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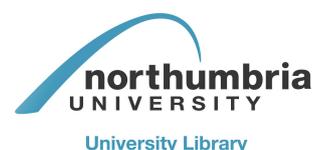
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## **Title Page**

### **Realigning the manufacturing priorities of SMEs as result of the 2008 UK economic downturn**

#### **Abstract**

This study provides consideration of the impact made by the uncertain business environment experienced in recent times in the UK on manufacturing priorities within its SME sector. This uncertainty centres on the economy's volatility during the recessionary period from 2008 onwards. A consequence of this is a realignment of manufacturing priorities, initiated by senior management within in the sector, accounting for sectoral conditions and associated market response. The study is based on a mixed methods research strategy, comprising a survey of 104 UK-based manufacturing SMEs and 17 interviewees with senior employees from these participating organisations. The study contributes to existing knowledge by building upon existing theoretical constructs of manufacturing strategy, specific to the manufacturing sector, and establishing a realignment of associated priorities around cost, flexibility, delivery performance and quality.

**Track: Strategy**

**Word count (excluding tables, graphs and references): 4,591**

## Body of paper

### **Introduction**

Manufacturing in the UK is well established, in global terms, representing the sixth largest contribution and being particularly well placed in terms of high-tech products (UNCTAD, 2010), although relative strengths and weaknesses do exist, the former around aspects of chemistry, biotechnology and pharmaceuticals, the latter including electronics and IT (BIS, 2010a). Government intervention in support of manufacturing growth is acknowledged, covering various aspects including innovation, new development implementation, skills and training investment, access to finance and safeguarding of energy supplies (BIS, 2020b). The contribution of the SME sector to the UK economy is substantial, £1.5trillion in monetary terms and comprising 42% of the UK's workforce (Engineering UK, 2012).

The outcomes of the UK recession have been difficult to comprehend and with respect to certain measures, rather contradictory. There has been a lack of correlation between unemployment and productivity (ONS, 2012a), with the ONS (2012a) pointing to differing patterns of behaviour by UK organisations compared with that exhibited during previous times of economic difficulty. These experiences have also varied between organisations and within industrial sectors, with the SMEs particularly challenged, given their sized-constrained opportunities to determine and respond to particular trends in the economy (Kitching *et al.*, 2009a) and less opportunity to diversify to reduce risk, given their smaller and more focused client base (Smallbone *et al.*, 2012).

From an SME perspective, the extant literature has perhaps given relatively little attention to the effect of this most recent recession on manufacturing, although consideration has been given to resources acquisition, particularly finance and strategies pertaining to market and product development (Kitching *et al.*, 2009a; 2009b; Cowling *et al.*, 2012; Smallbone *et al.*, 2012). Previous studies that have considered economic downturns have considered areas such as SME resilience achieved through flexibility and adaptability (Churchill and Lewis, 1984; DeDee and Vorhies, 1998) as well as the likelihood of continuation (Smallbone *et al.*, 1997). There has however, been recent recommendation to focus in a more concentrated way on the particular issues facing an individual company, performance impact and the potential for development of bespoke strategies in response (Smallbone *et al.*, 2012).

This study seeks to provide an understanding of the impact of this challenging business environment on UK-based manufacturing SMEs (referred to hereafter as MSMEs), and in doing so provide a contribution to theory underpinned by appropriate empirical analysis. The study will answer the question: *How has the 2008 UK economic downturn impacted on the manufacturing priorities of UK-based manufacturing SMEs?*

Based on recognition of specific gaps in the current body of knowledge, the study has incorporated a mixed methods approach, comprising data collected from 104 surveyed and 17 interviewed UK-based MSME senior managers, thus acknowledging the recommendations of Boyer and Swink (2008) and Barratt *et al.* (2011) regarding the adoption of mixed methods research within manufacturing and operations management. The study assesses how the ongoing UK economic downturn has impacted on MSMEs priorities relating to:

- Delivery performance
- Manufacturing cost
- Quality
- Manufacturing flexibility

The paper will provide a critical literature review around manufacturing strategy and priorities, environmental complexity and MSMEs operating in volatile and uncertain business environments, followed by consideration of the method of research, key findings and the overall contribution of the study.

## **Literature review**

### **Manufacturing strategy**

Academic consideration of manufacturing strategy is long established, with significant early contributions being made by Skinner (1969, 1974), this early work subsequently developing into the three key streams of strategic contribution of the manufacturing function, strategy formulation and implementation and the links between manufacturing strategy and related organisational facets around context, external environment and organisational performance (Kiridena *et al.*, 2009).

Manufacturing strategy is often divided into “*process*” and “*content*”, the former covering formulation and justification, the latter considering decisions and actions and its interface with the associated corporate strategy (Acur *et al.*, 2003; Slack *et al.*, 2007). Content encompasses priority selection, process design and infrastructure (Swink and Way, 1995), alongside recognition of distinctive competences that underpin competitive advantage (Swamidass and Newell, 1987). More recently, there has been adoption of the term “*manufacturing priorities*”, which will be considered within the context of this study (Noble, 1997; Lindman *et al.*, 2001; Ahmad and Schroeder, 2002; Joshi *et al.*, 2003; Tarigan, 2005; Rusjan 2006; Sarmiento *et al.*, 2008).

There is a necessity to align priorities with the demands of the market (Stobaugh and Telesio, 1983), with four areas of priority appearing to dominate; delivery performance, cost, quality and flexibility in manufacturing. Delivery performance encompasses speed and reliability, Hill (2009) recognising its necessity for order qualifiers and provider of competitive advantage for order winners, whilst Pullan *et al.* (2010) advocate concurrent engineering as an underpinning philosophy relating to manufacturing management in the pursuit of reductions in product development and lead-time, thus enhancing delivery performance. The components of cost are well established around labour, materials, infrastructure and energy (Boyer and Lewis, 2002; Hill, 2009), whilst productivity and transportation also play an important part (Slack *et al.*, 2007), whilst there is acknowledgement that enhancements in the priorities areas all contribute effectively to cost-related efficiencies. Quality is regarded also as being multi-faceted including assessment of customer perception (Garvin, 1987; Oakland, 2003; Schroeder *et al.*, 2011), alongside the necessity to establish strong cross-functional links to support this involving engineering, manufacturing and marketing internally, but also externally with suppliers (Ragatz *et al.*, 2002; Handfield and Lawson, 2007). Manufacturing flexibility is concerned with adaptability of the related processes to internal (Gerwin, 1987) and external (Correa, 1994) factors, the latter being particularly advantageous to competitive advantage in situations where the environment exhibits uncertainty and markets have associated instability (Oke, 2005).

There is an accepted lack of clarity around the constituents of manufacturing priority (Kathuria *et al.*, 1999; Sarmiento *et al.*, 2008), despite a greater level of consensus from the perspective of corporate management centring on the four dimensions considered above (Lindman *et al.*, 2001; Joshi *et al.*, 2003; Tarigan, 2005; Rusjan, 2006).

### **Manufacturing priorities and the external environment**

There is an understandable fluidity to these priorities, based on the nature of the business environment in which an organisation may find itself operating within. Work exists linking manufacturing capability with various aspects of strategy and organisational structure (Ward *et al.*, 1996), whilst size and structure can combine to afford organisations adaptability (Miller, 1988). In terms of priority, the four measures assessed in this paper are given equal credence by Womack *et al.* (1990), although Miller (1986; 1998) point to the greater relative weight of quality and cost compared with delivery performance and flexibility. This debate provides further challenges to the MSMEs, given the relative absence of consideration regarding their manufacturing priorities (O'Regan *et al.*, 2006).

In terms of growth, innovation has an accepted role to play within SMEs (Storey, 1994; Beaver and Prince, 2002), notwithstanding challenging initiatives around R&D being transformed into innovative products within this arena (O'Regan *et al.*, 2006), with sales and marketing priorities dominating manufacturing processes, whilst Hogg (2003) points to flexibility in response to the customer, with the UK's MSMEs moving away from price towards quality and customer service in their relative priorities (SIOM, 2012).

### **Environmental complexity and MSMEs strategy response**

The business environment is governed by “*uncertainty*” (Ansoff, 1979; Miller and Friesen, 1983; Dess and Davis, 1984; Dugal and Gopalakrishnan, 2000; Kipley *et al.*, 2012), “*hostility*” (Miller and Friesen, 1978; Dess and Davis, 1984; Zahra *et al.*, 2000) and “*heterogeneity*” (Khandwalla, 1972; Porter, 1980). Uncertainty, which accounts for changes in innovation, alongside fluctuations in the market and the behaviour of the competition may also encompass scarcity of capital (Cameron *et al.*, 1987; Street *et al.*, 2011), market share diminution (Cameron *et al.*, 1988), industry dynamics (Hall, 1980; Covin and Slevin, 1989; Kipley *et al.*, 2012; Li and Lu, 2012), and economic recession in general terms (Ewaldz, 1990; Want, 1990; McCallum, 1991; Touby, 1991).

The strategic response for organisations operating in such conditions result in two respective dilemmas, in the short-term capacity reduction to manage costs prohibits future growth in alternative market conditions and long-term, where capacity maintenance leads to the potential risk of cost escalation (Chastain, 1982; Deans *et al.*, 2009). From an assessment of the most recent UK recession, Kitching *et al.* (2009a; 2009b), point to two approaches open to the SME sector, cost cutting driven by resource assessment and product development and process investment in response to gaps in the market. Lessons from the previous recession in the late 1990s include SME investment in product innovation to develop quality-led competitive advantage and investments in overseas business relationships and associated support mechanisms (Beaver and Ross, 1999), this continuation of quality dominating price being reported subsequently for the most recent recession (SIOM, 2009). The commitment to innovation during the 1990s period of economic difficulty was further supported by SMEs forming inter-relationships to sustain experimentation and innovation (Torkkeli *et al.*, 2012).

In the early 1990s, cost cutting achieved through shrinking capacity and employee numbers dominated the decision making of the larger manufacturing organisations in response to the recession, alongside reducing the budgets for various investment-led activities (Geroski and Walters, 1995; Geroski and Gregg, 1997). This has been contradicted by the behaviour of the UK organisations in response to the economic climate from 2008 onwards, where levels of staffing have not declined as part of a cost-led response to the economy (ONS, 2012a; CIPD

Outlook, 2012), a decision that permits preservation of skills and knowledge within these organisations and a continuation from gentler economic times (DTI, 2002) when conscious investment was made in employees in response to Europe-wide growth and an ability to engage in both product development and new market entry. The importance of cost has, however, not been jettisoned, where strategically-led objectives involving energy-efficient and waste-reduction production processes have gained prominence, and as such, have delivered competitive advantage by means of the dual attainment of both business and environmental performance (BERR, 2008). In conclusion, from the perspective of the UK SMEs, the economic recession has restricted some in the realisation of their defined business objectives, whilst many SMEs have flourished, notably through innovation driven growth (Smallbone *et al.*, 2012).

### **Research design and approach**

Traditionally, manufacturing strategy studies pertaining to the SME sector have either solely used a positivist or interpretivist approach, with very few combining both of these, although the latter do exist, examples being Kitching *et al.* (2009b), SIOM (2009) and Badri *et al.* (2000). The mixed methods adopted here combine both quantitative and qualitative approaches to data capture and analysis (Creswell and Plano Clark, 2011), thus affording a wealth of potential insight that counters potential limitations in looking at either of the two methods alone, thereby potentially providing a fuller picture of the effect that the UK's 2008 recession has had on its MSMEs.

The online version of Kompass UK business directory was used to develop a sample of research participants, with 3,458 MSMEs (micro businesses not being included here) being identified. Contact was made with appropriate senior managers, these typically being Managing Directors or Manufacturing Directors. Via the online survey tool developed, 104 usable questionnaires were generated, from which 17 of the senior staff comprised the follow-up interview set. Both survey and subsequent interviews employed a common survey instrument, guided by Teddlie and Yu (2007) and Creswell and Plano Clark (2011), the content guided by literature pertaining to both manufacturing and operations strategy with an appropriate focus on manufacturing priorities, the latter being linked to participant perception of the impact made by the 2008 recession. Appropriate pre-survey piloting took place to assess for terminology, question effectiveness and structural and presentation issues. The survey was undertaken in an appropriately ethical manner, principally around safeguarding the anonymity and confidentiality of the survey participants and the corresponding organisations.

Analysis of the two data sources, quantitative and qualitative, was undertaken applying a parallel mixed analysis (Caracelli and Greene, 1993; Tashakkori and Teddlie, 1998). The quantitative analysis involved using descriptive statistics to provide a detailed sector overview, this according with the study's epistemological position around the necessity to both explore and explain the phenomena under consideration, but without necessity to test any established theory or model. In parallel with this, template analysis (King, 2004) was adopted to analyse the qualitative data, given its credibility across various epistemological positions (Waring and Wainwright, 2008). The analysis presented afforded the opportunity for appropriate synthesis, with particular need to ensure "*integration*" (Onwuegbuzie and Johnson, 2006) or "*nesting*" (Yin, 2006) between the two analysis strands, as well as dovetailing with the relevant parts of the academic literature.

### **Analysis and discussion**

In terms of the impact of the UK recession, the area impacted the most was manufacturing cost (90.2% of the responding MSMEs), followed by manufacturing flexibility (67.6%), delivery performance (67.3%) and quality (53.9%).

In terms of the underlying factors impacting cost, the interviewees suggested various drivers of increases, these being price inflation relating to raw materials, energy bills and the remuneration of essential, skilled employees. The expectation of the customer has also changed in this time period, with greater preference for batches that are smaller with greater frequency of delivery, reduced lead-times and both customisation and differentiation of the products being offered. In combination, these demand shifts have impacted on both the flexibility of manufacturing and delivery performance. Changes in the former have been addressed through necessary systems investments, whilst the latter has achieved relatively high priority within these MSMEs irrespective of the state of the challenging external environment. Supplier performance around quality and delays has impacted negatively on the quality levels achieved within these MSMEs, leading to a number of investment driven interventions, particularly around vertical integration and concurrent engineering, whilst product pricing has been calibrated downwards to ensure competitiveness.

The importance attached to delivery performance upholds various manufacturing studies (Swamidass and Newell, 1987; Ward *et al.*, 1995, Acur *et al.*, 2003, Grössler and Grübner, 2006), this prioritisation within the UK MSME sector appearing to be independent of the behaviour of the economy. With reference to the manufacturing strategy framework developed by Hill (2009), this would suggest that delivery performance has the status of an “*order qualifier*”, hence being regarded as a given, rather than an attribute that underpins competitive advantage (Hayes *et al.*, 2005). The trend towards high levels of delivery performance becoming the norm is further reinforced by the proportion of UK manufacturers exhibiting improvements since the millennium (DTI, 2008). The importance of high delivery performance is far reaching, Kathuria (2000) pointing to its dual role with quality as essential priorities amongst “*speedy conformers*”, alternatively referred to as “*niche differentiators*” (Ward *et al.*, 1996; Turner, 2009), whilst those operating an environment that is fast changing, will require high attainment here, this being the case particular for “*innovators*” (Li, 2000).

Batch size and order frequency changes described above have impacted on the participating MSMEs in terms of increases in transport costs, a need for greater flexibility (Wheelwright, 1984) and the potential for reduced profits arising from the loss of economies of scale (Slack *et al.*, 2007). Migration towards vertical integration, consideration of the supply chain and the pursuit of resources efficiencies have been the principal outcomes for the MSMEs in this particular study.

Since the start of the recession, around three in four of the participating MSMEs have experienced significant cost increases, primarily relating to energy, transportation and materials. The management of energy has emerged as a core strategic consideration, given the large above-inflation increases in both electricity and industrial gas (DECC, 2012). The role of automation and extensive IT systems has contributed to cost increases here (Hill, 2009), although opportunities for savings exist, through efficient use of energy supplies (Carbon Trust, 2012). To realise these achievements, the participating MSMEs report on the

essential role that needs to be played by senior management through employee motivation and changes to the culture within their organisations.

Increases in costs relating to transport centre on fuel, in particular diesel (DECC, 2012), and insurance, with MSMEs located in the second and third tiers being particularly vulnerable here. Where the supply chains are geographically dispersed, this can be particularly exacerbated (Slack *et al.*, 2007) and this is the case for the UK SME sector, where a significant proportion of the organisations have an export-oriented business (ICAEW, 2012).

For the MSMEs participating in this study, material costs represent the greatest organisational outlay, according with Hill (2009). The demand versus supply relationship within the respective supply chains has led to material price increases, where associated low stock levels have particularly affected those MSMEs that have implemented just-in-time manufacturing systems. There has been a consistency of price increases in this recessionary period as demonstrated by the Producer Price Index (ONS 2008; 2009; 2010; 2011; 2012b), with particularly large upward changes relating to the importation of raw materials such as chemicals, metals as well as plant and machinery.

Shortages in skilled employees across various shop floor specialisms have resulted in significant increases in employee costs, although there are supply challenges pertaining to lower skilled employees, with labour costs further impacted upon by the cycle of lower rates of pay, increased employee turnover and expenditure on training for replacement employees. Location can however, be an advantage in parts of the UK characterised by high-unemployment coupled with a manufacturing-intensive employment sector. There are clear salary variations UK-wide, with mean manufacturing salaries leading the UK mean in its entirety, £25,000 per year compared with £21,000 per year (BIS, 2010a). However, these salaries lag behind those afforded to professionals employed in finance, insurance and scientific disciplines. Recent years have witnessed below inflation salary increases for the manufacturing employees according to their employers' organisation EEEF (BBC, 2012). This trend, coupled with employment uncertainty specific to this sector, has driven a downturn in the supply of appropriate candidates for employment available to the MSME sector.

Many SMEs engage in international trade, both in terms of imports and exports, hence the effect of changes in exchange rates on these activities is of particular importance (Beaver and Ross, 1999). The work presented in this paper study endorses this earlier study by acknowledging that the SMEs do not pursue competitive advantage by positioning themselves to benefit from beneficial rates of exchange at appropriate points in the economic cycle. Alternative investments are typically identified, particularly around quality, again endorsing Beaver and Ross (1999) and specific to this study, product range. The avoidance of reliance on price endorses the arguments of Spall and Sykes (1999) about its limited impact in the context of globally competitive arenas. The avoidance of fluctuations in the value sterling has been recognised by MSMEs in this study, with the use of currency hedging or fixed supply contracts paid a stable single currency, Sterling included were cited approaches, in both cases, responding to advice provided by the Institute of Chartered Accountants in England and Wales (ICAEW, 2009).

From the outset of the 2008 recession, the participating MSMEs have been subject to product quality decline from their suppliers, but at the same time, are facing increase customer expectation around complexity of products. These conflicting movements have led to the creation of a “*demand and supply quality gap*”, the outcome of which is increasing quality

costs, particularly relating to scrap and rework, as well as delivery performance. The association identified here between product quality and delivery performance further endorses the findings of Grössler and Grübner (2006), whilst cost and delivery capabilities can only be achieved through the presence of conformance quality capability (Ward *et al.*, 1996). Working on the definition provided by Schroeder *et al.* (2011) that recognises quality being achieved if customer requirements are either met or exceeded, this would make a proportion of MSMEs vulnerable in terms of any claims regarding product quality, especially within a business environment that has become ever more competitive. In response to a relative weakening in position, MSMEs have undertaken a strategic assessment of their supply base, and in certain cases within the study, has resulted in investments pertaining to vertically integrated manufacturing processes, involving in-house manufacturing at the expense of poor external suppliers. There is also MSME investment in the communication of supply quality management, involving visual methods, including employee presentations and organisational newsletters. The value of visual communication as a primary method for staff engagement, information receipt and training has been endorsed by Oakland (2003), whilst Jayaram *et al.* (1999) has commended the human resources function in effective communication of initiatives and targets relating to manufacturing management.

Manufacturing flexibility has been significantly tested in this arena and has been reported by the participating MSMEs, with the potentially contradictory demands from the market place regarding smaller batches that have reduced lead times and increased the frequency of delivery as well as the growing demand for differentiation and customisation of the products, thereby endorsing Gerwin (1987) and Correa (1994), who made the link between manufacturing flexibility and the uncertainty of the products' specification. From a more positive perspective, both Harrigan and Rudie (1980) and Grewal and Tansuhaj (2001) demonstrate the benefits of flexible systems when pursuing opportunities in times of difficulty, whilst the positive link between manufacturing flexibility and the performance of the organisation is acknowledged (Swamidass and Newell, 1987). The MSMEs participating in this study resonate with the outcomes of the work of Ward *et al.* (1996) by using investments in processes to develop flexibility en route to achieving cost efficiency.

## **Conclusions**

The study has highlighted a number of interesting findings specific to the research question set in the introduction to this paper, and by doing so, contributes to greater understanding of the manufacturing priorities within the UK MSME sector.

The study positions delivery performance within the MSMEs as an order qualifier, consistent with the definition put forward by Hill (2009), building upon the ideas of Hayes *et al.* (2005) that high attainment in delivery performance has moved from being a determinant of competitive advantage to a manufacturing deliverable that is simply expected. With reference to particular taxonomies pertaining to manufacturing strategy such as those developed by Kathurai (2000) and Li (2000), the MSMEs considered in this study are exhibiting the behaviours of “*speedy conformers*” and “*innovators*”.

In the pursuit of sustainability and competitiveness, there has been movement by the MSMEs studies here towards fully embedding practices relating to concurrent engineering in order to underpin the realigned organisational culture and associated processes pertaining to both strategic and operational decision making. This builds on existing studies such as those of Geroski and Walters (1995) and Geroski and Gregg (1997) which were centred on the UK

recession of the 1990s by reinforcing the importance of a strong marketing function playing an essential enabling role in supporting manufacturing strategy roll-out in a business environment characterised by turbulence.

This study recognises the diminution of quality provided by the supply base for the MSMEs studies, moving senior managers to further rely on their human resource function in the support and embedding of quality management strategies across their organisation, thus building on the work undertaken by Jayaram *et al.* (1999) regarding human resources practices and Harrison and van Hoek (2011) with respect to quality management. The ability to recruit and retain appropriate employees represents an ongoing challenge to the MSMEs in the UK, given the potential attractiveness of the larger employees and the shift within this economy away from manufacturing and towards services. Despite this, the human resource functions within these organisations have been particularly successful during the recessionary period in helping to retain appropriate skilled and professional employees, thus endorsing the recommendations made by Cagliano *et al.* (2001) regarding the necessity of tangible investment in the development of employees in situ as a means of underpinning priorities pertaining to manufacturing flexibility and quality enhancement. The retention and even visibility of growth in employee numbers within this sector during the time of economic difficulties represents a major shift in organisational policy compared with that exhibited in previous recessions, where labour reduction played a significant part in an agenda of cost reduction.

In terms of future studies that can build upon the work presented here, with the data collected and findings presented representing the first stage of a longitudinal study, perhaps based on a cohort study design (Bryman and Bell, 2007), with the commonality of experience being the MSME participants have taken a journey through this recessionary period. Comparison with the experiences of MSMEs from alternative national settings may also provide an interesting study, although it would be desirable to ensure that there is consistency between the locations with regarding to the business environment in which the organisations have had to operate. A useful guide to such a bi- or multinational comparison may be the work of Smallbone *et al.* (2012) which assessed the experiences of SMEs located in both the UK and New Zealand.

### **Study contribution**

A number of contributions derive from the study presented in this paper. First, its literature review acknowledges a gap within the current body of SMEs research calling for empirical studies offering an insight into the impact of environmental uncertainty on manufacturing organisations within the sector. Its research question is driven by the critical strategic considerations faced by manufacturing and operations managers within the British SMEs arena as a result of the recent economic downturn, and offers empirical and conceptual value to this contemporary academic field. At the same time, its employment of a mixed methods research design responds to the recent call by Boyer and Swink (2008) and Barratt *et al.* (2011) for further qualitative-based methods to be used within the subject of manufacturing and operations management.

In particular, the analysis and discussion of the primary data collected for this study confirms a realignment of the manufacturing priorities of delivery performance, cost, quality and flexibility within the UK SMEs sector due to industry and market changes since the 2008 economic recession. Increasing market pressures for product customisation and shorter life cycles accompanied with short and frequent orders have led senior managers to promote

product and manufacturing process innovations within their SMEs. Central to this strategic decision is the introduction of concurrent engineering within the decision making processes and culture of the organisation, promoting input and collaboration from all business functions. Moreover, inflationary pressures on energy and supply costs are directing manufacturing SMEs towards green manufacturing practices and in-house-manufacture.

To conclude, evidence from this study suggests that UK-based manufacturing SMEs have proved resilient to the most severe economic downturn of the British economy by promptly realigning their manufacturing priorities and strategy. It confirms the adoption of an ambidextrous strategy as defined by the earlier studies of Kitching *et al* (2009a, 2009b), Rumelt (2009), and Williamson and Zeng (2009). Hence, they have defended their competitive position within the increasingly global and volatile industrial markets by promoting (internally and externally) an image of efficient and innovative suppliers.

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