Supply Chain Agility as an Acclimatisation Process to Environmental Uncertainty and Organisational Vulnerabilities: Insights from British SMEs

Authors:

Sean Naughton, Senior Lecturer, Business School, Edge Hill University, Lancashire, United Kingdom. Email: naughtos@edgehill.ac.uk

Ismail Golgeci, Associate Professor, Department of Business Development and Technology, Aarhus BSS, Aarhus University, Denmark. Email: i.golgeci@btech.au.dk

Ahmad Arslan, Associate Professor (International Business), Department of Marketing, Management & International Business, Oulu Business School, University of Oulu, Finland. Email: ahmad.arslan@oulu.fi

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Abstract

Even though supply chain agility (SCA) has been considered an essential concept in supply chain management (SCM) research, the way it is experienced and manifested, especially by small and medium-sized enterprises (SMEs), has received much less attention. Our purpose is to focus on SME organisational vulnerabilities in the context of increased environmental uncertainty, and explore how SCA is developed and applied by SMEs amid their vulnerabilities**.** By relying on insights from comparative case studies of three British SMEs, we examine SME SCA as an acclimatisation process and delve into SMEs' experiences of facing environmental uncertainty while developing and applying SCA. Our findings highlight that organisational attitudes underlie how SMEs perceive environmental uncertainty, tackle organisational vulnerabilities and develop SCA as an acclimatisation process. Our findings also reveal that resource constraints, supply chain relationships, interorganisational power dynamics, and access to information play important roles in developing SCA.

Keywords

Supply chain agility, small and medium-sized enterprises, organisational vulnerabilities, acclimatisation, environmental uncertainty

Introduction

Environmental uncertainty has been one of the most researched topics in operations management and supply chain management (SCM) research in recent years, and has been addressed using a range of theoretical and empirical lenses (e.g., Prater, Biehl, and Smith 2001; Paulraj and Chen 2007; Hult, Craighead, and Ketchen Jr 2010; Gligor, Esmark, and Holcomb 2015). It has also been argued that environmental uncertainty has increased in recent decades due to a range of changes taking place in political, economic and social frontiers globally (e.g., Cavusgil and Cavusgil 2012; Kingsley, Vanden Bergh, and Bonardi 2012). Environmental uncertainty has therefore become an increasingly daunting challenge to tackle, especially for small and medium-sized enterprises (SMEs - the definition of which adopted for this paper is that of the European Commission (2003) (similarly adopted by Mittal *et al*., (2018)) "The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro").

Extant literature indicates that SMEs tend to be influenced more by environmental uncertainty than large multinational enterprises (e.g., Thun, Drüke, and Hoenig 2011; Parnell, Long, and Lester 2015; Koh and Saad 2006). One reason highlighting this particular concern is organisational vulnerabilities that can present significantly negative influences due to environmental uncertainty. Some of the salient sources of organisational vulnerabilities for SMEs are their liabilities of size, resource and capability constraints - especially against environmental adversaries (Narula 2004; Lu and Beamish 2001).

Despite the increasing attention being paid to SMEs in SCM research (Kull, Kotlar, and Spring 2018), there is a relative dearth of research in terms of how SMEs manage risk and respond to environmental uncertainty (Thun, Drüke, and Hoenig 2011). In particular, even though supply chain agility (SCA) has been considered an essential concept in SCM research

(Gligor and Holcomb 2012b; Ying Kei et al. 2016; Gligor, Esmark, and Holcomb 2015), the way it is experienced and manifested has received much less attention (Ismail, Poolton, and Sharifi 2011). This gap highlights an essential yet overlooked issue, and there is a need for an in-depth and contextualised understanding of SCA in SMEs.

This is the starting point of our paper as we aim to focus on SME organisational vulnerabilities in the context of increased environmental uncertainty and explore how SCA is developed and applied by SMEs amid their vulnerabilities. We examine SME SCA as an acclimatisation process and a factor that can potentially offset the negative influences of SME environmental uncertainty due to their organisational vulnerabilities. In so doing, we rely on insights from comparative case studies of three British SMEs and delve into their experiences of facing environmental uncertainty whilst developing and applying SCA.

Our paper contributes to the debate on SCA and SME research in the SCM field by explicitly focusing on SCA in the context of SMEs, their organisational vulnerabilities and environmental uncertainty. We incorporate the concept of SCA into the research on SMEs in SCM to advance the understanding of how SMEs evolve and develop the necessary agile capabilities to respond to environmental uncertainty and tackle their vulnerabilities. We define SCA as the firm's ability to stay alert and quickly and easily adjust strategies, tactics and operations within its supply chain to effectively respond to changes in its environment (Gligor 2013), and place the concept at the epicentre of the way SMEs overcome their vulnerabilities against environmental uncertainty. Our framework highlights the entangled dynamic between environmental uncertainty, SME characteristics and SCA, and develops the theory on SCA by conceptualising it as an SME's acclimatisation process for correcting organisational vulnerabilities against environmental uncertainty.

The paper is organised as follows. The next section offers discussion on the theoretical background and a literature review on environmental uncertainty, organisational vulnerabilities

and SCA in the context of SMEs. After that, our methodology is discussed, followed by analysis and results. The paper concludes with the presentation of implications, limitations and future research directions.

Theoretical background and literature review

Environmental change and environmental uncertainty

The last half-century has seen dramatic transformations in the business environment from one of relative stability to a position wherein change is ever-present, fast-moving and intensely competitive (Kalkan 2008). This has come about in part due to unprecedented technological advancements, the rapid growth of GDP across the globe, hyper-competition, rapid socio-economic transformation, and political turmoil (Cavusgil and Cavusgil 2012).

Accompanying change are instability and uncertainty. Uncertainty particularly characterises the current business environment that curbs predictability and suffers from a lack of relevant and applied knowledge amid information abundance. Complexity and dynamism factors in different industrial settings represent environmental uncertainty in various businesses (Birkie and Trucco 2016). In this vein, environmental uncertainty is a crucial trait of many supply chains (Fynes, de Búrca, and Marshall 2004; Paulraj and Chen 2007; Tseng et al. 2014; Purvis et al. 2016; Samson and Gloet 2018) that are distinctively complex and dynamic (Skilton and Robinson 2009; Milgate 2001; Roscoe et al. 2019).

Whilst environmental uncertainty is often a trait that human beings attempt to avoid, it holds some positive characteristics. Economic volatility, for example, can be a positive factor from the standpoint of organisational change, providing the impetus for companies to raise standards and become more competitive in the global marketplace (Nickell, Nicolitsas, and Patterson 2001). There are, therefore, arguments affiliated with the organisational changes that indicate the need to align organisational strategies with the external environment (Venkatraman and Prescott 1990). Scholars such as Hallavo (2015) have gone further to argue for the

alignment of uncertain, external environmental factors with supply chains to develop working practices.

Unique characteristics of SMEs and supply chain agility in the context of SMEs

The environmental change affects everyone, most notably businesses, but due to the limited funds and resources they hold, the businesses most affected are SMEs (Ahmad et al. 2012). Unlike their larger counterparts, SMEs do not have dedicated tools at their disposal or resources for risk management and thus lack the means to assure their survival. They face internal shortages of information, capital, management time and experience, while externally, they face constraints arising from their vulnerability to environmental changes (Lu and Beamish 2001). From the standpoint of SMEs that have until relatively recently operated mostly within limited geographic regions, environmental changes have also affected businesses by introducing competitors from around the globe that without internet sales would never have been considered market rivals. This has made SMEs more vulnerable to changing markets than larger organisations (Thun, Drüke, and Hoenig 2011; Koh and Saad 2006). These challenges are made worse by factors such as international legislation, unpredictable markets, and financial system failures (Löfving, Säfsten, and Winroth 2014).

Furthermore, growing expectations for the continuous development, globalisation, and release of state-of-the-art, high-quality products has increased the competition and pressure on SMEs. This in itself provides a challenge for such companies, but SMEs may be fortunate in their standing of reduced bureaucracy and their skills in terms of swift adaptability (Sullivan-Taylor and Branicki 2011). However, research has been limited in this respect, and the research that has been conducted is mostly incompatible with regards SMEs (Herbane 2010).

Businesses have recognised the potential competitive advantages agility affords in terms of coping with increased environmental uncertainty and reacting within smaller windows of opportunity for decision-making (Wang, Tiwari, and Chen 2017). The implementation of

SCA into organisations such as Wal-Mart, H&M (Lee 2004), Zara and Swedish fashion house Gina Tricot (Abbasi, Hosnavi, and Babazadeh 2014) has positively impacted performance. The experience of these companies is also in line with the views that SCA enhances competitive advantage through rebuilding production provision and identifying and taking advantage of market changes (Li et al. 2008; Li, Goldsby, and Holsapple 2009; Blome, Schoenherr, and Rexhausen 2013; Whitten, Green Jr, and Zelbst 2012).

The ability to manage supply chains flexibly and responsively is essential to competitive advantage, particularly for SMEs that lack the economies of scale of larger firms (Malekifar et al. 2014). SMEs can, in turn, achieve SCA by the expediency of on-demand and on-premise cloud model (Sharma and Shah 2015) as well as through trust and IT infrastructure (Sharma and Shah 2015). Nonetheless, while SMEs' and their supply chains' relatively smaller scale may have the potential to facilitate achieving SCA, the level of exerted by SMEs on their supply chains are likely to be very limited (Gölgeci, Murphy, and Johnston 2018). Such lack of control is likely to result in challenges for SMEs to realise their agility strategies in the supply chain field. Furthermore, SMEs are likely to face the liability of smallness (Mellahi and Wilkinson 2004) and resource and capability constraints when deploying their strategies to achieve SCA amid their amplified organisational vulnerabilities.

Organisational vulnerabilities, acclimatisation and supply chain agility

The process of addressing organisational vulnerabilities and overcoming the challenges that uncertainty brings with it has taken on several different forms from the perspectives of quality (e.g., Deming 1986), outsourcing (Platts and Song 2010) and lean production principles (Lucio 2013). Each of these models provides advantages, but they tend to be most effective in times of stable demand and continuous production (Naim, Naylor, and Barlow 1999). This is the opposite of the unstable market demand predicted in the future.

Organisations have been historically beset by potential hazards and vulnerabilities that introduce unsought challenges - technological change, increased competition, insecure markets, the management of international production, and changing market needs (Cabral, Grilo, and Cruz-Machado 2012; Gunasekaran and Ngai 2005). Such challenges affect operating costs and organisational performance (Hendricks and Singhal 2003), ultimately making organisations more vulnerable to the outside world. Furthermore, severe external disruptions such as the 2008 financial crisis (Christopher and Holweg 2011) and the 2011 Japanese earthquake (Kumar, Liu, and Scutella 2015) amplify organisational vulnerability further.

Allied to such points, supply chains have become increasingly complex and more challenging to manage (Gligor, Esmark, and Holcomb 2015; Eckstein et al. 2015). What used to be a relatively straightforward process now encompasses information, inventory, resources and demand forecasting (Lindgreen et al. 2008), as well as the consideration of products, processes, financial information, customer and supplier relationships, and organisational operational and strategic objectives (Chandra and Grabis 2007). Amplified complexity of supply chains coupled with resource, capability, and expertise deficiencies of SMEs (Lu and Beamish 2001) exacerbates SME vulnerabilities to environmental uncertainty.

The high levels of uncertainty and organisational vulnerabilities prompted the development of a new way to operate supply chains (Abbasi, Hosnavi, and Babazadeh 2014). As such, extant research has put forward arguments for developing supply chain responsiveness and overall accomplishments in terms of issues such as service, delivery and quality (Gligor and Holcomb 2012a) to control vulnerabilities and uncertainties firms experience. This would better assist organisations in adapting to market needs (Eckstein et al. 2015; Christopher 2000). Agility-based arguments have centred upon the notion that monetary effects should only come about if the supply chain as a whole benefit.

It is, therefore, argued that agility (and responsiveness) within supply chains is key to benefitting every organisation operating within the supply chain process. In order to overcome vulnerabilities and uncertainties, suppliers are vital in terms of providing new knowledge, products, resources and developing appropriate standards to ensure new product development, manufacture and delivery to the target market (Christopher 2000; Sukwadi, Wee, and Yang 2013). Likewise, sharing knowledge within and across organisational boundaries associated with activities, including marketing and sales may also increase visibility in the supply chain that enhances SCA (Gligor 2013).

While SCA has been frequently considered a strategic capability (Gligor 2016; Swafford, Ghosh, and Murthy 2008; Blome, Schoenherr, and Rexhausen 2013; Gligor and Holcomb 2012a, 2012b), in this research, we conceptualise SCA as an acclimatisation process. Our view of SCA confirms past research on the concept in that firms develop and apply SCA to compete in volatile markets (Gligor, Esmark, and Holcomb 2015; Christopher 2000). Nonetheless, we explore the unique features of developing SCA in the context of SMEs as a means of overcoming the liability of smallness (Mellahi and Wilkinson 2004) and transcending resource and capability constraints. This approach to SCA is likely to enrich the understanding of SCA as it is developed and manifested by SMEs with unique characteristics – it effectively becomes their acclimatisation process.

The concept of acclimatisation is rooted in biology and means physiological or behavioural changes occurring within the lifetime of an organism, that reduces the strain caused by stressful changes in the natural climate (Lee et al. 2010). Sociology denotes the process of changing the perspectives of a person's self or world to get used to or feel at home with a changed environment (de Guzman et al. 2012). Acclimatisation is a primary mechanism by which entities match their physiology and behaviour in a timely, efficient, and beneficial way to a rapidly changing environment, and thus, it is pivotal for survival.

In this study, we define the *acclimatisation process* as the process of a business' gradual, frugal, and continuous adaptation to unexpected and rapid environmental change. Drawing on this definition, we apply the concept to the context of SMEs with vulnerabilities facing environmental uncertainty. Given the way the concept is examined and understood in the literature (e.g., de Guzman et al. 2012; Lee et al. 2010), the acclimatisation process reflects a thorough and lasting change in a firm's key characteristics and structure with minimal resource input. Although the concept of the acclimatisation process has not yet been applied in operations management and SCM fields, we argue that it is a distinct concept and is relevant to understand how SMEs face and respond to environmental uncertainty amid resource constraints in order to survive in the long run.

Because SMEs often have limited control and influence over their supply chains due to the power dynamics therein (Gölgeci, Murphy, and Johnston 2018), it may be more challenging for such firms to convert their agility into the agility of their whole supply chain. Such a challenge may require creative and experimental ways of promoting agility across supply chain partners and may amplify the need for SME partnership strategies in supply chains (Sukwadi, Wee, and Yang 2013). The threat of environmental uncertainty and organisational vulnerabilities stemming from size, resource and information constraints, and the lack of institutionalised practices may compel SMEs to invest in developing agile capabilities and practices and manifest SCA in a unique way. In this context, SCA may become a requirement rather than a choice. In turn, the acclimatisation process can be an instrumental means to achieve SCA.

Likewise, while some dimensions of SCA such as swiftness and decisiveness may be applied more smoothly by SMEs than firms of larger sizes, accessibility, alertness, and flexibility dimensions may be more challenging for SMEs to develop and apply (Gligor 2013). This is particularly the case for accessibility and alertness dimensions of Supply Chain Agility,

as they require major investments and unique (Gligor 2013) resources that SMEs may not be able to afford. Instead, such SMEs may have to make do with their available facilities in terms of responding to rapid changes in the environment (Senyard et al. 2014) and improvise during periods of environmental uncertainty and organisational vulnerabilities. Therefore, potential SME SCA idiosyncrasies demand an in-depth and contextualised examination of the concept and how it is applied to overcome SME organisational vulnerabilities through the acclimatisation process.

Empirical research design and method

Sampling and data collection

The current paper's focus lies on scholarly exploration. We aim to study a subjective phenomenon, i.e. organisational vulnerability in the context of environmental uncertainty, and the role of SCA in this context was not evident at the start of the research (Yin 2009; Ketokivi and Choi 2014). Thus, we deem qualitative methods through the use of case studies to be the most suitable.

In recent years, there has been a significant increase in the use of case study research for theory building, especially when the focus is on exploration (Ketokivi and Choi 2014; Pagell and Wu 2009). In the context of research on "agility," qualitative research methods have been specifically referred to as being more suitable to analyse the different influences of this emerging concept as its perception and application can vary between different firms (e.g., Battistella et al. 2017; Gerbl et al. 2015). In maintaining the case study premise, our research aimed to gather qualitative data such that we could identify themes throughout the study (should they exist). Accordingly, some of our questions required simple *yes/no* answers, whilst others (such as perceptions of organisational vulnerability) were required in terms of a percentage. Such data cannot be deemed perfect in terms of organisation to organisation analysis though as such percentage answers were perceptions of the interviewees, and these

perceptions are relative to the experiences of the individual organisations and not relative to a hard and fast criterion.

It is essential to bear in mind that as these are SME organisations, the key holders of all information relevant to our study are the owner-directors who maintain a *helicopter* perspective on operations as a whole, hold multiple roles, closely guide their companies on a daily basis, and make most of the decisions themselves. In the case of two of the organisations in the study, their size and a low number of employees by default forced the interviews to be conducted with the owner-directors. Subsequently, the research was conducted via structured interviews with company owner-directors (e.g., Warren 2002), with each interview taking between three and five hours to conduct. Data was triangulated by cross-checking information provided by different directors and asking others the same questions, thus validating the answers.

The data gathering procedure as a whole provided us with evidence that could be drawn upon and cross-referred to later during the analysis process. When directors at the same company provided different answers, we recorded them and considered the responses in line with the agility concepts under review. Whilst there were no major discrepancies, any moderate ones that did occur were cross-checked for accuracy and consistency.

Together, the answers provided a clear picture of the situation in which the organisations operated (e.g., Warren 2002). *Organisations A* and *B* provided two directors for our interviews – *Organisation C* provided one (which was simply due to the size and nature of the company). The research protocol involved all participants being afforded an explanation as to the nature of the study and their part in it. Whilst the option was not taken up, every participant was provided with the opportunity to withdraw at any point, along with the guarantee of personal and organisational anonymity at all times. Furthermore, an ethical statement of intent was provided to all participants, who were required to sign to acknowledge their understanding of the research and their role in it. All interviewees were chosen based on their communicative

competence and had access to the critical information regarding topics being investigated in our study.

Research approach and context

The key question to be addressed by our research is how SCA can help SMEs overcome their organisational vulnerabilities. To gather data to help answer this question, we approached three SME organisations to consider their approaches to Supply Chain Agility. These organisations were approached as they are all involved in product manufacture, yet whilst being SMEs, they sit within different ends of the SME definition spectrum. The smaller two organisations arguably face greater operational challenges than the third before any research consideration, simply due to the size and financial restraints in existence. In looking at such organisations, we hoped to be able to identify any factors that may benefit agility relative to such features. In so doing, we acknowledge the challenges associated with replicating results based upon a three case study design, but a fundamental interest in our research was based upon the depth of focus and the attitudes towards Supply Chain Agility portrayed by the organisations in question and, quite specifically, their relative sizes as SMEs (relative in terms of their sizes to one another and their attitudes towards overcoming supply chain challenges and their use of agility therein).

To better consider the agility concept when practically applied to SMEs, the organisations approached differed in size. The smallest of the three companies, *Organisation A*, holds a minimal international reputation, has a low turnover and profit margin, yet operates within a large, expanding, highly profitable market. *Organisation B*, by comparison, is the largest company in the study, holds an international reputation, and has a high turnover and profit, such that it only just falls within the definition of an SME. *Organisation C* sits somewhere between the two other companies in the study, operating predominantly in the local market, but also nationally via the internet. Its potential market is enormous, yet whilst it is growing in its geographic region and hopes to continue to do so for the foreseeable future, it

remains (and through owner-choice is likely to remain) size-limited yet highly profitable. Our rationale for choosing these organisations is that within the boundaries and contexts of SMEs, they sit within the lower, middle and upper of the SME definition. By considering organisations and their range and *spread* within the SME criterion, we believe any conclusions drawn could subsequently be applicable to many other SMEs. Had we concentrated purely on the *higher* or *lower* end SMEs exclusively (or indeed any other variation thereof), we believe our findings would be skewed and relevant only towards SMEs meeting similar criterion, thus preventing us from drawing generalised conclusions that would be applicable across the SME spectrum.

Interview protocol

All interviews were conducted at the premises of the organisations partaking in the research. Being aware of the need for data validity (Collis and Hussey 2013) and the need to eliminate researcher bias, each interview followed the same protocol in terms of strictly adhering to a pre-prepared set of approximately one hundred questions so as to provide accurate data and negate potential questions over originality (in line with Maxwell 2002) based around the key areas of Market risk, Suppliers and the supply chain, Relationship with suppliers, Suppliers and the future, Vulnerabilities, Business Environment, Product and the Financial Situation that were subsequently grouped for analysis purposes), some of which requiring quantitative-based yes/no type answers, others requiring higher levels of explanation. Each interview was recorded and subsequently transcribed.

Trustworthiness and data analysis

Further to validity, rigour is involved with checking that data outcomes are valid and reliable. As the data required interviewee interpretation that in itself is not hard and fast, reliability, trustworthiness and dependability are areas of potential problems (Kvale and Brinkmann 2009). In each instance, the respondents were contacted after the initial interviews to check

on specific facts and gather any subsequent feedback, thus improving the reliability of the findings in line with Gray (2009).

To evaluate the data, we made use of thematic analysis as it provides the ability to detect, examine and account for patterns identified within the gathered facts (Braun and Clarke 2006). It is suitable for research of this nature to enable data analysis in a flexible and interpretative way (Braun and Clarke 2006). Our thematic analysis was performed using the recommendations of Miles and Huberman (1994), as it allowed us to identify key themes associated with our focus on organisational vulnerabilities, environmental uncertainty and SCA. The data were coded into the following major areas for analysis: market risk, suppliers and the supply chain, relationship with suppliers, vulnerabilities, the business environment, the product and the financial situation (thus aligning with the interview questions).

After performing thematic analysis, we also performed content analysis as recommended by Patton (2002), to extract the maximum possible useful information from the interviews. This process enabled us to interpret data gathered between the case study organisations and allowed us (to some extent) to transform the qualitative data into quantitative data. To achieve this, all answers were noted on the questionnaire-interview forms, and the answers that were *yes/no* or data-based were subsequently entered into a spreadsheet that successively compiled the data into comparative formats depending upon the answers given. This data was subsequently converted into charts and graphs to identify trends as a means of comparing not only the outputs as a whole but also the differences between the case study organisations.

After completing these two forms of analysis, the resulting data has been compiled and presented in the following areas: environmental uncertainty, organisational vulnerabilities and SCA. These areas provide a clearer means of comparison between each of the case study organisations such that conclusions may be drawn.

Study findings

This section of the paper presents a comparative review of three anonymised British SME companies that have been used as case studies as a means of comparison between levels of uncertainty, vulnerability and Supply Chain Agility (identified from the questionnaire and its critical areas of Market risk, Suppliers and the supply chain, Relationship with suppliers, Suppliers and the future, Vulnerabilities, Business Environment, Product and the Financial Situation). The organisations differ in both their size (financially and physically) and the markets they serve. This is important in terms of their agility, as discussed later in the paper.

Organisation A

Organisation A is a privately owned and operated SME, manufacturing equipment for the international beauty-cosmetics industry, predominantly building essential products whilst also modifying and customising them to meet client needs. The company is predominantly UK based but trades internationally in minimal quantities. It is facing expansion challenges and recently relocated to expand its network and benefit from transport networks. The company employs five people.

Environmental uncertainty. The company has ten key local competitors, servicing some 500 customers. Annual sales are growing and increasingly rely on international sales through the internet. The company releases new products periodically to attract new and old customers but has to work hard to maintain long-term customer relationships. Whilst attempts are being made to expand its online presence to improve marketing, such activities have not been aligned with the supply chain, and statistical information about any business activity has never been considered. Whilst the company holds no financial liabilities, it sees finance as an obstacle to growth, attributing this to its small turnover that limits its ability to borrow capital to fund expansion. When asked about barriers coming about as a result of *environmental uncertainty*, the critical point of apprehension was based around legal directives and can be evidenced from a quote from one of the Directors:

"Yes – they are bringing in the new regulations all the time."

Organisational vulnerabilities. A primary vulnerability for the company is associated with supplier lead times of up to three months. Operating on a JIT basis, the organisation holds no stock, and at times disassembles finished products in order to sell spare parts to customers, thus rendering the finished product unsaleable, risking damaging parts and increasing labour costs. The company blames this situation on the international economic system as all suppliers reduced stocks since the 2008 financial crisis. Further to the reference to the 2008 financial situation, the company is broadly aware of its business environment, yet ignores economic factors such as interest, exchange and inflation rates. The company is cautious about change and uncertainty *per se* and believes it subsequently reacts to its business situation. A key point arising from the research identified that the organisation is aware of potential vulnerabilities with regards to social media (and its effects on customers – direct and indirect) and *social needs* in general. This point is evidenced by the interview quote from one of the directors:

"Vulnerable to social needs…well yes for social needs because if they stop going out to salons or places like that, it is going to impact on us forever."

Supply chain agility. For an organisation with a small turnover, the supply chain is large (50+), with orders for parts only being made when a firm sale has been made – effectively a simple JIT system. Subsequently, the company runs at the behest of suppliers, resulting in customers having to be made aware of the specialist nature of the products and the subsequent anticipated waiting time for the delivery of their goods. This does not concern the company, as it is believed that customers are willing to wait for the right goods based on the quality of the products themselves and the relationship built up between the parties. A subsequent benefit of this is that having purchased a product, replacement parts can only be purchased from *Organisation A*, as alternatives do not exist, resulting in clients having no alternative but to wait until the components are available. The company's supply chain shares component prices

and specifications but not marketing or business data. Non-disclosure agreements exist between supply chain members and relationships are weak, and cooperation is lacking as a result. Supply chain-wide product development is, therefore, not an option.

A significant issue arose during the research for SCA – it was identified that whilst the company has long delivery times that are often delayed without notice, it is not considered to be an issue. It was also not considered to be a supply chain problem – merely just a factor of production that cannot be overcome as there are no other suppliers to turn to. This point is evidenced from the interview response quote by one of the directors to the question of whether they had experienced any supply chain issues where supplies were not arriving on time and how often that happened:

> *'Very rarely. It is mainly time. You know rather than getting it in a month, it is delayed timing and that is all -we do not really have any supply issues."*

From the standpoint of Supply Chain Agility, this is a significant issue – whilst the owners believe the organisation to be responsive to market demands, this approach with regards *wait until the suppliers deliver* does not look after the customer, and could be argued will ultimately cause the organisation to fail. Furthermore, the determination to operate on a JIT basis, a concept that whilst effective, is mostly outdated in its *perfect* format and requires cooperation between all supply chain members in order to work effectively, is dangerous.

Organisation B

Organisation B manufactures internationally recognised goods for the domestic market and is working towards developing bespoke products to meet individual customer requirements, with most components being nationally or internationally sourced. Whilst meeting all world and European definitions of being an SME, *Organisation B* is the largest company considered in this study. It supplies critical UK high street retailers whilst also capitalising on the "made in the UK" moniker in the European and Chinese markets through the use of its traditional brand

and others that it has acquired in recent years. Despite its strength in the UK domestic and European markets, it faces potential future threats. Consequently, the organisation is considering developing assembly plants strategically placed throughout Europe to benefit from lower operating costs. Whilst still meeting the SME criterion, *Organisation B* employs over 200 people and is significantly different in size and structure from the other two companies in this study.

Environmental Uncertainty. The company is market *aware* and aligns risk to each product line. It keenly monitors sales to identify product maturity and subsequently introduce new lines. Whilst the company presently operates on a business-to-business format, due to the changing nature of the market and the need to meet individual customer needs, it is considering changing its operational market segment to business-to-consumer. The company faces increased high-street competition within the UK (as a result of intensifying retailer demands) and an increase in regulatory requirements that must be met throughout European and world markets. Sometimes as a consequence of this, the organisation is reactive to competitors and market needs.

The nature of the market requires the organisation to be highly competitive from a product, price and timely distribution perspective. Due to the nature of high street and internet sales and the competition brought about by low prices therein, the organisation has had to make specific major operational changes –vital from an agility perspective. One example of this comes from different retailers selling the same products the company manufactures. Due to underselling practices, the nature of the contracts held with many high-street chains means that should a competitor undercut the chain, *Organisation B* is contractually obliged to make up the shortfall. However, compensating the shortfall engendered financial instability and prompted the financially-dependent time delays between making a delivery, receiving the income for the goods, and then subsequently having to wait in case a repayment becomes necessary. Key

product lines are sold to each retailer with minor modifications to prevent these time delays. Resultantly, each retailer effectively sells the same but legally different products, thus removing the financial issues associated with the undercut-repayment practices that have been hitherto experienced. This type of strategic decision has provided organisational stability.

From an international perspective, the organisation is expanding into the Chinese market. Many product components are sourced from Chinese suppliers, which, whilst bringing significant benefits to the company, also delivers an increased risk -it would not take much for such suppliers to develop their manufacturing and supply chain one step further to include the final assembly processes in their home country. Consequently, the organisation is looking to potentially move manufacture elsewhere –potential locations include central Europe.

At the same time, the company is pursuing market opportunities by personalising products for customers, effectively manufacturing product features to individual requirements. The principle behind this is to devise how all options can be selected by a customer (including aesthetical preferences) providing buyer opportunities that competitors are unable to match. This notion seeks to capitalise on the *agility* concept by meeting a customer's actual needs at a specific time, although there are potential challenges faced in this regard as providing such levels of personalisation would arguably require a more complex and agile supply chain to ensure customer requirements are met at short notice (which could potentially cost *Organisation B* more to set up).

The organisation fundamentally does not see any clear barriers to its success either now or in the future. Accordingly, it does not perceive market research, product operations, product design, human resource management or SCM to be of concern or issue. Moreover, it considers its products and processes, management, research and development and SCM to be strong, successful and proven in ensuring the success of the overall finished product.

Organisational Vulnerabilities. Whilst its products are sold on a long-term basis with long periods between customer purchases, *Organisation B* controls a sizeable amount of its market yet considers itself to be 25% vulnerable from competitors. Having established the fact that the organisation exports products, 90% of its sales base remain within the UK. The company believes that extending its market share within the EU and the rest of the world could hold long-term benefits, as it would reduce the risk of remaining operational in the UK alone.

More immediately, the company needs to comply with changing legislation both within the UK, EU and the rest of the world. It, therefore, meets all requirements from a social angle. In terms of legal, human resource, personnel, strikes, accidents, criminal, environmental and energy issues, the real risks are relatively low for the organisation – between 5% and 10% – according to interview participants.

The organisation acknowledges its IT vulnerability, whereby it considers itself to be 50% vulnerable, which means that managers at the Organisation B consider their firm to be somewhere along the average level of organisational vulnerability within its industry. Whilst this could be written off as little more than the need to invest in a new IT infrastructure, it is essential to note that the organisation is working towards creating a more agile supply chain, and an effective and efficient IT infrastructure would be a prerequisite for this. Subsequently, a risk factor of 50% would not be deemed suitable. This is particularly important when considering the need to interact with other members of the supply chain and ensure that all data is accurate and up-to-date at all times.

The organisation is in a financially fortunate position, as it is not exposed to banks or other financial institutions. It is aware, however, of external economic risks as well as exchange rates and the cost of borrowing in foreign currencies. The organisation is also aware of vulnerabilities with regards to its relationship with business-to-business exposure and rates this vulnerability at around industry average. The company argues that it is difficult to eliminate

this quickly or easily whilst having to meet the requirements of individual high-street retailers and their need for varied products. The importance of maintaining healthy relationships in the retail side of the supply chain is, therefore, of paramount importance to the organisation.

Financially, the company benefits from being largely financially independent such that it does not require excessive bank loans to ensure its stability. It is broadly aware of exchange and inflation rate changes and monitors them closely in line with stock purchases to maximise financial opportunities.

Supply Chain Agility. Whilst manufacturing 50 core products, through the inclusion of product extensions and variations, the list extends to 800. The company deals with over 100 suppliers and assigns supplier challenges to between 5 and 10% of their actual supplier list. The company considers supplier relationships to be a high priority and also believes that sufficient advanced supply chain knowledge and information makes a difference in organisational growth and strategy. Furthermore, it is believed that improvements in relationships make a difference in response from suppliers, different product ranges and different rates of growth. Subsequently, the company prefers to hold regular face-to-face supplier meetings (as well as receiving regular supplier updates in electronic, paper and verbal formats), in part of overcome misinterpretations from text-based information due to the non-English supplier organisations being dealt with.

Whilst from an agility perspective the organisation could benefit from open information sharing practices with its suppliers, this is not considered to be a practical option as competitors work within the same supply chain, and the risk associated with information sharing is too high should a competitor obtain relevant information.

The company holds contracts with suppliers of between six months and three years, the difference being based upon how far into the future they wish to fix prices. Prices are usually fixed within a financial year to ensure budget stability for that given period. Notwithstanding

the contracts, the organisation holds different levels of trust between itself and its suppliers – an issue of great importance due to supplier dependence.

Organisation B is aware that many of its suppliers are knowledgeable about upcoming and future technologies that could affect their products and also know that some suppliers are actively building such technologies into future components and designs. Whilst acknowledging that some suppliers are doing this, not all of them are making information about developments available, and the company does not believe suppliers to be aware of the potential benefits in providing such information to the supply chain. Furthermore, it is not believed that all suppliers are aware of issues such as part obsolescence. If they did, the company believes the supply chain as a whole could act as a vehicle for the development and sales of products and that in terms of research, quality, delivery, cost reduction, efficiency, profitability and other such aspects, enhancements could be obtained through closer strategic ties within the supply chain. Furthermore, the company believes suppliers would respond favourably to closer strategic ties and acknowledges the benefit of having supplier input in product design and manufacture. There is, therefore, a logic to the organisation to begin developing stronger agility links with suppliers – if for no reason at present than to open up and deepen relationships and build trust such that agility can come about more naturally in the future with suppliers.

Organisation C

Organisation C is a privately owned and operated SME, servicing a highly competitive local market worth approximately £300 million annually in the field of gardening products and plant supplies. The company predominantly sells directly to customers and commercial clients within a 50-mile radius of its base but has recently expanded its online presence through developing the means to safely ship products and plants, thus expanding to a national market. The company employs five people but does at times employs more on a part-time basis, depending upon seasonal demand.

Environmental uncertainty. Organisation C makes full use of market knowledge and information presented by its 15 suppliers. The company has ten local competitors and around 300 regular customers as well as innumerable that purchase on a one-off basis. The owner-manager employs staff in line with market needs, thus providing maximum levels of flexibility and also reducing overheads from staffing, insurance and office-space perspective.

Whilst the company has faced challenges in expansion from a regional perspective, the past twelve months have provided greater online success, thus opening the company up to a nationwide market, and helping to smooth regional environmental and economic uncertainty simply through the adoption of economies of scale. The company holds no financial liabilities to minimise financial uncertainty, yet it acknowledges that in order to expand, it will have to take on debt if it is to meet its goals. Thus, the future will, by necessity, introduce higher levels of environmental uncertainty if the company is to progress. By comparison to *Organisation A*, all *Organisation C* respondent answers were very much to-the-point and provided little other than hard data to support points being made.

Organisational Vulnerabilities. The business carefully monitors the general business and economic environments, utilising critical economic indicators to help predict how the market will respond and react. It is, therefore, strategic in its view of organisational vulnerability and seeks to minimise demand and market changes and work with them to succeed. The company is acutely aware of its vulnerability, vis-à-vis the products sold and meeting market requirements. Subsequently, continuous market research is conducted alongside continuous price monitoring of competitors.

Supply Chain Agility. Organisation C works closely with its 15 suppliers, believing there to be a high level of trust, dependence and commitment from those within its supply chain, illustrated through the levels of communication, information sharing and cost transparency available. Whilst acknowledging that suppliers do not always meet quality requirements, the

company believes that maintaining relationships is the key to improvement, and is working to utilise technology and information sharing within its supply chain to improve standards. Such an approach, unbeknownst to *Organisation C*, aligns with some of the fundamentals of agility, and data gathered indicates that the company understands the benefit of working with the supply chain as a whole from the statement as a response to the question of whether the respondent thinks the supply chain as a whole could act as a vehicle for development and sales of the products:

"Certainly, for development of the products, yes, but I am not sure about sales."

In effect, through having close and open working relationships with suppliers, and explaining precisely the organisational and customer needs to them, Organisation C has developed its own informal supply chain with built-in agility.

Discussion of findings

At this point in the paper, we discuss the findings derived from the research. The discussion herein analyses the learning and understanding of the issues addressed in the literature review and the research lines of environmental uncertainty, organisational vulnerabilities and SCA. As well as quantitative data, the qualitative data collected identified characteristics such as attitude and perceptions of the firms to be considered relative to the critical elements of the concepts being considered – factors that had not been intentionally sought at the start of the research.

Two summary tables of general data appertaining to the three organisations in question are presented in Table 1 and Table 2, providing a like-for-like comparison of the organisations and their market characteristics. It is important to note that the sizes organisational identified are all relative to the identified definition of SMEs (with the *large* organisation being large in SME terms).

Case Study / Organisation	SME Organisation Size	Product format/strategy	Market size	Market uncertainty
A	Small	Specialist	Medium	Medium
B	Large	Mass	Large	Low
C	Small	Bespoke	Medium	Medium

Table 1: Organisational capacity categorisation (Each relative to SME size and classification)

Characteristics	Organisation A	Organisation B	Organisation C
Level of Competition (Low/Medium/High)	High	High	High
Product Complexity (Low/Medium/High)	High	High	Medium
Number of Suppliers	50+	100+	15
Number of Customers	500	25	300
Number of Products Sold	8	50 key (800 including all line extensions)	11
Annual Turnover	£100,000	£45 million	£150,000
Financial Liability	None	None	None
Overall Relationship with Suppliers (Low/Medium/High)	Low	Medium	Medium
Level of Uncertainty and change within Business Environment (Low/Medium/High)	High	Medium	Medium
Number of Employees	7	250	3

Table 2: Summary of organisational findings

The data illustrated in Table 1 identifies certain similarities and differences between the organisations in question. On the surface, it might be argued that these are little more than circumstantial given the diversity of the activities each organisation is involved with, yet from an operational perspective, there are apparent differences in both approach and outcomes.

Each company is an SME and therefore faces challenges in terms of limited funds and resources (Ahmad et al. 2012), environmental issues (Lu and Beamish 2001) and practical restrictions with regards influence over their supply chains (Gölgeci, Murphy, and Johnston 2018). *Organisation A* in particular faces challenges from legislation and financial system failures (in line with Löfving, Säfsten, and Winroth 2014). Whilst the turnover differs between them, their potential market sizes are similar, and they are financially independent. The companies rely on social media as forms of marketing, thus eliminating costs in that regard. This point made, each company has little invested in its IT infrastructure, and thus electronic linkage to suppliers and customers is subsequently restricted. This is significant in terms of dealing with suppliers as it eliminates a means of managing and maintaining up-to-date information, and as each company admits, results in their having little control over suppliers. From an agility perspective, this is anything but ideal. Having made this point, it is interesting to note that despite or possibly due to the lack of IT infrastructure, these companies use *informal* means of marketing and supplier communication – this lack of bureaucracy enables them to be able to quickly adapt when opportunities arise (in line with Sullivan-Taylor and Branicki 2011) – something that larger competitors may struggle to do.

The *hard data* gathered only identifies a particular perspective. Each company operates in a competitive, uncertain market, thus facing the situation identified by Kalkan (2008). Despite their similarities, detailed case study interviews clearly recognise one of the three organisations as being different – namely *Organisation C.* From the standpoint of this paper, this is of great interest, as it aligns a linkage between uncertainty, vulnerability and agility, and practically identifies the potential to align the three concepts in line with Abbasi, Hosnavi, and Babazadeh (2014). The discussion from this point will therefore predominantly be based around *Organisation C*. This company is clearly small and operates within a market that holds similar characteristics to *Organisation A*, yet deliberately eschews standardisation and operates

a bespoke service to raise standards (in line with Nickell, Nicolitsas, and Patterson 2001). It aims to meet the specific needs of customers whilst continuously enquiring about their future requirements (aligning external environmental factors to organisational strategies in line with Venkatraman and Prescott (1990) as well as Lee (2004) with regards the need to adjust to developments in line with market needs), thus purposely building relationships for the future – and without knowing about the agility concept *per se*.

Whilst it can be assumed that every organisation is interested in its own products, a major factor in the operation of *Organisation C* is its merchandise and supplier interactions. This is partly attributable to the need to work with seasonal products – plants have limited life spans, and customer orders work around the seasons. However, this company portrays a significant interest in each of its particular lines by illustrating an awareness of both the season and the sales time remaining therein relative to stock levels (and indeed the natural lifespan of plant products). It carefully monitors both premises-based and online sales, thus aligning with Platts and Song (2010) with regards to the need for careful financial consideration in supply chain development. In effect, *Organisation C* adapts to its market environment (in line with Christopher 2000; Eckstein et al. 2015), and continues to develop its responsiveness in terms of service, delivery and quality (in line with Gligor and Holcomb 2012b). In so doing, it operates in line with successful organisations such as Walmart and Zara whose SCA has enabled them to take advantage of market changes (in line with Li et al. 2008; Li, Goldsby, and Holsapple 2009; Blome, Schoenherr, and Rexhausen 2013; Whitten, Green Jr, and Zelbst 2012).

One particular example identifies this interest above others. A specific line was indicating high sales from the company's premises, but online sales were flagging. Website statistics showed customer interest, but this was not translating into orders. After some investigation, it was decided that too many options were being offered in the said product line. They were

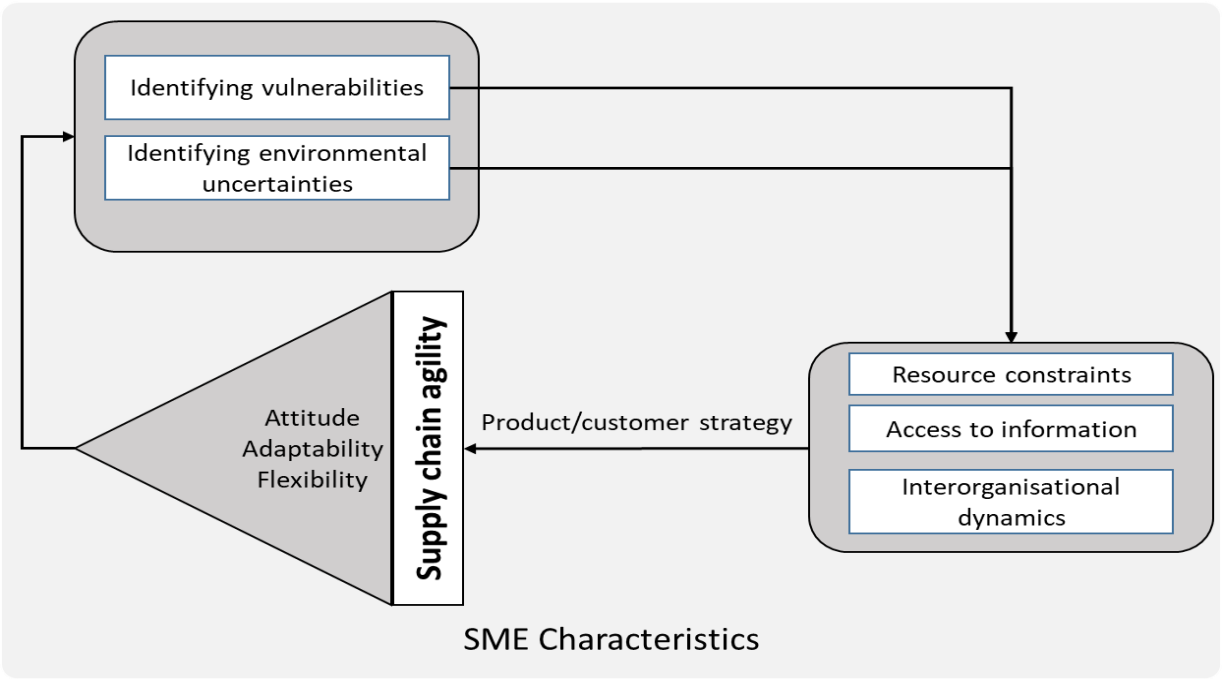
subsequently reduced, and sales improved more than 600% within the month. Such outcomes are not isolated – a point illustrated by the company targeting a 100% sales increase each year – a target requiring continuous change and adaptation to market needs. This ability to investigate, analyse and adapt to market needs is supported by the *bespoke* production strategy the company has adopted – as compared to the *specialist* and *mass* production strategies of the other case study companies. It aligns with the agility concept, and we hereby argue that its adoption assists when managing market uncertainty and organisational vulnerability (in line with Christopher and Holweg 2011; Tang and Musa 2011; Eckstein et al. 2015).

From this research, we believe that the critical attribute underpinning environmental uncertainty, organisation vulnerabilities and agility is *attitude*. *Organisation C*'s attitude to *think and try* was markedly different from the other companies in the study. We consider this to be a unique company feature that assists in overcoming SME liabilities in terms of resource and capability constraints (as indicated by (Mellahi and Wilkinson 2004) – a common feature of SMEs – particularly those employing few people. It might be easy to make suggestions to an organisation in terms of improvement, yet a common factor facing SMEs is the lack of time and resources available, with the subsequent results being similar to those of *Organisation A* and *Organisation B* – who concentrate on areas of safety and comfort and subsequently missing out on potential opportunities by operating within such controlled parameters. By thinking and operating *outside the box*, *Organisation C* has become more agile.

Another critical factor in terms of SCA comes from relationships with suppliers. *Organisation C* holds the most formal, stable relationship with suppliers, and commands the greatest control over its supply chain. It is arguably the ablest of the three companies to be able to swiftly adapt to market needs and environmental uncertainty, thus aligning with the findings of Hassler (2004).

Our study also considered organisational attitude to customers. Superficially, each company illustrated positive approaches in this regard. However, when questioned, *Organisation A* and *Organisation B* were vague in responses and less strategic in their approach than *Organisation C*. When considering the argument for aligning environmental as well as econometric factors by scholars such as Luo and Zhao (2013), we believe *Organisation C* to be best placed to deal with future market challenges. Based on the above discussion of findings, we depict key points and processes of SMEs' development of supply chain agility in Figure 1 and identify key behavioural findings in Table 3. Figure 1 clearly summarises the acclimatisation process, where environmental uncertainties as a circular manifestation, where SME characteristics, product/customer strategy, supply chain agility (attitude, adaptability ad flexibility) and vulnerabilities, as well as uncertainties, are dynamically interlinked.

Figure 1: Supply chain agility as SMEs' acclimatisation process to environmental uncertainty and organisational vulnerabilities



	Organisation A	**Organisation B**	**Organisation C**
Output Offered	Manufacturing	Manufacturing	Service/Assembly
Marketing Predominantly via	Social media	Advertising, recommendation, social media	Social media, recommendation
IT Infrastructure	Poor	Poor	Poor
Control over suppliers	Limited	Limited	Limited
Levels of bureaucracy	Informal	Informal	Informal
Use of parts/products standardisation	High	High	Low
Ability to adapt to supply chain needs	Strong	Strong	Strong
Ability to adapt to market needs	Limited and slow	Good but slow	Strong – openly looks to adapt at short notice to market needs
Willingness to adapt to market needs	Low	Medium but slow	High and fast to respond
Level of adaption to market needs	Low	Medium	High
Attitude towards overcoming uncertainty & vulnerability issues	Low	Low/Medium	High
Attitude towards customer needs	Low/Medium	Low/Medium	High

Table 3 – Summary of behavioural findings on SMEs

Contributions, limitations and future research directions

Theoretical contributions

A major theoretical contribution of this study relates to highlighting the role of SCA for SMEs while dealing with organisational vulnerabilities and environmental uncertainties. Our conceptual framework incorporates arguments from multiple streams of literature to theoretically address the entangled dynamic between environmental uncertainty, SME characteristics and SCA. This is, therefore, one of the first research papers to strengthen the theoretical development of SCA by specifically conceptualising it as an SME acclimatisation process for correcting organisational vulnerabilities against environmental uncertainty. With

SME organisational vulnerabilities being a somewhat under-researched domain, our study has theoretically established the need to consider it specifically from the perspective of SMEs, whose vulnerabilities are higher than those of large firms.

SCM researchers have justifiably paid extensive attention to SCA (Gligor 2016; Swafford, Ghosh, and Murthy 2008; Ying Kei et al. 2016; Gligor and Holcomb 2012a; Prater, Biehl, and Smith 2001), yet most of this research has focused on the antecedents, consequences, and boundary conditions of the concept. Literature effectively misses a contextualised understanding of the nature of SCA experienced by firms bearing different characteristics. Furthermore, extant research largely conceptualises SCA as a strategic capability (Gligor 2016; Swafford, Ghosh, and Murthy 2008; Blome, Schoenherr, and Rexhausen 2013; Gligor and Holcomb 2012a, 2012b), and pays less attention to the manifestation of SCA under various conditions. From the perspective of SMEs, intense exposure to environmental threats, resource constraints, SCM governance challenges and unique organisational vulnerabilities require the development of SCA distinctly.

This void highlights what we believe to be an essential aspect of SCA, and we hereby argue that as well as being a strategic and operational tool for SMEs, it is also an acclimatisation process, operating amid environmental uncertainty and organisational vulnerabilities. This acclimatisation process is, in turn, shaped by resource constraints, access to information, and inter-organisational power dynamics. Such a contextualised conceptualisation of SCA enriches the on-going discourse of the phenomenon (Gligor 2016; Swafford, Ghosh, and Murthy 2008; Ying Kei et al. 2016; Gligor, Esmark, and Holcomb 2015) and helps overcome the narrow perspectives that confine the scope of our understanding.

Managerial implications

The managerial contribution of our study comes from empirically establishing the role of SCA in relation to organisation size. We observed that *Organisation C* is the most agile despite being

small – a point supporting the view of Gunasekaran, Rai, and Griffin (2011) who argued that smaller firms are most likely to hold the characteristics of being flexible, quick and strategically able to adopt agility and capitalise on building agile supply chains. This line of thought also aligns with Ismail, Poolton, and Sharifi (2011) who argue that agility could be the means through which SMEs could compete against larger organisations. Whilst SMEs are resource-scarce; such operational hindrances are often the driving forces behind their attitudes, adaptability and ability to survive. At the same time, they can align their operations to the uncertain external environment, to improve their operations (in line with Hallavo 2015). SME managers should view SCA as a critical resource that provides the wherewithal to deal with increasingly volatile and uncertain external environments. Accordingly, we suggest that SMEs embrace the challenges such as liability of small, lack of greater supply chain control, and resource constraints that come with their size and leverage SCA as an acclimatisation process to overcome their organisational vulnerabilities. In particular, we suggest that SMEs managers adjust their attitudes according to environmental challenges, develop deeper levels of adaptability and flexibility in the face of environmental uncertainty, and jointly use these capabilities to acclimatise to external challenges and transcend organisational vulnerabilities.

Historically, manufacturing methods such as JIT or MRP were tools of large organisations with the financial means to bring them about. In the uncertain and vulnerable globalised business world of today, such operational tactics may be less suitable than in the past, and the means of managing exposure and insecurity (illustrated by Christopher and Holweg 2011) may well be through agility (Christopher 2000). In this paper, we have considered three SME case study organisations that face high external uncertainty. One stands out for its ability to limit the number of suppliers it deals with, the number of product lines it runs, its ability to manage its supply chain and adapt to market needs at short notice whilst continuing to grow. It is from this perspective that we argue for continued debate into SCA and

the benefits it brings in terms of managing environmental uncertainty and organisational vulnerabilities – a point we wish to emphasise from our study as being key to managerial audiences.

Limitations and future research

Despite the points made, as with all academic work, our paper has limitations. Primarily, it is based on three case studies SMEs from a single country (the UK). Our findings are, therefore, not generalisable in all contexts. Secondly, we limit ourselves to the analysis of organisational vulnerabilities in the specific setting of SCM. However, our study sets out bases for future studies to further expand these research topics by linking agility, uncertainty and organisational vulnerabilities in unresearched contexts (such as Brexit, which in itself is a source of potential uncertainty and vulnerability for British SMEs). Future studies might try to analyse agility's usefulness for SMEs in terms of addressing the uncertainty associated with Brexit and potential organisational vulnerabilities that come about from it.

We believe future studies could also consider SME SCA research in emerging markets. Despite the higher levels of uncertainty, SMEs face in such markets by comparison to similar organisations running in developed markets, research on their operations is limited. Future studies might focus on emerging market SMEs to understand the role of agility and address its impact on environmental uncertainty and organisational vulnerability. Furthermore, future research might build on our conceptualisation of SCA as an acclimatisation process and consider the potential interplay between bricolage and SCA (Bricolage being a distinct business approach and process that enables organisations to make do with whatever is at hand, thus transcending the resource constraints typically faced by SMEs (Senyard et al. 2014)).

References

Abbasi, Morteza, Reza Hosnavi, and Reza Babazadeh. 2014. "Agile and Flexible Supply Chain Network Design under Uncertainty." *International Journal of Industrial Engineering* 21 (4).

Ahmad, Ayyaz, Muhammad Ilyas, Mazhar Howard, and Ian Howard. 2012. "A Framework for the Adoption of Rapid Prototyping for SMEs: From Strategic to Operational." *International Journal of Industrial Engineering* 19 (3).

Battistella, Cinzia, Alberto F De Toni, Giovanni De Zan, and Elena Pessot. 2017. "Cultivating Business Model Agility through Focused Capabilities: A Multiple Case Study." *Journal of Business Research* 73:65-82.

Birkie, Seyoum Eshetu, and Paolo Trucco. 2016. "Understanding Dynamism and Complexity Factors in Engineer-to-Order and Their Influence on Lean Implementation Strategy." *Production Planning & Control* 27 (5):345-59.

Blome, Constantin, Tobias Schoenherr, and Daniel Rexhausen. 2013. "Antecedents and Enablers of Supply Chain Agility and Its Effect on Performance: A Dynamic Capabilities Perspective." *International Journal of Production Research* 51 (4):1295-318.

Braun, Virginia, and Victoria Clarke. 2006. "Using Thematic Analysis in Psychology." *Qualitative research in psychology* 3 (2):77-101.

Cabral, Izunildo, Antonio Grilo, and Virgílio Cruz-Machado. 2012. "A Decision-Making Model for Lean, Agile, Resilient and Green Supply Chain Management." *International Journal of Production Research* 50 (17):4830-45.

Cavusgil, S.T., and E. Cavusgil. 2012. "Reflections on International Marketing: Destructive Regeneration and Multinational Firms." *Journal of the Academy of Marketing Science* 40 (2):202-17.

Chandra, Charu, and Janis Grabis. 2007. *Supply Chain Configuration: Concepts, Solutions, and Applications*: Springer Science & Business Media.

Christopher, M. 2000. "The Agile Supply Chain:: Competing in Volatile Markets." *Industrial Marketing Management* 29 (1):37-44.

Christopher, Martin, and Matthias Holweg. 2011. ""“Supply Chain 2.0”: Managing Supply Chains in the Era of Turbulence." *International Journal of Physical Distribution & Logistics Management* 41 (1):63-82.

Collis, Jill, and Roger Hussey. 2013. *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*. London, UK: Macmillan International Higher Education.

de Guzman, Allan B, Katrina Illyana J Guevara, Frances Jane B Guiang, Anton Lorenzo I Gutierez, Alayne S Habaluyas, Marc Alison P Hizon, and Shalaine G Idanan. 2012. "Home Away from Home: Acclimatization of Filipino Elderly from Being Home to a Sense of Being “at Home” in an Elderly Institution." *Educational Gerontology* 38 (11):799-811.

Deming, W Edwards. 1986. *Out of the Crisis*. Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study.

Eckstein, Dominik, Matthias Goellner, Constantin Blome, and Michael Henke. 2015. "The Performance Impact of Supply Chain Agility and Supply Chain Adaptability: The Moderating Effect of Product Complexity." *International Journal of Production Research* 53 (10):3028-46.

Fynes, B., S. de Búrca, and D. Marshall. 2004. "Environmental Uncertainty, Supply Chain Relationship Quality and Performance." *Journal of Purchasing and Supply Management* 10 (4-5):179-90.

Gerbl, Martina, Ronan McIvor, Sharon Loane, and Paul Humphreys. 2015. "A Multi-Theory Approach to Understanding the Business Process Outsourcing Decision." *Journal of World Business* 50 (3):505-18.

Gligor, D.M. 2013. "The Concept of Supply Chain Agility: Conceptualization, Antecedents, and the Impact on Firm Performance." Dissertation, The University of Tennessee.

Gligor, D.M., C.L. Esmark, and M.C. Holcomb. 2015. "Performance Outcomes of Supply Chain Agility: When Should You Be Agile?" *Journal of Operations Management* 33–34:71-82.

Gligor, D.M., and M.C. Holcomb. 2012a. "Antecedents and Consequences of Supply Chain Agility: Establishing the Link to Firm Performance." *Journal of Business Logistics* 33 (4):295-308.

———. 2012b. "Understanding the Role of Logistics Capabilities in Achieving Supply Chain Agility: A Systematic Literature Review." *Supply Chain Management: An International Journal* 17 (4):438-53.

Gligor, D.M. 2016. "The Role of Supply Chain Agility in Achieving Supply Chain Fit." *Decision Sciences* 47 (3):524-53.

Gray, David E. 2009. *Doing Research in the Real World*. London, UK: Sage Publications.

Gunasekaran, Angappa, and Eric WT Ngai. 2005. "Build-to-Order Supply Chain Management: A Literature Review and Framework for Development." *Journal of Operations Management* 23 (5):423-51.

Gunasekaran, Angappa, Bharatendra K Rai, and Michael Griffin. 2011. "Resilience and Competitiveness of Small and Medium-Sized Enterprises: An Empirical Research." *International Journal of Production Research* 49 (18):5489-509.

Gölgeci, Ismail, William H Murphy, and David A Johnston. 2018. "Power-Based Behaviors in Supply Chains and Their Effects on Relational Satisfaction: A Fresh Perspective and Directions for Research." *European Management Journal* 36 (2):278-87.

Hallavo, Ville. 2015. "Superior Performance through Supply Chain Fit: A Synthesis." *Supply Chain Management: An International Journal* 20 (1):71-82.

Hassler, Markus. 2004. "'Governing Consumption': Buyer-Supplier Relationships in the Indonesian Retailing Business." *Tijdschrift Voor Economische en Sociale Geografie* 95 (2):206-17.

Hendricks, K.B., and V.R. Singhal. 2003. "The Effect of Supply Chain Glitches on Shareholder Wealth." *Journal of Operations Management* 21 (5):501-22.

Herbane, Brahim. 2010. "Small Business Research: Time for a Crisis-Based View." *International Small Business Journal* 28 (1):43-64.

Hult, G.T.M., C.W. Craighead, and D.J. Ketchen Jr. 2010. "Risk Uncertainty and Supply Chain Decisions: A Real Options Perspective." *Decision Sciences* 41 (3):435-58.

Ismail, Hossam S, Jenny Poolton, and Hossein Sharifi. 2011. "The Role of Agile Strategic Capabilities in Achieving Resilience in Manufacturing-Based Small Companies." *International Journal of Production Research* 49 (18):5469-87.

Kalkan, Veli Denizhan. 2008. "An Overall View of Knowledge Management Challenges for Global Business." *Business Process Management Journal* 14 (3):390-400.

Ketokivi, Mikko, and Thomas Choi. 2014. "Renaissance of Case Research as a Scientific Method." *Journal of Operations Management* 32 (5):232-40.

Kingsley, Alisson, Rick Vanden Bergh, and Jean-Philippe Bonardi. 2012. "Political Markets and Regulatory Uncertainty: Insights and Implications for Integrated Strategy." *Academy of Management Perspectives*.

Koh, SC Lenny, and Sameh M Saad. 2006. "Managing Uncertainty in Erp-Controlled Manufacturing Environments in SMEs." *International Journal of Production Economics* 101 (1):109-27.

Kull, Thomas J., Josip Kotlar, and Martin Spring. 2018. "Small and Medium Enterprise Research in Supply Chain Management: The Case for Single-Respondent Research Designs." *Journal of Supply Chain Management* 54 (1):23-34.

Kumar, Sanjay, Jiangxia Liu, and Jess Scutella. 2015. "The Impact of Supply Chain Disruptions on Stockholder Wealth in India." *International Journal of Physical Distribution & Logistics Management* 45 (9/10):938-58.

Kvale, Steinar, and Svend Brinkmann. 2009. *Interviews: Learning the Craft of Qualitative Research Interviewing*. Thousand Oaks, CA: Sage Publications.

Lee, Hau L. 2004. "The Triple-a Supply Chain." *Harvard Business Review* 82 (10):102-13.

Lee, Joo-Young, Mohamed Saat, Chinmei Chou, Nobuko Hashiguchi, Titis Wijayanto, Hitoshi Wakabayashi, and Yutaka Tochihara. 2010. "Cutaneous Warm and Cool Sensation Thresholds and the Inter-Threshold Zone in Malaysian and Japanese Males." *Journal of Thermal Biology* 35 (2):70-6.

Li, X., C. Chung, T.J. Goldsby, and C.W. Holsapple. 2008. "A Unified Model of Supply Chain Agility: The Work-Design Perspective." *International Journal of Logistics Management* 19 (3):408-35.

Li, Xun, Thomas J. Goldsby, and Clyde W. Holsapple. 2009. "Supply Chain Agility: Scale Development." *International Journal of Logistics Management* 20 (3):408-24.

Lindgreen, Adam, Roger Palmer, Martin Wetzels, and Michael Antioco. 2008. "Do Different Marketing Practices Require Different Leadership Styles? An Exploratory Study." *Journal of Business & Industrial Marketing* 24 (1):14-26.

Lu, Jane W, and Paul W Beamish. 2001. "The Internationalization and Performance of SMEs." *Strategic Management Journal* 22 (6-7):565-86.

Lucio, Miguel Martinez. 2013. *International Human Resource Management: An Employment Relations Perspective*: Sage.

Luo, Yadong, and Hongxin Zhao. 2013. "Doing Business in a Transitional Society: Economic Environment and Relational Political Strategy for Multinationals." *Business & Society* 52 (3):515-49.

Löfving, Malin, Kristina Säfsten, and Mats Winroth. 2014. "Manufacturing Strategy Frameworks Suitable for SMEs." *Journal of Manufacturing Technology Management* 25 (1):7-26.

Malekifar, Shaghayegh, Seyedeh Khadijeh Taghizadeh, Syed Abidur Rahman, and Saif Ur Rehman Khan. 2014. "Organizational Culture, It Competence, and Supply Chain Agility in Small and Medium-Size Enterprises." *Global Business and Organizational Excellence* 33 (6):69-75.

Maxwell, JA. 2002. "Understanding and Validity in Qualitative Research." In *The Qualitative Researcher's Companion*, edited by A.M. Huberman and M.B. Miles, 37-64. Thousand Oaks, CA: Sage.

Mellahi, Kamel, and Adrian Wilkinson. 2004. "Organizational Failure: A Critique of Recent Research and a Proposed Integrative Framework." *International Journal of Management Reviews* 5 (1):21-41.

Miles, M.B., and A.M. Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks, Ca: Sage Publications, Incorporated.

Milgate, M. 2001. "Supply Chain Complexity and Delivery Performance: An International Exploratory Study." *Supply Chain Management: An International Journal* 6 (3):106-18.

Mittal, S., Khan, M.A., Romero, D., Wuest, T. (2018) "A critical review of smart manufacturing and industry 4.0 maturity models: Implications for small and medium-sized enterprises (SMEs)." *Journal of Manufacturing Systems* 49: 194-214.

Naim, M, J Naylor, and J Barlow. 1999. Developing Lean and Agile Supply Chains in the Uk Housebuilding Industry. Paper presented at the Proceedings of IGLC.

Narula, Rajneesh. 2004. "R&D Collaboration by SMEs: New Opportunities and Limitations in the Face of Globalisation." *Technovation* 24 (2):153-61.

Nickell, Stephen, Daphne Nicolitsas, and Malcolm Patterson. 2001. "Does Doing Badly Encourage Management Innovation?" *Oxford bulletin of economics and statistics* 63 (1):5-28.

Pagell, M., and Z. Wu. 2009. "Building a More Complete Theory of Sustainable Supply Chain Management Using Case Studies of 10 Exemplars." *Journal of Supply Chain Management* 45 (2):37-56.

Parnell, John A, Zhang Long, and Don Lester. 2015. "Competitive Strategy, Capabilities and Uncertainty in Small and Medium-Sized Enterprises (SMEs) in China and the United States." *Management Decision* 53 (2):402-31.

Patton, Michael Quinn. 2002. "Two Decades of Developments in Qualitative Inquiry: A Personal, Experiential Perspective." *Qualitative social work* 1 (3):261-83.

Paulraj, A., and I.J. Chen. 2007. "Environmental Uncertainty and Strategic Supply Management: A Resource Dependence Perspective and Performance Implications." *Journal of Supply Chain Management* 43 (3):29-42.

Platts, KW, and N Song. 2010. "Overseas Sourcing Decisions–the Total Cost of Sourcing from China." *Supply Chain Management: An International Journal* 15 (4):320-31.

Prater, E., M. Biehl, and M.A. Smith. 2001. "International Supply Chain Agility-Tradeoffs between Flexibility and Uncertainty." *International Journal of Operations & Production Management* 21 (5/6):823-39.

Purvis, L, S Spall, M Naim, and V Spiegler. 2016. "Developing a Resilient Supply Chain Strategy During 'Boom' and 'Bust'." *Production Planning & Control* 27 (7-8):579-90.

Roscoe, Samuel, Dominik Eckstein, Constantin Blome, and Matthias Goellner. 2019. "Determining How Internal and External Process Connectivity Affect Supply Chain Agility: A Life-Cycle Theory Perspective." *Production Planning & Control*.

Samson, Danny, and Marianne Gloet. 2018. "Integrating Performance and Risk Aspects of Supply Chain Design Processes." *Production Planning & Control* 29 (15):1238-57.

Senyard, Julienne, Ted Baker, Paul Steffens, and Per Davidsson. 2014. "Bricolage as a Path to Innovativeness for Resource-Constrained New Firms." *Journal of Product Innovation Management* 31 (2):211-30.

Sharma, Sanjay, and Bhavin Shah. 2015. "Thinking Cloud-Enabled Adept and Agile Supply Chain for SMEs: A Conceptual Study." *International Journal of Business Information Systems* 19 (3):342-65.

Skilton, Paul F, and Jessica L Robinson. 2009. "Traceability and Normal Accident Theory: How Does Supply Network Complexity Influence the Traceability of Adverse Events?" *Journal of Supply Chain Management* 45 (3):40-53.

Sukwadi, Ronald, Hui-Ming Wee, and Ching-Chow Yang. 2013. "Supply Chain Performance Based on the Lean-Agile Operations and Supplier–Firm Partnership: An Empirical Study on the Garment Industry in Indonesia." *Journal of Small Business Management* 51 (2):297-311.

Sullivan-Taylor, Bridgette, and Layla Branicki. 2011. "Creating Resilient SMEs: Why One Size Might Not Fit All." *International Journal of Production Research* 49 (18):5565-79.

Swafford, P.M., S. Ghosh, and N. Murthy. 2008. "Achieving Supply Chain Agility through It Integration and Flexibility." *International Journal of Production Economics* 116 (2):288-97.

Tang, Ou, and S Nurmaya Musa. 2011. "Identifying Risk Issues and Research Advancements in Supply Chain Risk Management." *International Journal of Production Economics* 133 (1):25-34.

Thun, Jörn-Henrik, Martin Drüke, and Daniel Hoenig. 2011. "Managing Uncertainty–an Empirical Analysis of Supply Chain Risk Management in Small and Medium-Sized Enterprises." *International Journal of Production Research* 49 (18):5511-25.

Tseng, Ming-Lang, Kim-Hua Tan, Ming Lim, Ru-Jen Lin, and Yong Geng. 2014. "Benchmarking Eco-Efficiency in Green Supply Chain Practices in Uncertainty." *Production Planning & Control* 25 (13-14):1079-90.

Venkatraman, Nenkat, and John E Prescott. 1990. "Environment-Strategy Coalignment: An Empirical Test of Its Performance Implications." *Strategic Management Journal* 11 (1):1-23.

Wang, Xiaojun, Puneet Tiwari, and Xu Chen. 2017. "Communicating Supply Chain Risks and Mitigation Strategies: A Comprehensive Framework." *Production Planning & Control* 28 (13):1023-36.

Warren, Carol AB. 2002. *Qualitative Interviewing*, *Handbook of Interview Research: Context and Method*.

Whitten, Dwayne G, Kenneth W Green Jr, and Pamela J Zelbst. 2012. "Triple-a Supply Chain Performance." *International Journal of Operations & Production Management* 32 (1):28-48.

Yin, R.K. 2009. *Case Study Research: Design and Methods*. 4th ed. London, UK: Sage Publications, Incorporated.

Ying Kei, Tse, Zhang Minhao, Akhtar Pervaiz, and MacBryde Jill. 2016. "Embracing Supply Chain Agility: An Investigation in the Electronics Industry." *Supply Chain Management: An International Journal* 21 (1):140-56.