A sustainable BMW: a tautology or an oxymoron?
BMW's approach to supply chain sustainability (SCS) and supplier relationship management (SRM)

Abstract

There is a broad scientific consensus that anthropogenic activities and their related emissions pose a serious threat to our environment. Car manufacturing, with its systemic effects both during production and during the lifetime of its outputs, is one of the most influential industries in this regard. Consequently, there has been a strong drive toward sustainability in the sector. This study critically evaluates the existing literature on sustainable supply chain management (SSCM) with emphasis on car manufacturing and the German market in particular. It then evaluates BMWs practices with regards to supply chain sustainability (SCS) and supplier relationship management (SRM). After highlighting the German car manufacturer's strengths in the studied areas, the paper identifies a potential conflict between the firm's sustainability efforts and its core market positioning. Suggests possible improvements and areas for future research are presented in the conclusion.

Keywords: *supply chain sustainability, supplier relationship management, BMW*

wordcount: 2,870 (excluding, abstract, tables and figures)

1. Introduction

There is a broad scientific consensus that anthropogenic activities and their emissions pose a threat to our environment. Measurements indicate that after approximately 10,000 years of stability, since the beginning of the industrial revolution 150 years or so ago, concentrations of carbon dioxide have increased by more than 30% and concentrations of methane have almost doubled (Parry et al., 2007). Large-scale model projections suggest that there will be significant detrimental consequences to our environment if production and consumption habits don't change. Another factor contributing to the need for sustainable supply chains are the increasing number of standards and regulations (Johnsen et al., 2017). Furthermore, a personal commitment from business leaders, customer awareness and expectations and competitive pressures intensify the drive toward sustainable purchasing and supply practices (Walker et al., 2008; Giunipero et al., 2008).

Car manufacturing, with its systemic effects both during production and during the lifetime of its outputs, is one of the most influential industries in the world (Orsato & Wells, 2007; Mathivathanan & Haq, 2017). Effective management in the sector, through its economic and environmental impact, has a vital role in promoting societal well-being (Larsson, 2002). With these considerations, car companies have started implementing sustainability practices in their operations (Zhu et al., 2013, Mathivathanan et al., 2018). Sustainable Supply Chain Management (SSCM) includes a set of management practices that necessarily examine the environmental impact, explore each product's value chain in its entirety and encompass the entire product lifecycle through a multi-disciplinary lens (Gupta & Palsule-Desai, 2011).

Aims and objectives

This paper will critically investigate and analyse the SSCM practices of Bayerische Motoren Werke AG (BMW) and conclude with recommendations and suggestions for future research. It will accomplish this through an in-depth exploration of the target firm and contextualisation of all findings within existing research with a focus on the German automotive industry.

2. Literature review

After taking shape in the 2000s, the domain of SSCM has established itself as a central research area since 2010 (Rajeev et al., 2017). From 2011, the increasing importance of the field has been signified by a growing number of review papers. Despite this, it appears that no such review focusing on the automotive industry has been conducted until 2019. Masoumi et al. (2019) are the first researchers to undertake this following the rigorous Integration Definition Function (IDEF0) approach used for modelling systems of varying complexities, objectives and scopes (Woolridge et al., 2005). This paper will expand on their framework contributing a focused survey of SSCM practices among German car companies and including people and technology as a dimension (Figure 1 – IDEF0-based content analysis framework for SSCM – adapted from Masoumi et al. (2019)

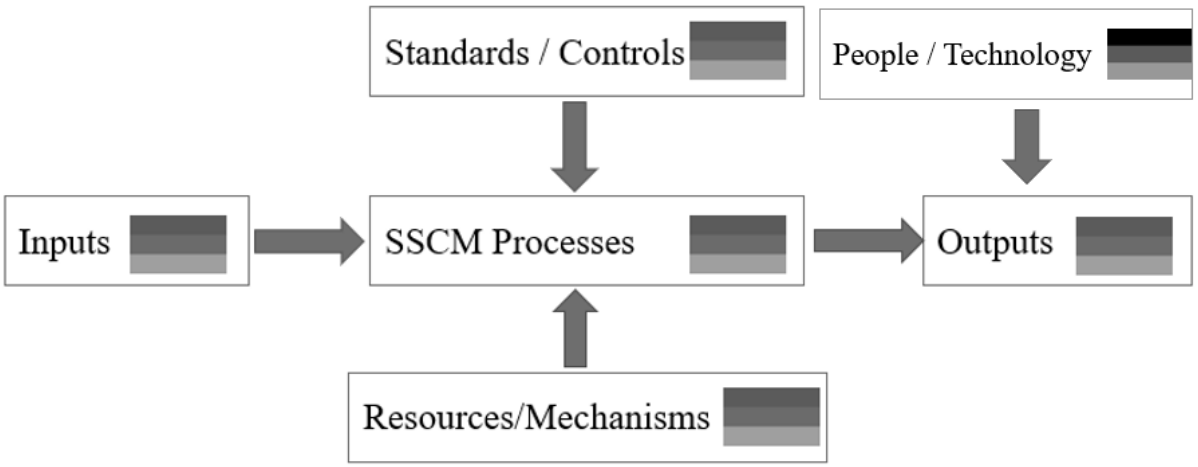

Figure 1 – IDEF0-based content analysis framework for SSCM – adapted from Masoumi et al. (2019)

One of the most influential policies is the European Union (EU) directive on end-of-life vehicles (ELV) Commission (Directive, 2000), which enforces the recycling, reuse, and use other forms of ELVs recovery. Other issues researched that relate to policy include extended producer responsibility (Xiang & Ming, 2011), recycling regulation (Zhang & Chen, 2014), recycling credit-fee, tax on virgin materials, subsidies on recycled material, landfill tax, economic instruments including free take back (Mazzanti & Zoboli, 2006), imposing a tax on used car export (Kumar & Yamaoka, 2007). Furthermore, legal frameworks in Germany lack support for collaborative relationships, which necessitates the creation of private contracts (Casper, 1995).

Inputs, in this context, refers to stakeholder requirements. Pressures from involved parties vary in their type and in the degree to which they accelerate the adoption of SSCM in car manufacturing (Sarkis et al., 2010; Zhu et al., 2007). While stakeholders' pressures are a contributing factor, it is the vision and perspective of managers that enables firms to embrace sustainability (Roh et al., 2015).

Within the wider umbrella of SSCM processes, further categories can be identified based on Sutherland et al.'s (2004) comprehensive framework classifying environmental challenges in the automotive industry (Figure 2).

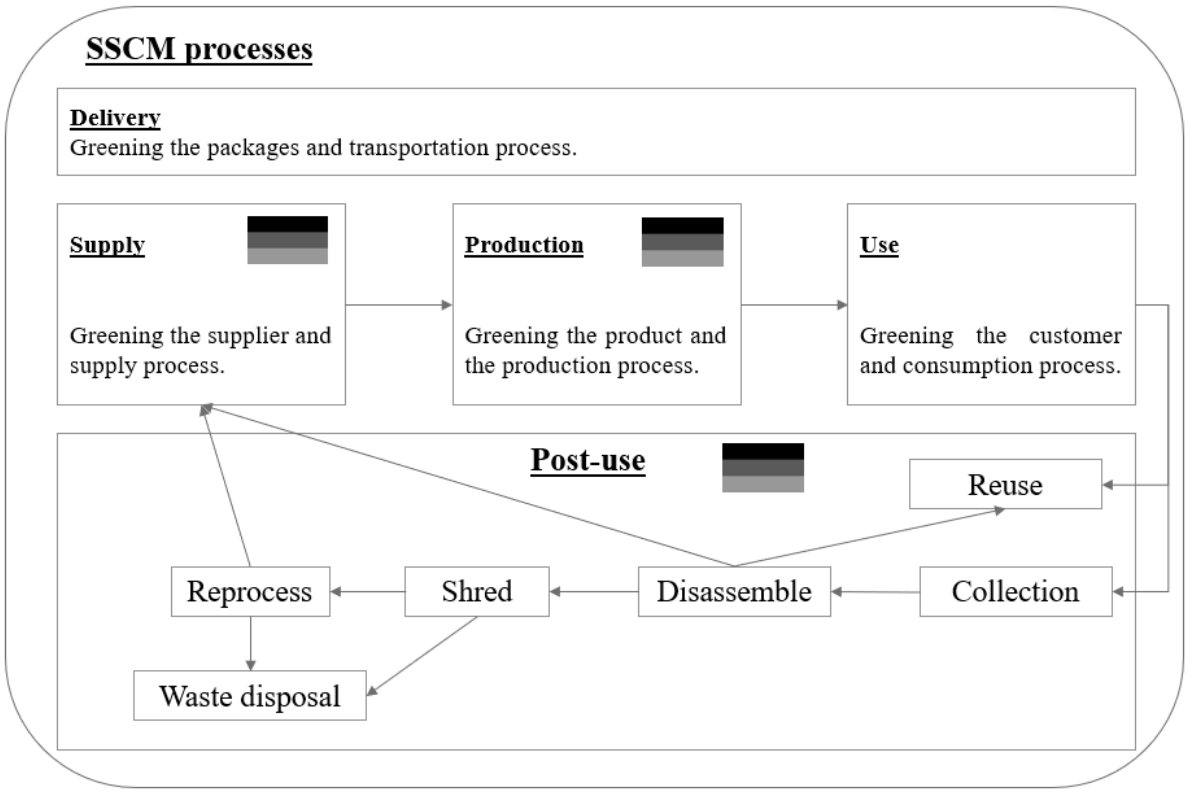

Figure 2 – SSCM processes and sub-processes – adapted from Masoumi et al., 2019.

Looking specifically at sustainable supplier selection (SSS) in the German automotive industry, Zimmer et al. (2017) utilised a quantitative analytical approach to demonstrate big differences in social risk depending on the chosen supplier. Govindan et al. (2015) investigated sustainability through a mathematical lens with a quantitative model that integrates supply chain network design (SCND) and the order allocation problem (OAP). Trust emerged as an important relation-specific skill in forming sustainable supplier-maker partnerships in Germany and Japan (Saeki & Horak, 2014).

With regards to production, McKenna et al., (2013) analysed German car manufacturing demonstrating significant energy savings through direct secondary reuse (DSR). Important for the later discussion are Martínez's (2011) insights about different factors such as energy prices and taxes as well as technology and economies of scale that affect the energy efficiency of the automotive industry in Germany.

With regards to the use phase, White et al. (2015) highlighted that operational concerns and external supply chain influences are key constrains in the attempts toward designing sustainable green packaging. Having a balanced scorecard for the assessment of green transportation (Staš et al., 2015) would be beneficial later on when benchmarking BMW's performance.

Recycling and remanufacturing were some of the widely investigated areas in the post-use phase. Malaysian car production was explored to determine the expertise of remanufacturing (Yusop et al., 2016), while an exploratory study looked into the role that associations and the government played in encouraging remanufacturing in Brazil (Saavedra et al., 2013). Germany was recognised as a pioneer in this field (Siuru, 1991) and Dyckhoff et al. (2004)

presented a theoretical and practical model for the expansion of SCM to closed-loop management (CLM) focusing on car recycling practices in Germany.

When it comes to resources and mechanisms, research focused on the identification of ideal sites and optimising material movements while honouring any pre-existing constraints (Masoumi et al., 2019). Tognetti et al. (2015) focused on the trade-off between economic objectives and environmental imperatives with a case study of a German car manufacturer demonstrating a 30% reduction in CO2 emissions of the supply chain without raising variable costs.

People and technology, as key factors in accomplishing auto-SSCM, were also widely-investigated. Günther et al. (2015) explored the role of electric vehicles in SCS with a special focus on Germany and China covering social, environmental and economic objectives. Furthermore, Vachon and Klassen (2006) identified a positive relationship between technological integration with major customers and key suppliers and environmental monitoring and collaboration. Innovative and collaborative information communication technology (ICT) (Howard, 2005; Stone et al., 2008), e-procurement (Howard et al., 2010) and automotive e-hubs (Howard et al., 2006) were investigated as ways to enhance sustainability, even if indirectly. Another, more futuristic study, investigated German car part suppliers using technology foresight to identify developments and adoption hindrances (Förster, 2015).

The output phase in car manufacturing is of prime importance with regards to SSCM and research in this domain has majored in designing measurement systems and defining measures of performance (Masoumi et al., 2019). Azevedo et al. (2016) proposed and then confirmed the usefulness of a lean, agile, resilient, and green (LARG) index for measuring the performance of automotive SCs. Sellitto et al. (2015), on the other hand, evaluated the effectiveness of SSCM by assessing a set of categorical indicators. With regards to measures of performance, Habidin et al. (2018) identified social responsibility as a critical success factor (CSF) in car manufacturing in Malaysia, while Rehman et al. (2015) identified 12 such factors studying the Indian market. One study embraced a practical approach by investigating real-life experiences and success factors in a leading German car company (Hunke & Prause, 2014).

3. Findings

BMW ranks third among all German companies and first among car manufacturers for sustainability (Menn & Matthes, 2012). Their mission statement aspires that "The BMW Group is the world's most successful and sustainable premium provider of individual mobility" (BMW Group, 2019, p.10). This section will report on BMW's approach focusing on SCS and SRM.

In its Sustainable Value Report (SVR) (2019), BMW states that sustainability is embedded in its entire corporate strategy across the whole value chain and all processes that constitute it. "The BMW Group will significantly increase supply chain transparency and resource efficiency by 2020" is the explicitly stated goal (BMW Group, 2019, p.80). According to the firm, their objectives align with the Sustainable Development Goals (SGDs) set by the United Nations. Specifically, BMW articulates 10 group-wide goals with potential impact on the SDGs and this section will focus specifically on the one highlighted below, namely, sustainable, resource-efficient SC (Figure 3).

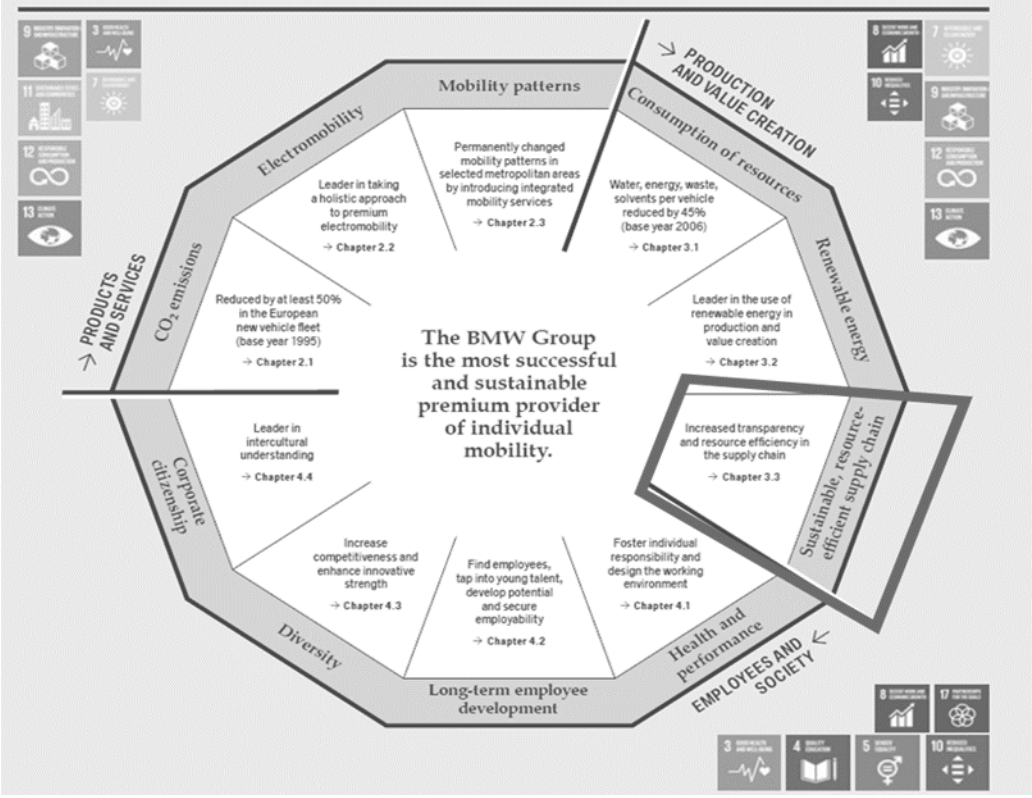

Figure 3 – BMW's 10 sustainability goals – adapted from BMW Group (2019)

In the same report, BMW emphasised the critical role of its due diligence process (DDP) in implementing SCS and SRM and how it extends standards across suppliers of products and services. The firm identified materials essential for sustainability as early as 2012 and gathered relevant experience through pilot projects. BMW feeds these insights into initiatives such as Drive Sustainability and Responsible Minerals with the stated aim of driving sustainability along the entire SC. Following an in-depth analysis, the firm released a Material Change Report in 2018 discussing risks and opportunities with regards to 18 key raw materials and made sustainability a key criterion in their procurement. BMW also

supports its suppliers to reduce their environmental impact by encouraging participation in the Carbon Disclosure Project's (CDP) Supply Chain Programme (BMW Group, 2019b).

BMW's SVR also emphasises the importance of their DDPs in minimising risks and increasing transparency. Significant here is the Group's approach to SRM described on their SCM page. BMW's Group Supplier Sustainability Standard is the foundation of this process and entails adherence to globally established social, labour and human rights standards. Broadly, the focus is on minimising sustainability risks on the one hand and leveraging the potential for resource efficiencies on the other. In practice, this translates into three steps that complete the supplier DDP, namely, risk identification, self-assessment and external audit (BMW Group, 2020). Furthermore, the company's supplier sustainability policy summarises seven core standards and principles for its partners: Resource management and environmental protection; Social responsibility; Lawful and Responsible Conduct; Preventing the flow of funds to armed groups and conflicts; Animal welfare in the supply chain; Implementation of these standards in the supply chain; Ensuring compliance, consequences of misconduct and grievance mechanism (BMW Group, 2018a). Another important aspect of BMWs SRM is the Supplier Innovation Award which runs every two years and recognises outstanding innovations across five themes. The last ceremony in 2018, ran under the inspiring motto "Turning visions into Reality", recognised three suppliers under the sustainability category for reducing emissions, human rights preservation and community development (BMW Group, 2020).

Importantly, the Group not only articulates and emphasises SCS but also measures its performance (Figure 4).

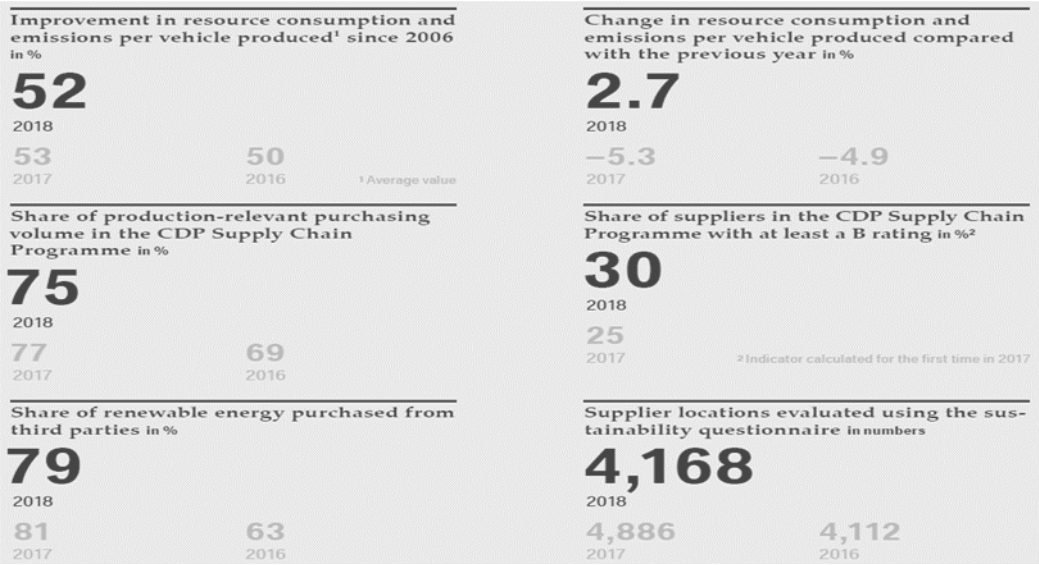

Figure 4 – BMW's sustainability KPIs (BMW Group, 2019b)

4. Discussion and Analysis

In assessing BMW's approach to SCS it is helpful to rely on comprehensive and holistic performance indicators such as those presented by Saeed and Kersten (2017) (Table 1).

Sustainability	Attribute categories
Environmental	Energy efficiency, material efficiency, water management, waste management, emissions, land use, environmental compliance, supplier assessment.
Social	Human rights and anti-corruption, human resources, health and safety, training and education, consumer issues, social compliance.

Table 1 – Overview of attribute categories adapted from Saeed and Kersten (2017)

An in-depth examination of the Group's SVR and environmental statement enables a thorough assessment against most of these parameters. The firm performed well in the energy efficiency of car production by reducing consumption by 2.3% year-on-year and reducing the CO2 emissions in its supply chain by 39 million tones. At the same, time as the ICCT report revealed, the energy efficiency of the vehicles themselves is not that impressive. With regards to material efficiency, BMW recycles an impressive 90% of its battery cells and uses a large proportion of recycled materials in its i3 electric model. While these contributions may be somewhat insignificant given that relatively small contribution of electric vehicles to the overall market, BMW embraces a far more holistic approach to recycling with initiatives targeting electrode caps, paint, raw materials, packaging, and of course, ELVs. Water recycling, multiple flushing, wastewater filtration, and production leakage tests demonstrate BMW's solid performance with regards to water management. Waste management standards are also high with required independent certification for contractors and regular audits. It is commendable that emissions are strictly controlled and optimised in the production process and regrettable that it is in the firm's very DNA to produce high-emission generating vehicles. BMW is performing exceptionally well when it comes to land use and soil protection with initiatives such as sampling and clearance, compensatory areas, rainwater percolation, restraint systems and substitution of hazardous materials. Environmental compliance is also on an exceptional level thanks to the use and submission to the International Material Data System (IMDS) of Material Data Sheets and the use of Approval of Chemical Products process. Furthermore, the basis for all compliance is inspired by a strong commitment from leadership in the Group's Code of Conduct. The supplier assessment standards are also exemplary and are not only internally evidenced through a robust process but also externally validated through awards and high independent rankings (BMW Group, 2018b, 2019b). Finally, although BMW's approach to SRM is solid it can be improved if a few paradigm shifts as suggested by Kashyap et al. (2018) are embraced.

BMW's SCS with regards to social factors is also exceptional. Safety at work, equality, diversity, and personal data protection are cornerstones of the Group's Code on Human Rights (BMW Group, 2019a). The document is not only comprehensive by covering areas such as child and forces labour, freedom of association, health and occupational safety, remuneration, working times and many more, but also clearly articulates how it extends to suppliers and how the requirements will be monitored and enforced. Although the firm has solid anti-corruption policies in place, their practical validity can be questioned. In recent times, an EU probe investigated BMW's sponsorship of the Finnish council presidency (Mackessey, 2019) and a BMW dealer allegedly committed fraud against more 800 clients in

South Africa (Anti-Corruption Digest, 2018). Still, the most reported case documents an isolated occurrence of intra-firm corruption in 2005 where an employee received more than $100,000 in bribes in exchange of giving orders to a specific supplier (Eicher, 2016).

Furthermore, Avery and Bergsteiner (2011) differentiated between 'honeybee' leadership, which is about building communities and encouraging collaboration among stakeholders and 'locust' management, which focuses exclusively on short-term profitability. This paper is important as it offers concrete examples of how BMW demonstrates sustainable leadership in 23 categories (Figure 5).

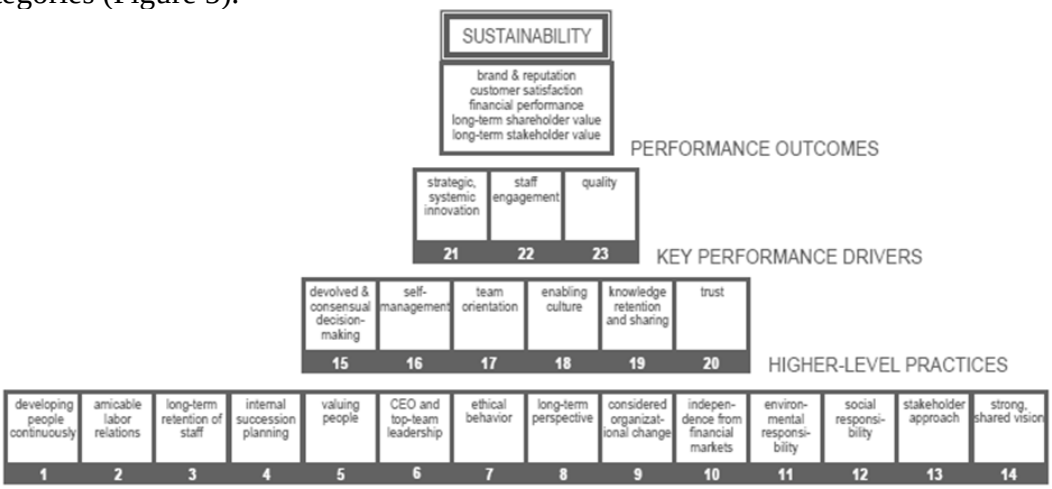

Figure 5 – Sustainable Leadership Pyramid – source Avery and Bergsteiner (2011)

Although BMW has made great progress in terms of improving its SCS, some important implications arise when examining the firm in the context of its industry. For example, BMW is one of the firms with the highest average CO2 emissions (g/km, NEDC) (Figure 6), and one among only three manufacturers that still sell more than half of their new vehicles with diesel engines (Figure 7). Both of these figures are generally indicative of greater detrimental environmental impact.

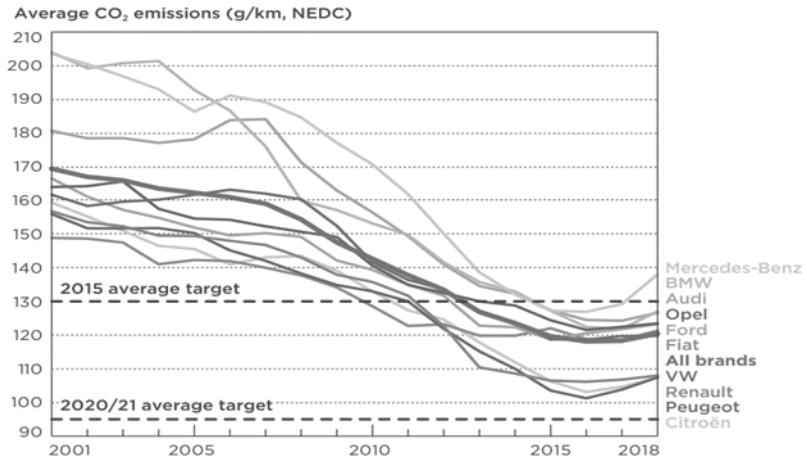

Figure 6 – Passenger cars: CO_2 emissions by brand (ICCT, 2019)

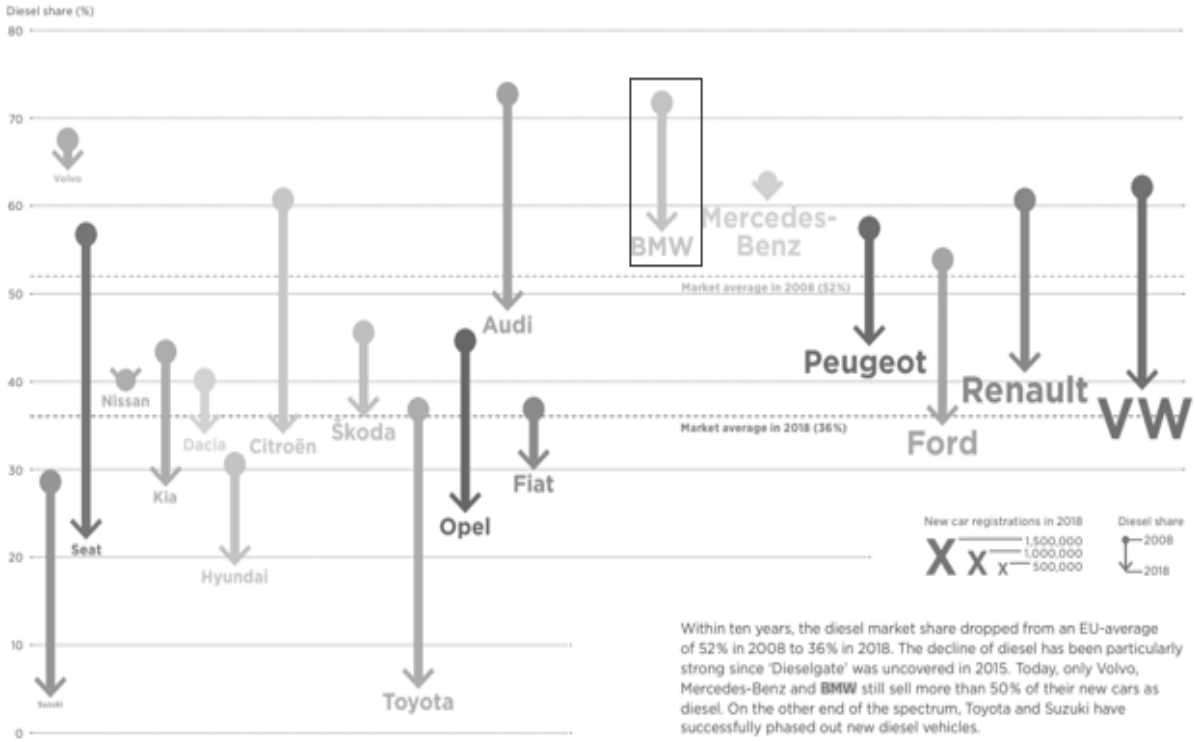

Figure 7 – Diesel share of new car registrations by brand, 2008 to 2018 (ICCT, 2019)

This is partially offset by BMW's solid performance in the plug-in hybrid electric vehicle and the battery-electric vehicles market (Figure 8**Error! Reference source not found.**).

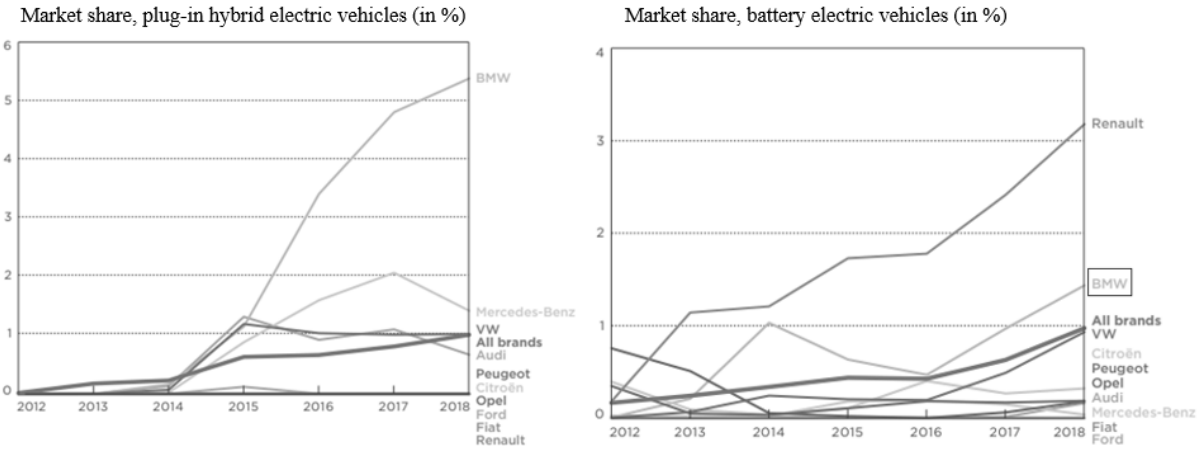

Figure 8 – BMW's share in plug-in hybrid and battery electric vehicles (ICCT, 2019)

Still, the German car giant was awarded the most sustainable corporation in the world for 2016 in a prestigious global ranking (Corporate Knights, 2016). However, the fact that it is no longer in the first 100 raises some questions (Corporate Knights, 2020).

Steers and Osland (2019) describe two acknowledgements of BMW's SCS efforts. Dow Jones Sustainability Indices recognised the German giant as an industry leader and the most sustainable car manufacturer., while the Carbon Disclosure Project (CDP), one of the most prestigious independent assessors of sustainability, gave the company the highest score ever given to a car company – 96 out of 100.

In the domain of SRM, BMW also performs exceptionally well. It was ranked first in the 2012 Supplier Relationships (SuRe) index and its willingness to enable supplier profitability over the lifetime of a contract was commended (Johnsen et al., 2014). The Group has also been praised for its long-term orientation and willingness to support its troubled suppliers during the financial crisis of 2008 (Avery & Bergsteiner, 2011).

5. Conclusion

A strong commitment to sustainability is unquestionable and embedded in BMW's mission statement. Previous research has demonstrated the firm's dedication to SCS across 23 metrics embedded in the entire value chain. The Group's excellent SRM evidenced by its thorough selection and development processes, its care for suppliers during the financial crisis and its awards have also been documented in the literature. This paper contributed a detailed analysis of BMW's sustainability in the domains of SCS and SRM aligned with Saeed and Kersten's (2017) comprehensive sustainability performance indicators.

Still, the analysis revealed several areas of improvement. For example, the firm can incorporate KPIs for eliminating corruption through total compliance thus reducing reputational risks. Additionally, BMW can improve its SRM by incorporating fundamental paradigm shifts that conceptualise suppliers as customers rather than providers and emphasise total responsibility (Kashyap et al., 2018). The most promising area of improvement is perhaps the most contentious as well. BMW has converted millions of customers into brand evangelists through the powerful and exciting cars it produces. Unfortunately, there is a trade-off between the joy of driving and environmental sustainability. With high CO_2 emissions and a high proportion of diesel vehicles, there is a glaring conflict between the Group's stated commitment to sustainability and its actual production of resource-hungry vehicles. A possible solution to this conflict can involve the gradual repositioning of the brand as a more 'green' or 'futuristic' in the minds of clients coupled with the development of sufficiently exciting/dynamic electric vehicles. Alternatively, the firm may choose the middle way and remain true to its premium/sports origins while simultaneously directing its efforts toward other areas of SSCM.

Future research could focus on the implications of autonomous vehicles for premium brands such as BMW and the likelihood of embracing smaller more economical engines. Further research could also focus on BMW's SC resilience to environmental or pandemic catastrophes such as the COVID-19 outbreak.

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