berry et al., (1991). It was suggested to overcome the limitations, organisations should increase focus which can be achieved though the development of a 'plant within a plant' (Skinner, 1974). Application of our framework in this organisation revealed the separation of Group D products will result in increased speed and cost performance that will subsequently improve productivity. This also supports assertions by Skinner (1974) and Berry et al., (1991) that 'plants within plants' are valid methods for reducing the impact of trade-offs.

It is interesting that Barnett et al., (2014) suggested the sharp fall in UK productivity could be explained by factor utilization, but later revealed utilisation has returned to pre-crisis levels whilst productivity has remained lower than expected. Our findings establish how a reduction in capacity utilisation as a result of the 2008 economic downturn can be recovered without expected productivity improvements. This is a consequence of the introduction of new products requiring different capability configurations, to recover revenue losses during a financially constrained period (i.e., post recession). The integration of these products with existing assets contributed to misalignment and subsequently reduced performance. Furthermore, we suggest the requirement for process-level improvements such as the upgrade of ingredient storage facilities to all departments as a consequence of constrained investment decisions, supporting assertions by Harari (2016).

Our findings complement studies by Syverson (2004), that firms within the same industries can experience different levels of productivity. This study demonstrates a relationship between productivity and the underlying processes and asset configurations. Furthermore, we build on research by Syverson (2011) by demonstrating how the organisation of production units and in-process improvements can enhance productivity in UK manufacturing organisations.

5.4 Evaluation of the Conceptual Framework

Application of our model with various methods of data capture revealed how process-level improvements can lead to plant-level improvements that subsequently enhance market and operational alignment. Thus, improving firm-level productivity whilst minimising the impact of trade-offs in a organisation with heterogeneous customer requirements. The literature revealed the need to explore relationships between capabilities at the process-level to understand the best method to develop capabilities in context. Although our framework was successful at collecting data and supporting investment decisions, it would be useful to have a tool for guiding this process. Our framework could be further developed by exploring relationships between capabilities at the process-level in other less-mature manufacturing organisations. This would contribute to a deeper understanding of the relationships between capabilities at the process-level whilst facilitating the development of 'industry specific' or 'strategic' competitive models of capability development through the use of a bottom-up approach. It would also help unravel some unanswered questions surrounding the UK productivity puzzle.

6. Conclusion

There are various models of capability development. However, due to the lack of empirical support for existing models, views on the best method of capability development are conflicting and as of yet, there is no consensus. Our study provided empirical evidence of trade-offs between capabilities at the process-level of a UK manufacturing organization. Furthermore, our study revealed how the organisation of production units could serve to enhance capabilities at the plant-level, and also, how relationships between capabilities can be constrained or impacted by the manufacturing process and the corresponding assets. We propose organizations are dynamic and the key to developing a greater understanding of capability development lies at the process-level. This view has been supported by plant-level capability developments we were able to reveal through the application of our framework in a manufacturing organization, and the subsequent improvement outputs associated with firm-level productivity.

The productivity challenges UK organizations currently face are well documented throughout the literature. We believe the challenges facing UK manufacturing organisations can be addressed with practises from existing literature, and the key is to operationalize these practises. To enhance firm-level productivity, manufacturers should align capabilities with competitive priorities determined by market requirements. Our study demonstrated how alignment can be increased by investigating the relationships between capabilities at the process-level. This served as a guide to formulating improvement priorities that would lead to plant-level capability improvements and subsequently firm-level productivity improvements. Furthermore, our study demonstrated how broader strategic initiatives, such as the reconfiguration of existing manufacturing facilities can increase alignment with market requirements. However, unless market requirements remain static, organizations will have to continually adapt by refreshing manufacturing capabilities.

Our paper contributes to existing research by providing a study into capability development at the firm-level that have been recommended to shed light on existing models (Rosenzweig and Easton, 2010 ; Sarmiento and Shukla, 2011). Furthermore, we have provided and applied a framework that can be used to increase firm-level productivity in less-mature organisations by aligning competitive capabilities with customer requirements. Although the scope of the investigation was limited to an individual organization, further application of our framework in less-mature organisations will develop our understanding of capability development. Output from application of the model can support the development of industry specific or strategic competitive models of capability development. Finally, we provide some insight into the productivity issues facing UK manufacturers. Through this study, we were able to demonstrate how productivity improvements could be made in a UK manufacturer that had become incrementally misaligned with its business environment during a period following the 2008 global recession.

6.1 Limitations

The use of a case study limits generalisability since it is not representative of the extensive manufacturing industry, or organizations in different industries. However, capability constructs and the transparent nature of the research, and comparisons with literature conducted at higher levels of abstraction opens the door for more research on capability development at the firm-level. Our goal was to facilitate a deeper understanding of the relationships between capabilities in different organisations and promote the exploration of contingent approaches to capability development. To support generalisability, care should be taken in future comparative research to define constructs and ensure compatibility with historical research.

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