

Sustainability and Its Effects on Organizational Behavior in the Automotive Industry

Jie Sun, JOÃO Bruno Soares, and Nicholas Kolar

Abstract—This paper reviews the history of the automotive industry in regards to the development of sustainability and the subsequent organizational behavior that leads companies to sustainable practices. We highlight technological development and various phases of manufacturing processes by comparing these advancements to historical practices to determine if the industry is progressing towards sustainable practices. We also explore green marketing practices of the automotive industry and the many environmental aspects comparing the past automotive cultural attitudes. Examples of sustainable initiatives by the automotive industry are categorized into three factors, which are environmental, social, and economical factors. The environmental aspects hinge on the effectiveness of new designs and advancements in green technology that contributes to. Green technology and environmental aspects are assessed in this paper. Our analysis shows that the automotive industry has been progressing towards sustainability through the efficiencies of the industry's logistics, supplier relationship management, customer relationship management and environmentally friendly production.

Index Terms—Sustainability, organizational behavior, green marketing, automotive industry, environmentally friendly, green technology.

I. INTRODUCTION AND LITERATURE REVIEW

The automotive industry is defined as a wide range of companies and organizations involved in the design, development, manufacturing, marketing, and selling motor vehicles. By using this definition and the parameters that define the industry we can now develop areas to investigate which will help in determining the extent of green marketing and its effective reduction of environmental pollution.

The history of the automotive industry begins in the 1890's where hundreds of manufactures offered horseless carriages. The United States led the world in automobile production and by 1929 there were over 32 million automobiles worldwide with 90% being produced by US manufacturers (OICA) [1]. At this time in the US there was one car for every 4.87 person.

World-wide production of automobiles has fluctuated between various countries since the Great Depression with the US, China, and Japan being the top competitors. The US produced about 75% of the world's automobiles after World War II but by the 1980's Japan had overtaken the top spot. In 1994 Japan became the leading manufacturer of automobiles then again in 2006 Japan held the top spot till 2009 when China took over the top spot by producing 13.8 million units.

In 2012, China nearly doubled US production with 19.3 million units, with US manufactures producing 10.3 million units and Japan a close second with 9.9 million units [2], [3].

The first major technological development to the manufacturing process of automobiles was the perfection of the assembly line and the use of interchangeable parts. Modern concepts have been added to the way assembly lines operate today. Toyota's TQM and Just-In-Time production are effective in the reduction of waste and time when assembling vehicles (Toyota) [2]-[4]. This effectively reduces the amount of energy it takes to make a vehicle and reduces the amount of waste that ends up in the landfill.

The automotive industry's environmentally friendly vehicle was developed by Toyota and was called the Prius. The Prius is the first mass produced hybrid vehicle and went on sale in Japan in 1997. It was introduced worldwide in 2000. The Prius represents a design and attitude change of automotive companies towards green technology and green marketing. Other concepts have followed since the Prius hit the market. Chevy has come out with the Volt which is an all-electric vehicle; Nissan has also come out with the Leaf which comes in electric or hybrid versions [4], [5].

Tesla has also produced an electric vehicle that represents the high end markets but plans on developing economy class vehicles for mass production. The automotive industry has also been developing hydrogen powered cars, biodiesel and propane vehicles which all haven't been conducive to current infrastructure capabilities. Initiatives taken on by the automotive industry have transformed not only how the world views the product but defines what the company stands for. BMW has received the Environmental award for its investments in clean energy. This award was not only for its low emission vehicles but also the process and innovative capabilities BMW possesses when it comes to clean energy. BMW has strategically placed its state-of-art manufacturing facilities closest to its largest consumer market the US [4], [5].

Factors that influence organizational behavior are green technology and environmental impact. These two main concepts ask the question whether consumer demand dictates the automotive industry's behavior or does the need to reduce waste create higher profit margins. Environmentally friendly company's conscious about carbon footprints, air pollution, and water pollution are the hot trends in the automotive industry. But they weren't always that way [6].

In the 21st century, consumers are increasingly concerned with whether the products are green or not and this has brought the automotive industry back to the drawing board.

With the Prius being introduced to the world in 2000, consumers are looking at miles per gallon (MPG) rather than horsepower and towing capacity. This new MPG is the

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prominent selling point of every car commercial with horsepower being substituted for not only fuel savings but environmentally friendly advertisement. These demands have spawned a new style of management in the automotive industry called Green Innovation Management. Green Innovation Management is a process that many companies in the automotive industry use to enhance environmental performance while at the same time enhancing competitiveness [7]. Some examples of these processes are the six sigma program, TQM, ISO certifications, and the Just-In-Time system developed by Toyota [7], [8].

II. THEORETICAL FRAMEWORK

According to Capra [9], sustainability must be seen as a chain of related aspects and facts, thus it can be classified as a “Strategic Issue”: “...sustainability must be analyzed taking into account the nature of sectors, organizations, processes and products within a society. A challenging principle would imply a systematic approach to understanding the impact of an organization on the economy, society and ecological environment.” [9].

Therefore, many firms started a “self-declaration” of their “green-acts”. But “it is important to understand that each company adopted a different interpretation and forms of presenting their environmental practices and initiatives” [6]-[9]. So, it has been really common to find new “environmental initiatives” as support for cost reduction, competitiveness tools and differentiation. So, new labels and claims like “Eco-friendly”, “Green Product”, “Going Green” and “Eco-Development” have been more frequently used in business vocabulary.

All sustainable initiatives can be in the three major dimensions or the bottom line, Environmental, Economic and Social. Fig. 1 shows exactly the importance and correlations among all factors.

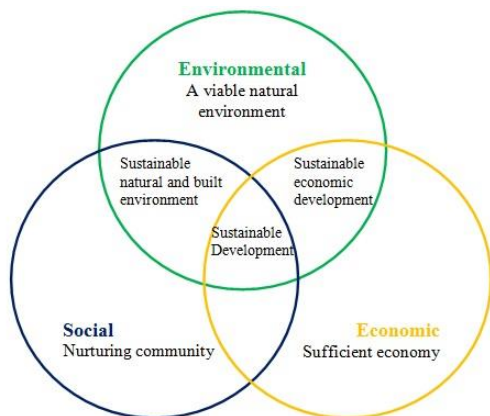


Fig. 1. Classification of sustainable initiatives.

A. Environmental

“The environmental aspect of sustainability involves taking care of our surroundings. This includes everything from picking up litter and reducing pollution to wildlife and rainforest conservation. This is the only planet we have, so we'd better take care of it.” [10].

B. Economic

“In today's world, it's very difficult to get by without money. We need to live responsibly and within our means so that we aren't a burden on others. This is as true for you and me as it is for cities, states and countries around the world. No one can prepare for every situation, but we can still do our best to make sure we can support ourselves.” [10].

C. Social

“We should all aspire to treat ourselves and each other with fairness and respect. This is as simple as letting someone merge into your lane during heavy traffic to respecting the views and opinions of people who disagree with you to working towards social justice in faraway countries. We don't have to like everyone we meet, but we all have to share the planet.” [10].

III. ANALYSIS

“The automobile industry has made remarkable positive contributions to the world economy and people's mobility” connecting and giving people a wider horizon. “But its products and processes are a significant source of environmental impact” [7]-[10].

The same authors expose: “Total world production of cars reached more than 53 million units in 2007 and if commercial vehicles are incorporated this increases to 73.10 million units. Recently, there are approximately three-quarters of a billion cars worldwide and, if the industry continues to produce cars at the current rate, there will be two billions cars on the road by 2050 [11].”

The amount of cars has increased daily as well as their environmental impact. From production through discard, cars have contributed greatly to pollution. Hence, numerous firms are looking for a way to enhance their “environmental performance”. The “Green operations practices” can be considered one of those initiatives assessed by the “Environmental Operation Management” [12] to strengthen strategy. From the time when strategy started to put a strong focus on lean production, it dramatically reduced the costs, pulling also the prices, thus margins, down. So for example, the Japanese companies, considered pioneers of the “Just-in-time production”, “cannot rely any further on the benefits of lean production alone as the rules of competition changed from the 1980s to the 1990s.” [13]-[15].

Population growth combined with the ease with which credit can be obtained has generated a considerable increase in the sale of vehicles, compared to previous decades. The worldwide production of vehicles, including heavyweight commercial vehicles, grew 3.20% in 2011 compared to the year 2010, leading to a record volume of 80.10 million units produced according to data from OICA [1].

Although, this data is positive from an economic standpoint, there has been a considerable increase in the environmental impacts generated throughout the supply chain as a result of the consumption of natural resources and the waste generated. The production of automobiles consumes vast amounts of natural resources, and generates huge quantities of waste throughout the supply chain. According to Karlsson [16], over 10,000 items can be used in the production process. Transforming these items into an

automobile can generate negative impacts in the sustainable development process which is known in the business environment as the triple bottom line, aimed at balancing economic environmental and social development. Many of the actions carried out in the automotive supply chain prioritize the generation of significant economic impact for companies and for society, placing less emphasis on the environmental and social dimensions [17].

Freyssenet [18] asserts that the automobile industry is undergoing a second revolution. This time it is based mostly on the petroleum shortage and growing needs in big cities. Thus, companies related to the automobile industry are seeking to develop lucrative environmentally friendly vehicles, especially due to regulatory penalties and the demands of customers [19]-[21].

There has been a growing interest in the adoption of sustainable practices in the automobile supply chain and an increase in the number of publications related to the cause and effect relationships of such practices. However, there is a lack of research that organizes these practices and how they are measured. Many of the studies focus on presenting isolated results from specific manufacturers. Chaharbaghi and Willis [22] say that many authors focus on discussing theoretical models of sustainability rather than presenting results of their practices. In this sense this paper aims to identify the main practices and sustainable performance measures in the automotive sector. Furthermore, it aims to identify the main categories of the studies that can be fulfilled within the reality presented by the companies [23].

Strategic eco-design initiatives to reduce impacts.

Among all needs and initiatives it may be a hard and confusing decision, the indication of which area or practice is going to be on the top list of priorities. How do we know which one is the correct, or the most significant environmentally? Not to mention, which is cheaper or the one with a better ROI (Return of investment)? This is a very common feeling in the midst of management boards.

“Most environmental initiatives are fuzzy, and there are also many other non-environmental factors issues that need to be addressed such as investment or cost feasibility, customer satisfaction and quality requirements. Furthermore, it is fundamentally important to consider that environmental initiatives must compete against other prospective projects in an organization (marketing campaigns, production capacity expansion, quality improvement, etc). On the other hand, public pressure, legislation, possible cost reduction and improved company image may be sufficient motivation to improve environmental performance [7], [24].

Nevertheless, researchers noticed an evolution through environmental management, a “Historical Path” showing how it evolved from pollution control in the 1970s to pollution prevention in the 1980s to the subsequent implementation of systematic product and process management [7]. There are so many possibilities that a company could invest in, like “in facilities, manufacturing, logistics, marketing, process and product design, etc.” [20]-[24]. Which one is the is “key area for improvement” that “gathers the environmental requirement needs and the company’s goal for profitability?”

“Indeed, it is not always that environmental management initiatives will return a profit for an individual initiative or

provide a match with all corporate objectives. There will be conflicts, mainly when the initiatives are taken under an opportunity cost analysis. However, the more that businesses consider the importance of managing intangibles, the more environmental issues will become better commended and prove valuable; even starting with an economic or financial analysis” [20], [22], [24].

These are only a few topics about why “environmental and sustainability management decisions are, in fact, strategic subjects”. Summing up, as well as any other management processes, these must also be controlled and analyzed prior to and after implementation in order to measure performance with the appropriate metrics and indicators. Once “the essence of logistics is not to simply reduce costs” [25], [26], such effectiveness may be primarily evaluated like this. But, pollution control and/or prevention, is also being seeing “from the perspective of resource inefficiency” [27] leading to resources usage performance and then when the full suite is composed it generates an actual competitive advantage.

A good example of the importance for evaluating in the “Environmental Management Systems (EMS)” is the ISOs. Specifically the “ISO 14000” that examines these particular topics, establishing a “control over the consumption of natural resources and the generation of waste” [28], and has been accepted as prerequisites for quality in a flatness standard.

Once the practices and goals are listed, the companies, through its managers, must then start a process of implementations, which comes with several barriers and impediments. The most complicated step within any change needed, at any level, is the people involved. These difficulties often create a “gap between organizational desires to be environmentally responsible and actually engaging in environmental management practices [29]. Cantor, *et al.* [29], also list “the several reasons why organizations may experience difficulty implementing environmental initiatives.

First, many environmental initiatives are not initially advanced by organizational leaders but are instead promoted by those at lower levels within the organization. Garnering support from those in leadership positions to redirect organizational energies is thus one hurdle. Second, implementing an environmental initiative will often necessitate resource reallocation and changes in business practices that will not be favorably received by everyone in the organization. Third, environmental issues have been recognized as a major challenge for decision-makers as they must reconcile competing viewpoints of internal and external stakeholder views on environmental matters. Moreover, the process of adopting and resisting new environmental practices can generate ambiguity among employees regarding the true level of organizational support for environment activities. Finally, the adoption of new environmental practices has been shown to be difficult unless an organizational member is specifically assigned to serve as the proponent or champion of such efforts [28], [29].

The called “champion” is the person responsible on the engaging of the employees, as a leader, a trend maker that pulls the correct behavior within the company culture. Therefore, it is all about “the commitment of environmental managers to act as champions of such endeavors” [30]-[32].

The main reason for such need on transparency of acts from the hierarchy is the base for the called “Perceived Organizational Support” (POS). “People are more likely to act on behalf of an organization to the degree they perceive the organization as being ready to provide them help when needed and reward their increased efforts [31]. POS is the perception on the part of employees of the extent to which the organization values their contributions and cares about their well-being.

Aselage and Eisenberger [32] highlight that empirical tests of POS have shown that employees strive to repay an organization for its demonstrations of support by increasing their efforts to help the organization reach its goals. Thus, transparency is a must from all people involved into the processes, especially when the goal regards behavior and engagement from co workers. “They are successful champions of organizational environmental practices because they are personally committed to environmental issues; individuals’ commitment to environmental practices in a company is associated with their personal level of environmental behaviors [29].

So, how would a company evaluate such commitment and engagement on the part of the employees? Some companies develop their own metrics, based on securing certifications, as the International Organization for Standardization (ISO) “that focus on the extent to which organizations meet specific, non-governmentally imposed standards” [20]-[22], like the ISO 14001, that regards sustainability, and the ISO 26000 which is not necessarily a certification, but a set of norms that guide the companies in regards to its people, community, human rights, etc. One internal metric used by the companies for evaluating these aspects is the turnover percentage, evaluating the “desired behavior” [33]-[35], when matches or not the company’s goals and needs. In addition to the metrics, firms develop several “training programs, reward structures, and a supervisor’s support for the environment” [18]-[20], [36], to better engage all people involved.

All factors listed above, difficulties, people involved, champions, metrics are under the umbrella of the “Supply Chain Relationship” (SCR) - “the relationship formed between two independent entities in supply channels to achieve specific objectives and benefits [33], [36]. These links must be strengthened internal and externally, among employees and suppliers.

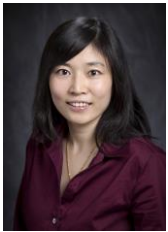
The company’s culture defines the level of communication with suppliers, being essential to to SCR [33], [36]. Once the culture and values define other aspects linked like trust and commitment, we could then assume that it directly impacts the performance and productivity of the employees.

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