

Guidelines for sustainable-value creation within the context of German automotive industry's strategic carbon crisis management

*Carina Legl, MSc (Carina.Legl@gmx.de)
Edinburgh Napier University*

*Dr Miles Weaver
Edinburgh Napier University*

Abstract

The importance of leading German automotive industry's low/non-carbon transition is set upon a collaborative-undertaking approach towards sustainable-value creation. By discussing single corporation's strategic environmental and social sustainability focus (i.e. pollution prevention; clean technology; product stewardship) and collaborative contribution, the exploratory research identifies and classifies single-applied and collaborative-contributed key, strategic clean/green-technological initiatives by Germany's influential OEMs and OEM-parts suppliers through interpretation of annual/sustainability-reporting' patterns/relationships within 2010 to 2015. By unifying those enforced/realised significant, future-oriented measures/ideas, the authors propose universal guidelines of transferable, operational initiatives that motivate the guideline's incorporation by environmental/sustainability managers of diverse industrial sectors to ensure/promote strategic sustainability development/management.

Keywords: strategic sustainability management, clean/green-technological innovation, collaborative sustainable-value creation

Introduction

The continuing debate on the global environmental progress through achievement of smarter clean/green policies, reasoned with the need for carbon-emissions' reduction and/or prevention (The Economist, 2015a; 2016a), has reached a higher level of interaction between German's federal government, automotive industry, and society (BMUB, 2016). The potential benefit of improving carbon emissions' efficiency, and thus, having an impact on climate change, is set on a single-undertaking approach of already enforced and/or realised significant, future-oriented measures/ideas by influential German automotive industry's stakeholders to create sustainable-value. Obviously, the importance of leading the industry's low or non-carbon transition is set upon the interrelation of each stakeholder, thus a rather collaborative-undertaking approach towards sustainable-value creation is suggested by the authors (ACEA, 2016a; The Economist, 2015a; 2015b; 2016b).

When considering interdependent challenges' realisation of matching environmental-performing improvements and strategic corporate social responsibility (abbreviated as

CSR) with economic growth solely through a collaborative approach (ACEA, 2016b), the question arises of how to interrelate each stakeholder's applied, transformed, and implemented contribution to an effective collaboration (Salvado et al., 2015; Unruh and Ettenson, 2010). Thus, this research questions 'what were key, strategic clean/green-technological initiatives applied by German's automotive industry to address the ongoing global carbon crisis?' and 'how and why have those initiatives contributed to create collaborative sustainable-value?'. Hereto, this research critically-explores, identifies, and classifies single-applied and collaborative-contributed environmental and social sustainability initiatives of Germany's influential three original equipment manufacturers (abbreviated as OEMs) and seven leading OEM-parts suppliers within the time frame of 2010 to 2015. By unifying those already enforced/realised significant, future-oriented ideas/measures to address the ongoing global carbon crisis, the authors propose universal guidelines of transferable, operational initiatives that motivate the guideline's incorporation by environmental/sustainability managers to ensure and promote strategic sustainability management, and further, enable the basis for a prospective-following conceptual-framework creation (ACEA, 2016a; The Economist, 2015a; BMUB, 2016).

Literature review

Theoretical key concepts of sustainability, strategic-CSR, corporate strategy, clean/green-technological innovation, and crisis management are reviewed with regard to sustainable-value creation, and subsequently brought together for developing clean/green policies to ensure collaborative, strategic sustainability management practices.

Strategic sustainability management

When responding to sustainability's challenges, such as climate change, particularly by overcoming the global carbon crisis (Elkington and Burke, 1987), the novel solution requires next to an engagement of multiple stakeholders, dynamic-flexible, interdisciplinary approaches towards sustainable socio-ecological innovations (White and Van Koten, 2016). Hereto, White and Van Koten (2016) argue for a novel manufacturing paradigm, that contributes to environmental and social sustainability through stakeholder's collaborative process in reducing, minimising, and eliminating non-renewable resources next to waste and pollutant emissions (Mayyas et al., 2012).

Connectively, in Hart and Milstein's (2003) developed sustainable-value framework, sustainability is seen as an opportunity for corporations, i.e. sustainability enables cost/risk-reductions, with innovation stimulates revenue/market-share. This is evidenced further by Laszlo's (2008), who elucidates opportunities, as: reputation enhancement; product differentiation; employee motivation; cost reduction and/or new market entries; and thus, argues for understanding the current value-position in question of stakeholder's performance in relation to market's expectations, to identify value-creation/destruction along the value-chain, and proposes the implementation of effective performance indicators of each stakeholder's sustainable-value (Nunes et al., 2016). When connecting to corporation's strategy, Laszlo (2008) provides an applicable tool for value-creation's identification, through six levels of strategic focus, wherein certain levels are addressed that highlight corporation's value-source and enhance further German automotive industry's opportunities along the value-chain, as: mitigation of risk; improvement of processes; redesign of products; new markets; brand reputation enhancement; and/or more favourable business context. This is extended with 'radical innovation' towards the 'generic strategy response' (Laszlo and Zhexembayeva, 2011).

When aiming at stakeholders' satisfaction through each relevant stakeholder's contribution by reaching the desired higher ideal of sustainable-value creation, and in turn of car-carbon footprint's prevention/reduction (Hirota et al., 2010), Campbell and Yeung (1991) emphasise on the utmost importance of corporation's creation of a 'strong' mission, through intertwining and reinforcement of purpose, strategy, behaviour standards, and values, as components of the Ashridge mission model. Hereby, emphasis is set on corporation's achievement of strong purpose when aiming at the higher ideal, that in turn creates enthusiastic and committed stakeholders. Connectively, strong strategic focus provides explanation in how to achieve the higher ideal. Corporation's distinctive competency and competitive advantage support achievement of sustainability. When purpose and strategy with relation to e.g. consciousness of the environment are converted into strategic actionable behaviour standards, corporation's performance changes effectively. This is underpinned through values: moral principles and beliefs, which connect to corporation's culture. Upon four element's intertwining and reinforcement, the corporation reaches the foundation for achieving the strategic-intended higher ideal of sustainability.

Clean/green-technological innovation

Within the context of the carbon crisis and need for clean/green production-processes, clean/green products, and green markets, car-manufacturers and suppliers, among others, take responsibility for carbon-emissions' generation (Laszlo, 2008; Shunsuke, 2016). Existing environmental pressures brings about green-innovation processes/products, by aiming at pollution's reduction and/or prevention, energy's productivity, waste' reduction, limited resources' substitution through sustainable resources. Strategic interaction for sustainability through innovations results in innovative, clean/green-technological products/processes (Küçükoğlu and Pinar, 2015). By responding to environmental protection, the corporation's focus has to be set on predictive, proactive approaches, particularly through clean/green-operational concepts, i.e. green product, process, and strategic-management innovation (Hsieh et al., 2012). Unruh and Ettenson (2010) address specific, clean/green-technological product/process development' operational/cultural challenges, i.e. execution, and by referring to this, question clean/green-technological strategic initiatives' feasibility, i.e. corporation's capabilities towards sustainable-clean/green growth, desirability, i.e. corporation's un/willingness as well as strategic fit with objectives and resources, and implementation, i.e. single application and collaborative contribution towards effective execution, as those dictate German automotive industry's strategic sustainability management and the path to overcome the carbon crisis.

Collaborative sustainable-value creation

With awareness, involvement, and innovation, German's automotive industry with influential stakeholders turns to and acts on the creation of sustainable-solutions through single-corporative activity and collaborative teamwork within and beyond the carbon crisis (Hart and Bell, 2013; Laszlo and Zhexembayeva, 2011). Thus, the creation of sustainable-value aids in advancing business-priorities, driving clean/green-technological innovation, and achieving competitive advantage (Laszlo, 2008). For achieving strategic competitiveness throughout the carbon crisis, corporations have to successfully formulate and implement a value-creating long-term strategy with linkage to CSR-related operations (Smart and Vertinsky, 1984). Hereto, strategic flexibility and responsiveness enables to respond to demands and opportunities within the dynamic, uncertain competitive environment (Ireland et al., 2013).

Moreover, Hart and Bell (2013) reinforce the importance of collaborative engagement, and emphasis on sustainable development towards sustainable solutions through collaborative teamwork (Nunes and Bennett, 2010; Porter and Kramer, 2006). For this, Laszlo (2008) clarifies clearly disadvantages for German's automotive industry, when disregarding adoption/transition of clean/green operations and products, and furthermore, outlines stakeholder's issues of greenhouse-gas emissions and usage of fossil-fuels, that in turn create certain consequences through preventive regulations, as exemplified by carbon taxes or energy-efficiency standards (Burritt and Tingey-Holyoak, 2012). Conclusively, the collaborative attempt of influential stakeholders is to set the strategic intent upon 'collaborative' sustainable-value creation, by focusing on intertwining of efficiency, consistency, and sufficiency strategies, as incorporated by Hart and Milstein's (2003) framework that in turn is reinforced by Campbell and Yeung's (1991) Ashridge mission model (Nunes and Bennett, 2010; Porter and Kramer, 2006), and connectively, following specific collaborative strategic intended steps towards sustainable-value creation (Laszlo, 2008). With key concepts' discussion, the researchers' questions remain on how social and environmental concerns with single stakeholder's commitment translate into German automotive industry's collaborative, strategic clean/green-environmental sustainability management (Banerjee, 2001).

Research gap – on the incorporation of strategic sustainability management

The complexity and interconnectedness of environmental issues, and thereby, the complexity of stakeholder's collaborative contribution towards sustainable-value creation as a contribution to the carbon crisis, is still not understood completely (Banerjee, 2001). Banerjee (2001) regards corporation's innovative, social and environmental, entrepreneurial activities, next to productivity improvements of resources, as encouraging avenues of approaching clean/green-technological products/processes. In connection with German automotive industry's sustainable, clean/green-strategic intention towards sustainable, clean/green growth, Unruh and Ettenson (2010) question particularly strategy's feasibility, desirability, and implementation. This questions particularly what were key, strategic clean/green-technological initiatives applied by German's automotive industry, and further, how and why have those initiatives contributed to create collaborative sustainable-value, and thus, deal effectively with the ongoing carbon crisis.

Design/methodology/approach

By regarding corporation's declaration of implemented social-responsible behaviours, moral values, and ethical codes, while pursuing business activities, as the foundation for embedding sustainability (Jose and Lee, 2007; Kolk, 2008), this research's strategic intention intertwines each corporation's annual reports to reach a decision in whether the corporation's sustainability mission is strong (Campbell and Yeung, 1991). Thereupon, Hart and Milstein's (2003) framework is applied for building theory on strategic sustainability reporting, focusing on clean technology and pollution prevention (environmental sustainability), as well as product stewardship (social sustainability).

Campbell and Yeung's (1991) Ashridge mission model and Hart and Milstein's (2003) sustainable-value framework aid in defining specified criteria for the content analysis of annual reports, and subsequently, of sustainability-reporting of German's narrowly-defined OEM and OEM-parts suppliers. With relation to the defined criteria, the researchers review literature, specifically, on research regarding mission statement's value (Desmidt et al., 2011), and further, on environmental reporting and frameworks for defining parameters, i.e. keywords/codes (Kolk, 2008). Moreover, this exploratory

research pursues an inductive approach, through interpretation of annual and/or sustainability-reporting' patterns/relationships. With the applied qualitative methods, the secondary data collection is critically-examined in consideration of effective, supportive initiatives for reducing/preventing car's carbon footprint. Thereby the project quantifies content by counting occurrence' frequency of predetermined, indicative keywords (Bryman and Bell, 2015; Frechtling and Boo, 2012).

As German automotive industry's value-chain is seen as capital/technology-intense, inclusive, characterised with a high-environmental impact of one car, and thus collective, of the fleet (Nunes et al., 2016), Blume and Walther (2013) emphasise on the OEM's strong, powerful position, which exemplifies a producer-driven value-chain. Therefore, this research project critically explores, specifically, influential OEMs: BMW AG; Daimler AG; and Volkswagen AG; and OEM-parts suppliers: BASF SE; Continental AG; Mahle GmbH; Robert Bosch GmbH; Schaeffler Technologies AG & Co. KG; Thyssenkrupp AG; and ZF Friedrichshafen AG, as those OEM-parts suppliers contribute 70 per cent and more of value-added to a manufactured car in Germany (Altenburg, 2014; Crain Communications, 2015). With regard to the research questions, the researchers explore, which OEM/OEM-parts supplier reports environmental sustainability/CSR-information, and herein, what each actually reports in context of applied clean/green-technological innovation/s, and furthermore, what characteristics each, single corporation shares with others (Jose and Lee, 2007). As this research intends to understand the collaborative contribution towards collaborative sustainable-value creation, the subsequent step is to analyse relationships between each analysed corporate clean/green-environmental initiative/s (Bryman and Bell, 2015; Jose and Lee, 2007; Porter and Kramer, 2006).

Analysis/interpretation/findings

Project 1, analysis of each corporation's sense of mission (within NVivo 10)

With clear indication towards corporations' strong sense of mission, all four, intertwining and reinforcing categorical areas (i.e. purpose; strategy; behaviour standards; values) with nine mission statement components (i.e. core technology; customer/market; concern for employees; geographic domain/location; corporation's philosophy; product/service; concern for public image; self-concept; concern for survival) are positively stated in each, single corporations' annual reports. Thus, the defined, integral keyword's occurrence within annual reports of the specified timeframe encourages the interpretation of each OEM's and OEM-parts supplier's strong mission (Altenburg, 2014; Bryman and Bell, 2015; Campbell and Yeung, 1991).

However, as the entire data collection is not manually-coded, the accurate, precise, and exact matching of each parameter is not definite. Nevertheless, given each, single keyword's exceeding occurrence and overabundance in single automatically-coded reports, the researchers argue upon the highly, strong concentration of Campbell and Yeung's (1991) four, reinforcing and intertwining categorical areas, next to nine mission statement components (Bryman and Bell, 2015; Desmidt et al., 2011; Pearce II and David, 1987). Although, the researchers advise on precise auditing of automatically-coded documentary data collection, yet for this project, based upon researchers' assertion upon each corporation's strong mission, sustainability/CSR-efforts are continued to be progressed for all prior-defined corporations (Bryman and Bell, 2015; Campbell and Yeung, 1991; Kolk, 2008).

Project 2, analysis of each corporation's environmental and social sustainability initiatives (within NVivo 10)

All corporations actively-reported on sustainability/CSR within the set time frame, in two forms, either annual reports with integrated sustainability/CSR information or separate sustainability reports (Kolk, 2008). Based on extracted findings of parameters/keywords for each corporation's sustainability/CSR-efforts, the researchers explore the 20 highest keywords' occurrence of automatically-coded documentary data, that emphasis signals of concentrated environmental and social sustainability (Bryman and Bell, 2015; Kolk, 2008). Conclusively, each corporation's displays key, strategic clean/green-technological initiative/s with various focus on – prior-defined categorical areas, i.e. the three strategies of Hart and Milstein's (2003) sustainable-value framework: clean technology; pollution prevention; and product stewardship. Hereby, previous research and study cases, foremost on environmental and social sustainability reporting as well as certain frameworks, specifically with regard to termed indicators that in turn link to sustainability, offers potential key parameters/keywords for the three-interlinked strategic categories (Kolk, 2008; Salvado et al., 2015). Thus, this exploratory research classifies each corporation's strategic sustainability management with distinct intersection and interrelation between sustainability, sustainable competitive advantage, and sustainable-value creation.

Final step, analysis of collaborative contribution towards collaborative, sustainable-value creation (within IBM SPSS Statistics)

When analysing the quantified data's conjoint findings, the interpretation of German automotive industry's collaborative contribution towards sustainable-value creation is enabled. Within IBM SPSS Statistics 20, the researchers run univariate frequency distribution upon single SPSS-variable/s, of former NVivo-node/s, i.e. keyword/s, upon mean, maximum, and sum; and further, extract 20 most-occurred variables, according to sum, and visualise those findings in Figure 1 with variable's corresponding mean, maximum, and sum, as listed in Table 1 (Altenburg, 2014; Bryman and Bell, 2015).

Table 1 – Extract of three OEMs and seven OEM-parts supplier's collaborative contribution

	N = 670779		Mean	Maximum	Sum
	Valid	Missing			
Environmental AND management AND systems	10	0	2294,10	3287	22941
Environmental AND research AND development	10	0	1396,30	2581	13963
Increase AND investments AND R&D AND environmental AND products AND processes	10	0	1479,20	3880	14792
Integrated AND management	10	0	1558,10	2443	15581
Market AND value	10	0	1470,90	3174	14709
Product AND development	10	0	1056,90	1958	10569
Reduction AND fuel AND consumption AND emissions	10	0	892,30	1956	8923
Regional AND global AND environmental AND impact	10	0	1146,20	2030	11462
Report AND activities	10	0	1672,60	3312	16726
Risk AND management	10	0	2069,80	3718	20698
Sustainable AND development	10	0	990,50	1707	9905
Technology AND power AND vehicles	10	0	922,00	1896	9220
Total AND quality AND environmental AND management	10	0	2689,00	4077	26890
Waste AND management	10	0	1508,70	2715	15087
Cooperation AND stakeholders AND using less energy during product transportation	10	0	1112,00	2784	11120
General AND external AND report	10	0	1540,20	3073	15402
Integrated AND management	10	0	1558,10	2443	15581
Labour AND management AND relations	10	0	832,50	2458	8325
Sustainability AND requirements AND partners	10	0	850,00	2138	8500
Sustainability AND requirements AND suppliers	10	0	960,80	2372	9608

The top most findings, as accented highest quarter range in Figure 1, are interpreted, as those emphasise signals of concentrated environmental and social sustainability of the collaborative contribution (BASF SE, 2016; BMW AG, 2016; Bryman and Bell, 2015; Continental AG, 2016; Daimler AG, 2016; Hart and Milstein, 2003; MAHLE GmbH, 2016; Robert Bosch GmbH, 2016; Schaeffler Technologies AG & Co. KG, 2016; Thyssenkrupp AG, 2016; Volkswagen AG, 2016; ZF Friedrichshafen AG, 2016).

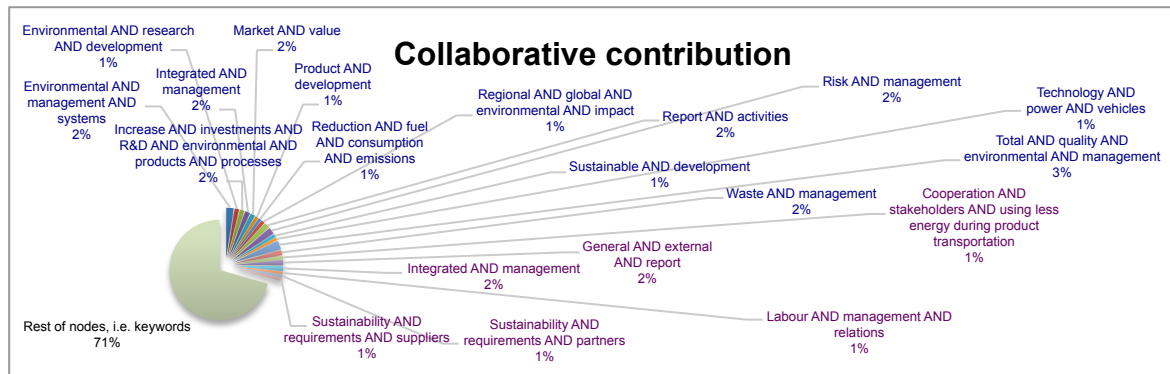


Figure 1 – Extract of three OEMs and seven OEM-parts suppliers collaborative contribution, i.e. 20 highest nodes/keywords' occurrence connected to environmental (blue) and social (violet) sustainability dimensions

When interpreting the extract of findings, variable's means indicate importance of the collaborative contribution to clean technology through investments in environmental research for clean/green-technological products and processes that create sustainable-value. With clean/green technology to power vehicles, German's automotive industry contributes with e.g. hybrid propulsion systems, to pollution prevention, particularly, through reduction of fuel consumption and emissions. With environmental policies and practices, as reports on corporations' activities towards sustainable development and sustainable-value creation, the industry offers next to industry-specific approach with clean/green technology to power vehicles, a more general approach to clean technology and pollution prevention. In comparison to environmental sustainability, social sustainability is addressed through product stewardship with focus set upon collaborative, integrated cooperation with all stakeholders, i.e. suppliers, partners, and employees, in collaborative sustainable-value creation of products and processes along the value-chain (Altenburg, 2014; Bryman and Bell, 2015).

Upon the researchers' interpretation, key guiding clean/green-technological initiatives of German automotive industry's strategic sustainability management are summarised particularly by evaluating highest means in relation to maximums. Thus, the interpretation leads to seven key, strategic clean/green-technological initiatives that enhance collaborative sustainability performance. Those initiatives, in turn, conjoin with Hart and Milstein's (2003) strategy focuses on clean technology, pollution prevention, and product stewardship. Based on those guiding, fundamental initiatives of environmental and social sustainability, this exploratory research enables to define specific instructions for German corporations, stakeholders, and society's collaborative sustainable-value creation. Hereto, the researchers relate to the above what, how, and why research questions, connects findings of collaborative contribution to create sustainable-value, and thus, forms operational guidelines that aid in dealing effectively with the ongoing global carbon crisis (Hart and Milstein, 2003; Kolik, 2008; Porter and Kramer, 2006).

Towards operational guidelines for collaborative sustainable-value creation

By building theory upon prior-defined OEMs and OEM-parts suppliers' strategic sustainability reporting with particular strategic focus on clean technology, pollution prevention, and product stewardship of Hart and Milstein's (2003) sustainable-value framework, seven applied, guiding key, strategic clean/green-technological initiatives are classified as the answer to the research *what*-question (Jose and Lee, 2007):

- product and process innovation from environmental core competencies;

- achievement of new clean/green technology, innovations of policy-making processes, and sustainable solutions for corporation's activities;
- competitiveness from sustainable development;
- sustainable-value from clean/green-technological products and processes;
- achievement of the higher ideal from reduction, minimisation, and elimination of waste and emissions;
- collaboration from joined sustainability best practices; and
- benefits to society and nature from German automotive industry's strategic sustainability management.

Ensured with the preceding findings of each corporation's strong mission (Campbell and Yeung, 1991), this research defines operational guidelines with those initiatives that include answers to the research *how* and *why*-questions. For this, the *why*-question is separately answered in perspective of environmental and social sustainability, and connects within the following subordinate clauses the answers to the *how*-question.

Environmental sustainability addresses the expectance of corporation's pursuit of effective environmental protection throughout the entire supply-chain to reduce/prevent carbon footprint, in rather more general-terms than particularly of just cars. Hereto, the guidelines aid in dealing effectively with the ongoing global carbon crisis through:

- effective, supportive clean/green-technological initiatives, as expected to create sustainable competitive advantage for corporation and entire supply-chain;
- corporation's implementation of specified sustainability requirements for suppliers and partners, as expected to lead to collaborative sustainable-value creation throughout the supply-chain; and
- accurate environmental performance assessment of suppliers and partners, as e.g. total environmental quality management is crucial for collaborative sustainable-value creation.

Social sustainability addresses corporation's application and implementation of sustainable activities, i.e. business processes to create collaborative sustainable-value throughout the value-chain. For this, i.e. corporation's:

- suppliers, partners, and employees are expected to operate responsible, according to corporation's sustainability requirements with measures and mechanisms for products and processes' waste reduction, emission minimisation, and pollution prevention; and
- integrated management involves participation of all, relevant stakeholders, especially, employees, partners, and suppliers.

Strengthened by reviewed literature, the compliance with those operational guidelines aid, next to collaborative sustainable-value creation for German corporations, stakeholders, and society, furthermore, through a low or non-carbon transition to an effective approach of Germany's endorsement in the long-term climate objectives – a global greenhouse gas-neutral state (BMUB, 2016).

Conclusion

When embedding the achieved operational universal-guidelines (i.e. product/process innovation from environmental core competencies; achievement of new clean/green technology, innovations of policy-making processes, and sustainable solutions for corporation's activities; competitiveness from sustainable development; sustainable-value from clean/green-technological products/processes; achievement of the higher ideal; collaboration from joined sustainability best practices; benefits to society/nature from strategic sustainability management), this research provides an initial step towards

a conceptual-framework, and contributes to further discussion on what can be achieved with clean/green-technological initiatives, why those initiatives matter, and especially, how German automotive industry's key, strategic clean/green-technological initiatives can be transferred to and implemented by environmental/sustainability managers within diverse industrial sectors to ensure with clean-green policies and practices the promotion of strategic environmental and social sustainability management.

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