The challenges of GSCM implementation in the UK manufacturing SMEs

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Abstract*—The importance of green supply chain management has long attracted the interest of both researchers and practitioners in the industry. As environmental concerns are becoming one of the major issues discussed in the 21st century, countries with manufacturing as its principal economy contributor are always on the lookout for innovations and new approaches to balance both environmental considerations and profit making. The UK, being one of the top manufacturing countries in the world already considered green initiatives among their manufacturers. According to reports from the industry, large and international manufacturing companies from the UK have successfully implemented some green initiatives with significant improvements across the supply chain. However, the adoption of green initiatives is mainly focused on large companies rather the real backbone of the UK manufacturing industry, which is the small and medium-sized enterprises (SMEs). This paper therefore sets out to determine the implementation level of green supply chain among the SMEs. The paper adopts a mixed methods based approach and findings are based on 57 survey responses and 5 semi-structured interviews from UK manufacturing SMEs. The findings show that the level of GSCM implementation among the UK manufacturing SMEs is low compared to large organisations. Cost of implementing GSCM practices emerged as a key challenge faced by the UK manufacturing SMEs which was followed by the lack of knowledge within the organisation. This study thus adds to the limited literature on the manufacturing SMEs and provides evidence from the UK manufacturing sector on the adoption of GSCM practices.

Keywords—green supply chain, SMEs, mixed methods, manufacturing, UK

I. Introduction

Entering the 21st Century, the business environment is becoming more challenging as there have been other elements that became a concern by industries such as climate change, air and water pollution, and poor water disposal [1]. Reference [2] reported that industrial activities in today's world have the capacity to wipe out the species and cause fatalities due to pollution from toxic compounds disposed of irresponsibly, in particular by the manufacturing industries. Countries such as the UK and China has put much effort in solving those issues, giving out incentives to organisations to adopt a sustainable waste and environmental management, which ultimately refers to the basics of green supply chain management (GSCM) approaches [3].

Green Supply Chain Management (GSCM) has emerged as a potential solution that seeks to respond to environmental issues brought about by industrial developments. GSCM also has the potential to reduce the impact of the climate change and abnormal weather patterns such as acid rain, the rising of sea levels, loss of biodiversity of species and chronic ailments [4]. As according to [5], GSCM is accepted as a relatively new concept with limited structured literature. From the business point of view, [6] indicated that the environmental consequences of the logistics system are also a major part of the customer service since customers are increasingly making specific demands for environmentally friendly products and services. Reference [7] reports that the practice of green supply chain management (GSCM) goes a step further and combines environmental management practices with the traditional SCM concepts. GSCM also considers upstream, downstream, and internal operational practices [8], [9] and encompasses policies and activities adopted by organisations to reduce their negative impacts on the natural environment [10], [11]. Hence, GSCM has emerged as an integral component of an organisation's overall strategy of moving towards an environmentally sustainable business model [12]. As a result GSCM is attracting increasing attention from operations and SCM researchers [7], [13], [14], [15], [16], [17].

Manufacturing contributes £6.7 trillion to the global economy. Contrary to widespread perceptions, UK manufacturing is thriving, with the UK currently the world's eighth largest industrial nation. If current growth trends continue, the UK will break into the top five by 2021. In the UK, manufacturing makes up 11% of GVA, 44% of total UK exports, 70% of business R&D, and directly employs 2.6 million people [18]. According to the latest study [19] from Hampshire Trust Bank, the British manufacturing sector has seen a six percent increase in SMEs since 2010. According to the Federation of Small Businesses [20], small businesses accounted for 99.3% of all private sector businesses at the start of 2017 and 99.9% were small or medium-sized (SMEs). Total employment in SMEs was 16.1 million; 60% of all private sector employment in the UK and the combined annual turnover of SMEs was £1.9 trillion, 51% of all private sector turnovers in the UK. This shows that SMEs play an important role in the UK economy. With the increasing pressure from the government to adopt green practices, SMEs in particular are under huge pressure to adopt green supply chain management practices across their operations. Given the limited research on GSCM adoption in SMEs [17] it is quite important to understand the challenges of GSCM adoption in SMEs. The next section aims to explore the drivers and enablers of GSCM implementation.

A. Drivers of GSCM Implementation

As it is evident from the discussion so far GSCM has gained a lot of attention from businesses and manufacturers across the globe. SMEs are under immense pressure to adopt GSCM practices that are driven from government policies, environmental regulations, competitive environment, and social responsibility towards the environment. It is hence important to understand what are the prime drivers and enablers for SMEs to adopt them in their supply chain management. In this section, we will consider the drivers from large organisation's perspective and also small organisation's perspective and to make it easy to understand; we can categorise the drivers into two different groups, internal and external factors [21]. Internal factors are the issues within the organisation itself when they strive to improve their business processes and increases their profit, while external factors are issues outside of the organisation that demand the adoption of

GSCM, which the SMEs need to consider to fulfil the requirements from their customers and the market they are serving. Reference [21] identified a number of internal GSCM drivers such as green image; global marketing; competitiveness; economic beliefs or cost reduction benefits; investors and shareholders pressure; employees motivation; health, and safety; scarcity of resources; higher wastes generation; waste disposal problem; and organisational capabilities and awareness. Whereas governmental rules and legislation; environmental concerns & legislation; social & environmental responsibility; customer awareness, pressure, and support; suppliers pressure and willingness; and global climate pressure were identified as external drivers [21]. Some of these drivers have also been echoed by other researchers such as [22] in their study of the prime drivers of GSCM implementation in the Indian manufacturing industry highlighted employees motivation, health, and safety as a key driver. This is also consistent with the definition of GSCM by [23] and its activities whereby, the green practices are being put into practice by the employees itself, and full cooperation and participation are needed to make it happen. Reference [24] also identified the key drivers and enablers that foster environmental management capabilities (EMC) of SMEs in the supply chain. They identified environmental championing as one of the crucial factor that drives the EMC among the Korean automobile SMEs. Hence, being the pioneers in integrating green approach in their supply chain will develop their branding and market proposition, thus increases their competitive advantage. A study of the key drivers and enablers of GSCM implementation focusing on the UK manufacturing industry reveals that legislation and regulations from the government exert the most pressure on the manufacturing organisations [5]. This finding mirrors the results of similar studies from previous researchers dated back to the late 1990's and early 2000's [25], [26], [27], [28], [29], [30]. These studies also highlight societal pressure as one of the key drivers of implementation of GSCM. It is thus evident that there are a number of drivers that affects the implementation of GSCM, and all of them play an important role. Moreover, they are interrelated and improve the performance of GSCM [31].

B. Benefits and Advantages of Implementing GSCM

Adopting green supply chain management requires a lot of effort and may even involve restructuring of business processes [32]. Changes in sourcing, product design, transportation and distribution will cost not only time but also human resources [33]. However, in contrary, the advantages of adopting green supply chain management is so robust that up until today, organisations and academies across the world are discussing the improvements and have applied to various types of industries. According to [34], over 4000 manufacturing companies in seven developed countries has indicated that GSCM increases the environmental performance. One of the most relevant advantages to cover the cost of adopting green in the supply chain is the potential financial gain itself. According to [35], certain activities would reduce the cost of production, opening opportunities for the companies to make a profit and achieve economic performance. Reference [32] stated that GSCM incorporates the collaboration between the manufacturer, and the supplier on the design, material and management of products which results in environment friendly product through its design, material, and management, which was also echoed by [33]. Implementing GSCM in the supply chain also boosts the brand image and also opens up new market for opportunities. According to [35], companies who adhere themselves and invest in environmental issues can improve their corporate brand images, develop new markets and increase their competitive advantage.

C. Current implementation of GSCM in manufacturing industry

The responsibility of supply chain towards natural environment and environmental performance has been a point of discussion in many studies [7], [36], [37], [38], [39], [40]. The idea of GSCM therefore is to integrate environmental thinking into the supply chain management, creating a sustainable supply chain. GSCM also provides an opportunity for enterprises to improve their international competitive advantage. Research indicates that there are several factors that facilitate the GSCM implementation however, growing environmental awareness, new environmental legislations and directives from customers are central motivating factors [41], [42].

One of the reasons that lead to GSCM implementation is the environmental issues, legislations and directives from its customers especially in the US, the European Union (EU) and Japan [41]. A study by [43] found that GSCM is not well implemented in small scale industry (SSI) in India, as the general maturity of GSCM concept is very little and the industry's focus is towards their profitability. However, interestingly, this is contrary to a study in large industries such as the automobile industry in India. A study by [44] found out that major Indian automobile parts manufacturers do initiate several green initiatives such as internal environmental management, green purchasing, green marketing, and eco-design. This was also echoed by [45] who reported that a higher percentage of green practices were currently implemented by large organisations. The knowledge of GSCM in China is not a new thing since the manufacturers are becoming aware and have been implementing green approaches in their supply chain and manufacturing processes for the past few years [46]. Reference [47] later in their study of Chinese textile enterprises also shows that companies have implemented green initiatives along their supply chains. These studies indicate that globally, international organisations have implemented GSCM to improve their business processes and gain competitive advantage. Review of study also indicates that there are many drivers for the implementation of GSCM and organisations

implement GSCM due to particular reasons that affects them which differs from organisation to organisation. Reference [5] report that the UK, being one of the developed countries in the world and a major contributor to manufacturing industries, have implemented a reasonable amount of GSCM practices in their supply chain and manufacturing processes. Interestingly, their sample also includes a small number of the UK manufacturing SMEs. However, SMEs in the UK manufacturing industry have the least amount of GSCM practices [5], and it mirrors the findings of general environmental literature that suggests SMEs experience the least pressure and adopt less green operational practices. The next section discusses the challenges of GSCM as these are the ones that can inhibit the implementation of GSCM.

D. Barriers and Challenges of GSCM

As according to [32], implementing GSCM in the business requires a lot of effort as it may involve a restructuring of the business processes and the product itself. In this line, [33] showed that some of the business processes include strategic sourcing, product design, transportation and also distribution. Hence, there are a lot of things that need to be considered before an organisation can implement GSCM. Reference [48] reported that firms are facing difficulties in integrating the sustainable strategy and corporate strategy in their business operations and having a sustainable vision and mission. Organisations are somewhat not open to changes due to certain reasons when it comes to environmental responsibility and awareness. Organisations who try to adopt GSCM have to strive hard in convincing the stakeholders and this is not an easy task as some may not co-operate at all [15]. Reference [15] and [49] demonstrated that internal factors are the ones contribute much to the barriers in implementing GSCM. Reference [15] explains that practising green initiatives is a costly affair since it requires green products/services, green technology, green power and energy which will cost the organisation a fortune in R&D programs. Reference [33] also echoed this by highlighting that implementing GSCM means integrating environmental thinking into the product design and strategic sourcing. These two elements require alternatives materials to replace the ones in use which do not comply with the new environmental policies. Lack of sources and choices leads to the high price tag of each of those alternatives materials. Hence, it is a hard decision of the management to decide as it involves extra costs, and if they acted with the fixed trade-off in the mind of ecology versus economy, this would be not in favour [50]. More recently, [51] investigated the GSCM challenges faced by Wal-Mart and found that the organisation faced difficulties to find and fund low-carbon technologies to meet the requirement for Return on Investment. Reference [21] showed that lack of information sharing and communication results in poor integration and collaboration which relates directly to the supplier's commitment to improving the supply chain management. This finding is consistent with the results of past studies by [52], and also by [53] as both of them states that suppliers are critical for the overall performance and improvements in the supply chain.

Focussing on the SMEs, there are a few barriers and challenges that are significant and have caused a major impact towards the implementation of GSCM. Reference [54] summarised that SMEs are the once faced a lot of challenges not only due to little funding but also a lack of understanding the concept of GSCM. Even though his research focuses on the SMEs in India, but the research is significant to other SMEs regardless of their location. Reference [55] also showed that these problems are widely spread, complicated and interact with each other, meaning they are interdependent. Reference [21] point out the damage that will be caused by SMEs will gradually grow in the next few years if there is no innovative strategies and support given to them from either public of private sector as they are consistently surviving in the market to compete with large and global companies. Reference [21] further identified several internal (costs, management commitment, R&D, lack of awareness in the organisation, lack of understanding) and external (supplier commitment, customer's perception and willingness, lack of resources, lack of communication (networking), regulations that inhibits innovation) barriers to GSCM implementation. Although the competition is growing and environmental conditions are currently being discussed in all sectors, SMEs have not traditionally recognised the advantages of having a sustainability supply chain as part of key elements in gaining competitive advantage [55]. Reference [56] in their study of the Indian automobile SMEs concluded that for maintaining the environmental awareness supplier barrier emerged as the dominant one for GSCM implementation. A recent study [57] suggests that for SMEs to practice GSCM, supplier collaboration is essential. This study also suggests that collaborating with suppliers help firms practice GSCM which will bring sustainable firm performance. More recently, [17] investigated the impact of adoption of five green practices on SMEs performance, through a survey of owner/managers of 200 manufacturing SME firms in Uganda. Their study concluded that internal environmental management is the key to positive outcomes and better understanding of the costs and benefits, both environmental and economic, is important to encourage green practice adoption in SMEs. These studies indicate that there are many barriers that SMEs need to overcome to successfully implement GSCM practices.

E. SMEs in the UK

SMEs are major contributor of the GDP in the UK. Small businesses accounted for 99.3% of all private sector businesses at the start of 2017 and 99.9% were small or medium-sized (SMEs). SMEs also employ 16.1 million people and contribute to 60% of all private sector employment in the UK. Additionally, the combined annual turnover of SMEs was £1.9 trillion [20]. Currently, the government of UK is trying to make the public sector more accessible to the SMEs and supporting their

business through several initiatives that can improve their business processes. According to a report by the University of Cambridge on the manufacturing industry [58] the manufacturing sectors is investing 5% or more of revenues in R&D to gain a higher GVA per employee which results in a significant improvement in the organisation such as greater GDP impact, intellectual capital development, product, and process innovation. The report also suggests that to tackle the rising environmental issues, there should be a consideration for GSCM in their business processes and product innovation since the year 2010. The manufacturing SMEs also realises that they should focus on their potential growth areas to gain competitive advantages in the industry. Among the criteria that the SMEs should focus on improving is to foster the development of coherent business strategies, and enable firms to innovate and invest adequately in research and development- and capture value through production or service-based business models. Among things that should be considered when developing business strategies and adapting GSCM is to have an efficient collaboration with other SMEs in the supply chain. Manufacturing SMEs would require supplies and transportation from other SMEs in their business network to support their operations. Hence, a comprehensive collaboration between them should be one of the strategies to think of when developing their business models.

Literature reviewed in previous sections already highlights a number of GSCM drivers for SMEs which goes beyond the general environmental awareness of the organisation. Reference [59] also lists the increasing role of government regulations in carrying out environmental initiatives for the manufacturing sector. They further suggest that buyer influence whereby the supplier participates in providing direct inputs for manufacturing has been intensifying and demands greater ties to support non-central activities of the production system in developing environmental capabilities among the buyer network. This will also echoed by [60] who highlight that the collaborative networks among the SMEs especially in manufacturing involves the standard purchase of raw material, machines, equipment or services whereby these items can be integrated with GSCM activities. SMEs have a huge potential to grow and expand their businesses and with the implementation of GSCM in the business processes and their products, they will not only follow the encouragement from the government to be green but also meet their customer's preference.

It is evident that most scholars have primarily focused on justifying the importance of GSCM in multi-national companies whereas only a few have focused on the SMEs. There is also inadequacy of specific studies that clearly states and measures the current implementation and challenges of the UK manufacturing SMEs, as most of the studies focus on large firms or SMEs in developing countries such as China, India, or other European countries. The challenges faced by SMEs may not be necessarily the same as the one faced by large firms or SMEs located in different countries operating under different business environment. Studies relating to GSCM in SMEs have been relatively scant particularly that focusses on the environmental management challenges faced by manufacturing SMEs in the UK faced. Hence, this research aims to fill in this research gap and contribute to the limited literature.

II. Methodology

This research focuses on a specific area of GSCM adoption in manufacturing SMEs in the UK. The study aims to determine the current GSCM challenges and the implementation level in the UK manufacturing SMEs. The study therefore adopts a mixed method approach combining the qualitative and quantitative research methods. The study involves a survey based questionnaire to collect the quantitative data. Qualitative method aims to seek views of respondents (mainly supply chain experts) who have good knowledge and understanding of GSCM. The study also involves semi-structured interviews with supply chain experts from the UK manufacturing SMEs.

This study aims to collect preliminary data on the current implementation, challenges and benefits of GSCM in the UK manufacturing SMEs. Hence, the reasonable number of data sampling size is required for both survey questionnaires and interviews to minimise the risk of validity and reliability [61]. More than 150+ questionnaires were distributed to supply chain experts in SMEs using the contacts collected from the FAME database (A database for all industries registered in the UK and Republic of Ireland) as well as through personal networks and use of social media (LinkedIn). Whereas for the interviews, around 15 supply chain professionals from the UK manufacturing SMEs were contacted. Finally, 57 completed survey questionnaires were returned representing a response rate of 38%. For the interviews, 5 supply chain experts working in the UK manufacturing SMEs agreed to participate in this study. This forms the final sample size of the study.

III. Findings

This study reports the findings based on 57 completed survey responses and five interviews from supply chain experts.

A. Quantitative Survey findings

The first part of the survey involved questions on demographics of respondents. The survey respondents included 48 male and 9 females. In terms of their work experience, around 35% participants had at least 3-5 years of experience whereas around 31% had more than 5 years of experience. Majority of the respondents (49%) were in the middle management positions, this was followed by lower management (32%) position and around 14% were in the top management. In terms of their educational background, 63% of respondents had at least undergraduate degree whereas 19% had postgraduate level qualification. Rest 18% had either college level or some other educational qualifications. Figure 1 below shows the distribution of SMEs across the UK whereas Figure 2 shows the different types of

manufacturing SMEs who participated in the study. Around 49% of these SMEs employed between 151-200 people whereas around 30% employed between 101-150 employees. Only 3 SMEs employed just around 10 people.

In total, only 26 percent of the SMEs have adopted GSCM and 74 percent did not. When asked about their opinion on support for GSCM implementation by the government/local authority, only 37% of them agreed that government/local authorities were providing good support to help SMEs implement GSCM practices. 99% SMEs also agreed that implementation of GSCM will improve their business operations. Similarly, 97% of SMEs agreed that GSCM will improve their organizational performance. It was very interesting that two respondents disagreed with this. When they were asked about the GSCM's impact on profitability, all respondents were in agreement. SMEs were then asked to rate most important reasons why they should consider implementation of GSCM practices, as identified from the literature. Cost savings emerged as the most important factor, followed by business expansion opportunities, meeting customer needs, satisfying the local government/authority on the environmental issues and gaining competitive advantage. This finding was not a surprise as SMEs often struggle with their finances and cost saving is their top priority.

Figure 1: Location of SMEs

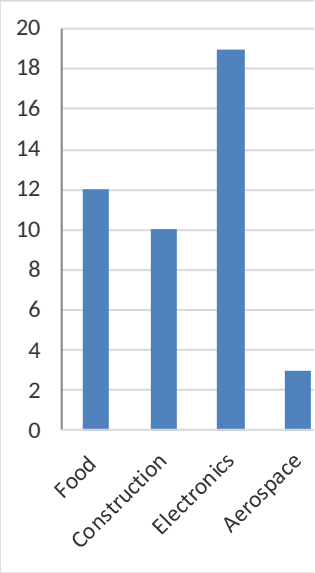

Figure 2: Types of manufacturing SMEs

Respondents where then asked on their opinion on the initiatives that could support the implementation of GSCM. Respondent rated the invention of alternative materials for production as the most important factor, which was followed by support from the local authorities/government, recruitment of knowledgeable employees and better integration with suppliers. It was very surprising that integration with suppliers emerged as the least important factor. This is in sharp contrast to findings reported in literature for larger organisations where often supplier integration delivers more value. When asked about which level of management should really understand the importance of GSCM? Majority of respondents suggested top management, followed by shareholders and middle management while none of them suggested that lower management understanding is really important (See Figure 3).

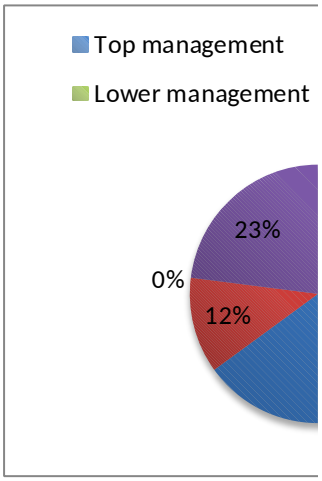

Figure 3: Which level of management should really understand the importance of GSCM

Majority of respondents (94%) also suggested that GSCM requires a lot of time to set up. It was very interesting to see that only 27% SMEs participating in the survey had actually implemented GSCM. Around 84% SMEs reported that they faced major challenges in GSCM implementation. When asked on their opinion on the challenges of adopting GSCM, SMEs cited 'cost' as the major barrier which was followed by a lack of knowledge, lack of human resources and lack of supply chain integration. Finally, respondents were asked about the benefits of GSCM. Respondents rated 'sustainability of resources' as the most important benefit that was followed by 'adoption to regulation and reduced risks', 'lowered costs', 'increased efficiency', 'improved quality of products' and 'product differentiation and competitive advantage'. These findings suggest that UK SMEs are fairly aware of the GSCM practices however they have faced certain challenges that inhibit its implementation. To further understand these issues, a series of semi-structured interviews were conducted with experts from SMEs which is discussed in the next section.

B. Qualiative Findings

To gain further understanding of the GSCM implementation challenges in the UK SMEs, five interviews were held between with SCM experts, consisting of four males and one female. The respondent's age ranges between 27 to 38 years old their experience varied from each other ranging between 5 to 10 years. Each interview was around 30 minutes and was properly scheduled to ensure participants had sufficient time to answer semi-structured interview questions. The interview sessions were recorded using a digital voice recorder and later transcribed to extract as much information as possible. All the interviewee's identities were kept anonymous (they will be referred as R1, R2... R5) and their responses were only used for academic purposes.

Most interviewees mentioned that they have already implemented GSCM practices in their SMEs with exception of interviewee R2 who stated that their organisation hasn't implemented it yet. Additionally, level of

GSCM implementation was not uniform across the four organisations who participated in this study. For example, R1 stated that "*We have implemented GSCM but only on logistics and transportation side with the help of consultants and their advice on the green initiatives*". Whereas R3 stated that "*We have implemented GSCM partially mainly focusing on internal activities, i.e. waste management systems. Our aim was to manage the waste and have some potential cost savings*". Regardless of the implementation level in their organisation all participants had a good understanding of the conceptual understanding of GSCM.

Interviewees were then asked about the challenges that they have encountered in GSCM implementation. R1 stated the main challenge that they faced was internal challenges related to cost (R1: "*It was a hard decision to balance the trade-offs between being green and cost saving*"). R3 on the other hand highlighted both the internal and external challenges prior adopting GSCM. R3 particularly stressed on the lack of funding and technology to develop more green approaches and lack of management commitment. This was also highlighted by R4 who stressed that inadequate amount of knowledge in GSCM and time consuming implantation process led to reluctance by the senior management at the beginning to consider green approaches. R5expressed the concern about external challenges such as getting suppliers involved and the sustainability of resources since most of the materials the company manufactured was bought from other countries. R5 further stressed on internal challenges by stating that "*The other challenges we faced is with regard to cost, lack of knowledge and lack of supplier integration*". These findings support the outcome of the survey where cost emerged as a key challenge. Supplier integration and lack of management commitment also emerged in the survey findings which were further supported by the interviewees.

Finally, interviewees were asked about the potential benefits of GSCM to manufacturing SMEs. All interviewees reported positive impact of GSCM adoption by SMEs such as cost savings, positive market perception, supplier integration, future expansion of the businesses and sustainability of resources. Additionally, they also highlighted that GSCM adoption also improves brand loyalty and quality.

IV. Conclusions

This study provides preliminary insights into the implementation of GSCM in the UK manufacturing SMEs. The findings of the study are very similar to what has been reported in previous literature on GSCM implementation in SMEs. Thus, suggesting that regardless of the geographical differences SMEs face some common problems. Manufacturing SMEs in the UK have the least amount of GSCM adoption [5] which was also mirrored in the findings (only 26 percent of the SMEs have adopted GSCM). General environmental literature suggests that SMEs get the least pressure to adopt GSCM. Many researchers such as [15], [21], [33], and [54] have stated the challenges and barriers to adopting GSCM that is associated to SMEs. Table 1 presents a summarised comparison of the findings of this study with the existing literature. This study also highlights the benefits of GSCM adoption by SMEs which includes resource sustainability, cost saving, better integration with suppliers, improved quality and two additional benefits that were not normally reported in the literature on manufacturing SMEs which is brand loyalty and positive market perception.

Table 1: Comparison of Literature

Challenges to adopting GSCM	
Lack of resources, time and money	
Lack of capabilities, skills and knowledge	
Lack of awareness on provisions and their benefits	
Lack of awareness on their business environmental impacts	
Lack of strategic and holistic thinking	
Lack of internal communication and integration with suppliers	
Lack of flexibility and change	
Lack of external communication (networking)	
Lack of management commitment	
Lack of awareness of issues, risks, and regulation	

The study fills the research gap by addressing the current challenges that the UK manufacturing SMEs is facing and identifying the most significant ones among others. Cost is on top of the list for the challenges faced by the UK manufacturing SMEs and followed by lack of knowledge within the organisation itself. The study also confirms the benefits of GSCM practices that have been reported in earlier literature. Since the topic of GSCM practices among the UK SMEs, especially the manufacturing industry is very limited, hence our study provides additional insights to the public and private sectors on how well GSCM practices is adopted in the SMEs across its supply chain and also other issues behind it. The feedback from survey and interviews would act as a guideline for the industry to review and plan their future strategies to overcome those challenges.

However, like every research, this study has certain limitations. The study is based on limited responses from the survey and a small number of interviewees, nonetheless the study adds to the limited research focused on UK manufacturing SMEs. Future research should therefore aim to seek views from much larger sample including mixed methods, so that findings could be generalised with confidence. Future research can also focus on investigating the impact of the GSCM challenges on the performance of SMEs. Moreover, the current study relies on the descriptive analysis to draw conclusions. Thus, future studies should also focus on designing the survey keeping in mind the use of robust statistical techniques such as correlations, regressions and structural equation modelling to draw conclusions. Additionally, future research needs to approach more practitioners from the industry that can provide detailed, relevant and incisive information.

REFERENCES

[1] Diane. M, Hannah. S. Wendy. L. and Monique U (2010) Green, lean, and global Supply chains, International Journal of physical distribution and logistics management, Vol. 41, No. 1, pp. 14-41

[2] Hu, A. H., & Hsu, C. W. (2010). Critical factors for implementing green supply chain management practice: an empirical study of electrical and electronics industries in Taiwan. Management Research Review, Vol. 33, No. 6, pp. 586-608.

[3] Zhu, Q., & Sarkis, J. (2006). An inter-sectoral comparison of green supply chain management in China: drivers and practices. Journal of cleaner production, Vol. 14, No. 5, pp.472-486.

[4] Min, H., & Galle, W. P. (2001). Green purchasing practices of US firms. International Journal of Operations & Production Management, Vol. 21, No. 9, pp. 1222-1238.

[5] Holt, D., & Ghobadian, A. (2009). An empirical study of green supply chain management practices amongst UK manufacturers. Journal of Manufacturing Technology Management,Vol . 20, No. 7, pp. 933-956.

[6] Johnsson P, (2008) Logistics and Supply Chain Management. Me Grawhill London. Kenneth Lysons and Brian Farrington Purchasing and supply chain management seventh edition, Prentice Hall (2006). London.

[7] Kumar, V., Holt, D., Ghobadian, A., & Garza-Reyes, J. A., (2015), Developing green supply chain management taxonomy-based decision support system, International Journal of Production Research, Vol. 53, No. 21, pp. 6372-6389.

[8] Bowen, F. E., P. D. Cousins, R. C. Lamming, and A. C. Faruk, "The Role of Supply Management Capabilities in Green Supply." Production and Operations Management , Vol. 10, No. 2, pp. 174–189, 2001.

[9] Zhu, Q., Sarkis, J. and Lai, K.H., 2008. Green supply chain management implications for "closing the loop". Transportation Research Part E: Logistics and Transportation Review, Vol. 44, No. 1, pp. 1-18

[10] Mollenkopf, D., Stolze, H., Tate, W. L., & Ueltschy, M. (2010). Green, lean, and global supply chains. International Journal of Physical Distribution & Logistics Management, Vol. 40, No. 1/2, pp. 14-41.

[11] Sarkis, J., Zhu, Q., & Lai, K. H. (2011). An organizational theoretic review of green supply chain management literature. International Journal of Production Economics, Vol. 130, No. 1, pp. 1-15.

[12] Zhu, Q., Sarkis, J., & Geng, Y. (2005). Green supply chain management in China: pressures, practices and performance. International Journal of Operations & Production Management, Vol. 25, No. 5, pp. 449-468.

[13] Srivastava, S. K. (2007). Green supply-chain management: a state-of-the-art literature review. International journal of management reviews, Vol. 9, No. 1, pp. 53-80.

[14] Mishra, N., Kumar, V., & Chan, F. T. (2012). A multi-agent architecture for reverse logistics in a green supply chain. International Journal of Production Research, Vol. 50, No. 9, pp.2396-2406.

[15] Bhattacharjee, K. (2015). Green Supply Chain Management-Challenges and Opportunities. Asian Journal of Technology & Management Research, Vol. 5, No. 1, pp. 14-19.

[16] de Sousa Jabbour, A. B. L., de Oliveira Frascareli, F. C., & Jabbour, C. J. C. (2015). Green supply chain management and firms' performance: Understanding potential relationships and the role of green sourcing and some other green practices. Resources, Conservation and Recycling, Vol. 104, pp. 366-374.

[17] Namagembe, S., Ryan, S., & Sridharan, R. (2018). Green supply chain practice adoption and firm performance: manufacturing SMEs in Uganda. Management of Environmental Quality: An International Journal (Early Cite).

[18] UK Manufacturing Statistics - The Manufacturer; https://www.themanufacturer.com/uk-manufacturing-statistics/ [accessed 20/09/2018]

[19] Manufacturing Global, 2017: https://www.manufacturingglobal.com/lean-manufacturing/uk-manufacturing-sees-increased-number-smes [accessed 20/09/2018]

[20] FSB, 2018 : https://www.fsb.org.uk/media-centre/small-business-statistics [accessed 20/09/2018]

[21] Walker, H., Di Sisto, L., & McBain, D. (2008). Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors. Journal of purchasing and supply management, Vol. 14, No. 1, pp. 69-85.

[22] Bhool, R., & Narwal, M. S. (2013). An analysis of drivers affecting the implementation of green supply chain management for the Indian manufacturing industries. International Journal of Research in Engineering and Technology, Vol. 2, No. 11, pp.2319-1163.

[23] Sarkis, J. (1998). Evaluating environmentally conscious business practices. European journal of operational research, Vol. 107, No. 1, pp. 159-174.

[24] Lee, Nick J., and Lings, I., (2008), Doing business research: a guide to theory and practice. Sage. School of Study, Aston Business School.

[25] Welford, R., & Gouldson, A. (1993). Environmental management & business strategy. Pitman Publishing Limited, London, UK.

[26] Davies, A. R. (2009). Clean and green? A governance analysis of waste management in New Zealand. Journal of Environmental Planning and Management, Vol. 52, No. 2, pp.157-176.

[27] Henriques, I., & Sadorsky, P. (2007). Environmental technical and administrative innovations in the Canadian manufacturing industry. Business Strategy and the Environment, Vol. 16, No. 2, pp. 119-132.

[28] Min, H., & Galle, W. P. (2001). Green purchasing practices of US firms. International Journal of Operations & Production Management, Vol. 21, No. 9, pp.1222-1238.

[29] Baylis, R., Connell, L., & Flynn, A. (1998). Company size, environmental regulation and ecological modernization: further analysis at the level of the firm. Business Strategy and the Environment, Vol. 7, No. 5, pp. 285-296.

[30] Zhu, Q., Geng, Y., & Sarkis, J. (2013). Motivating green public procurement in China: An individual level perspective. Journal of Environmental Management, Vol. 126, pp. 85-95.

[31] Tyagi, M., Kumar, P., & Kumar, D. (2015). Parametric selection of alternatives to improve performance of green supply chain management system. Procedia-Social and Behavioral Sciences, Vo. 189, pp. 449-457.

[32] WY Wong, C., Lai, K. H., Shang, K. C., & Lu, C. S. (2014). Uncovering the value of green advertising for environmental management practices. Business Strategy and the Environment, Vol. 23, No. 2, pp. 117-130.

[33] Srivastav, P., & Gaur, M. K. (2015). Barriers to Implement Green Supply Chain Management in Small Scale Industry using Interpretive Structural Modeling Technique-A North Indian Perspective. European Journal of Advances in Engineering and Technology, Vol. 2, No. 2, pp. 6-13.

[34] Testa, F., & Iraldo, F. (2010). Shadows and lights of GSCM (Green Supply Chain Management): determinants and effects of these practices based on a multi-national study. Journal of Cleaner Production, Vol. 18, No. 10-11, pp. 953-962.

[35] Villanueva. R., Garcia L. J., 2013. Green Supply Chain Management; a competitive advantage. International Congression on Logistics & Supply Chain, CILOG 2013. Sanfandila, Queretaro, Mexico.

[36] Choudhary, M. and Seth, N. (2011), 'Integration of green practices in supply chain environment the practices of inbound, operational, outbound and reverse logistics', International Journal of Engineering Science and Technology, Vol. 3, No. 6, pp.4985-4993.

[37] Hoejmose, S. U., & Adrien-Kirby, A. J. (2012). Socially and environmentally responsible procurement: A literature review and future research agenda of a managerial issue in the 21st

century. Journal of Purchasing and Supply Management, Vol. 18, No. 4, pp. 232-242.

[38] Huang, X., Tan, B.L. and Ding, X. (2012), 'Green supply chain practices: an investigation of manufacturing SMEs in China', International Journal of Technology and Management and Sustainable Development, Vol. 11, No. 2, pp. 139-153.

[39] Frederick, H., and Elting, J. (2013), Determinants of green supply chain implementation in the food and beverage sector, International Journal of Business Innovation and Research, Vol. 7, No. 2, pp.164-184.

[40] Zhu, Q., Feng, Y., & Choi, S. B. (2017). The role of customer relational governance in environmental and economic performance improvement through green supply chain management. Journal of Cleaner Production, Vol. 155, pp. 46-53.

[41] Ninlawan, C., Seksan, P., Tossapol, K., Pilada, W., (2010), 'The Implementation of Green Supply Chain Management Practices in Electronics Industry', Proceedings of the International MultiConference of Engineers and Computer Scientists 2010, Vol. III, IMECS 2010, March 17 – 19, 2010, Hong Kong

[42] Luthra, S., Garg, D., & Haleem, A. (2016). The impacts of critical success factors for implementing green supply chain management towards sustainability: an empirical investigation of Indian automobile industry. Journal of Cleaner Production, Vol. 121, pp. 142-158.

[43] Selvaraj, R.K., (2011), A Study on the Implementation of Green Supply Chain-A Comparative Analysis between Small Scale Industries in India and Developed Nations, Thesis, Mälardalen University, School of Innovation, Design and Engineering, pp. 1-75.

[44] Stephen, G., Kumar, E.R., (2015), The Implementation of Green Supply Chain Management Practices in Automobile Industry, International Journal of Innovative Research in Science, ngineering and Technology, Proceedings of National Conference on Trends in Automotive Parts Systems and Applications (TAPSA-2015)

[45] Jain, V. K., Sharma, S. (2012), Green Supply Chain Management Practices in Automobile Industry: An Empirical Study, Journal of Supply Chain Management Systems, Vol. 1, No. 3, pp. 20-26

[46] Zhu, Q., Sarkis, J. and Lai, K.-H. (2007), Green supply chain management: pressures, practices and performance within the Chinese automobile industry, Journal of Cleaner Production, Vol. 15 No. 11-12, pp. 1041-52.

[47] Zhou, F., (2009), Study on the Implementation of Green Supply Chain Management in Textile Enterprises, Journal of Sustainable Development, Vol. 2, No. 1, pp. 75-79.

[48] Hanna, M. D., Rocky Newman, W., & Johnson, P. (2000). Linking operational and environmental improvement through employee involvement. International journal of operations & production management, Vol. 20, No. 2, pp. 148-165.

[49] Solomon, C., Mohamad, M.N. and Jamaluddin, R., (2014). Development in Corporate Sustainability: The Green Supply Chain Management Perspective and Challenges. Journal of Asian Scientific Research, Vol. 4, No. 10, pp.590-596.

[50] Porter, M., & Van der Linde, C. (1995). Green and competitive: ending the stalemate, In the Dynamics of the eco-efficient economy: environmental regulation and competitive advantage, Edited by Emiel F. M. Wubben, Edward Elgar, Cheltenham, UK, 33-38.

[51] Negi, S., & Anand, N. (2016). An overview of fruits and vegetables' retail supply chain models in India. In Handbook of research on strategic supply chain management in the retail industry, pp. 170-187, IGI Global.

[52] Cooper, R.W., Frank, G.L. and Kemp, R.A., (2000), A multinational comparison of key ethical issues, helps and challenges in the purchasing and supply management profession: the key implications for business and the professions. Journal of Business Ethics, pp.83- 100.

[53] Clark, D., 1999 "What drives companies to seek ISO 14000," Pollution Engineering, pp. 14-15. .

[54] Verma, S., (2014) Analysing environmental supply chain of small & medium enterprises (SMEs) in India: research challenges & future directions.

[55] Hilton, M. (2000), 'SME Support for Sustainable Development: Principles and Practice', in: European Foundation for the Improvement of Living and Working Conditions, Sustainable Development, SMEs and New Enterprises (Conference Report), Luxembourg: Office for Official Publications of the European Communities, 2001, 25-27.

[56] Mathiyazhagan, K., & Haq, A. N. (2013). Analysis of the influential pressures for green supply chain management adoption—an Indian perspective using interpretive structural modeling. The International Journal of Advanced Manufacturing Technology, 68(1-4), 817-833.

[57] Ali A., Bentley Y., and Cao G., (2016), The influence of supplier collaboration on green supply chain management practices and sustainable firm performance in UK food supply chain SMEs', Logistics Research Network Conference, Chartered Institute of Logistics and Transport UK, Hull, 7-9 September.

[58] Stimulating growth and employment in the UK economy, (2010) Lessons from practical engagement with industry: A new priority and approach for direct business support for manufacturing SMEs, IfM Education and Consultancy Services Ltd 2010, https://www.ifm.eng.cam.ac.uk/uploads/News/Stimulating_growth.pdf

[59] Kamaruddin, N.K., Kovalan, V., Adi, M., Nazir, M. and Ahmad, A.R., (2013). Adoption of green supply chain initiatives among small and medium sized suppliers, In Proceedings of The 20th International Business Information Management Association Conference, 25-26 March 2013, Kuala Lumpur, Malaysia.

[60] Pouly M., Monnier, F., Bertschi, D., (2005), Success and Failure Factors of Collaborative Networks of SME in: Camarinha-Matos LM, Afsarmanesh H (eds) Collaborative Networks and Their Breeding Environments, Vol 186. Springer, Berlin Heidelberg, New York.

[61] Bryman, A., & Bell, E. (2015). Business research methods. Oxford University Press, USA.