CHALLENGES IN THE IMPLEMENTATION OF REVERSE LOGISTICS IN THE AUTOMOTIVE INDUSTRY

ABSTRACT

Due to growing environmental concerns, the need for recovery of returned vehicles has been receiving more attention than ever before. Yet, not many automobile manufacturers have a satisfactory reverse logistics system for recovering and re-using returned vehicles. The purpose of this article was to explore challenges associated with the implementation of green logistics for end-of-life vehicles in the automotive industry in South Africa and to provide insight into how these challenges can be overcome. This article reported findings of a qualitative study involving interviews with 12 participants from four automotive companies in South Africa. Purposive sampling techniques were used. Five themes emerged from the primary data collection, all of which were identified as key challenges in the implementation of green logistics in the automotive industry. From the findings, these challenges include lack of collaboration, knowledge sharing and standardised application of reverse logistics processes; lack of strict adherence to environmental policies; failure of consequence management for non-compliance; absence of clear policy and legislative direction; perception around the cost of implementing reverse logistics; and inadequacy of leadership. On the basis of the literature reviewed and empirical findings, conclusions were drawn and recommendations accordingly made.

Keywords: automotive industry, end-of-life vehicles, reverse logistics, sustainable supply chain

INTRODUCTION

Since the publication of the Brundtland Report known as “Our Common Future” in 1987, the world is constantly reminded of the need for economic development that could be sustained without depleting the natural resources or harming the environment. Plummer and Armitage (2007:62) concur that concern for the environment has increased significantly in modern times and that signs of environmental deterioration and climate change caused by global warming have touched everyone. As a consequence, governments, businesses and civil society have taken steps to preserve the environment and sought to reduce the effects of human activities on the environment (Jie 2008:971; Strange & Bayley 2008:11). Hence, such environmental concerns have caused supply chains not only to focus on efficiencies, but to also incorporate environmental concerns into the whole supply chain so that they are greener and the production of pollution and waste is eliminated (EPA 2009:10).

Sadly, the latest Global 500 Greenhouse Gases Performance Report by Moorhead and Nixon (2016:3) indicates that ‘the world’s largest businesses’ aggregated emissions increased when they should have decreased’. The increasing pollution is not only as result of greenhouse gases but products that have reached their end-of-life. According to Zarei, Monsour, Kashan and Karimi (2010:16), when a product reaches its end-of-life (EOL) stage, it can potentially pollute the environment. Yet, EOL products sometimes have important parts, components, and materials that can be returned to the production line or could be used again, thus necessitating the producer to at least provide a return pathway. This is referred to as reverse logistics. According to Baenas, De Castro, Battistelle and Junior (2011:169) reverse logistics can provide companies with a competitive advantage through acceptable environmental practices and may provide an opportunity for a company’s additional economic activities. By its nature, the automotive industry presents an ideal opportunity for the implementation of reverse logistics. In this regard, Chan, Chan and Jain (2011:14) observed that reverse logistics is increasingly becoming important to the automotive industry for reasons such as the inevitable product recalls and legislative policy regarding environmental and sustainable issues.

PROBLEM INVESTIGATED

Due to growing environmental concerns, the need for recovery of returned vehiclesis receiving more attention than ever before. Yet, Chan *et al*. (2011:14) acknowledged that not many automobile manufacturers have a satisfactory reverse logistics system for recovering and reusing returned vehicles, partly due to a lack of systematic investigation of this area. At the same time, Badenhorst and Nel (2012:73) hold the view that the concept of reverse logistics is often “misunderstood and academic research in this field is limited, especially in South Africa”. The under-researched state of reverse logistics affects the automobile industries adversely in that well-informed consumers are shying away from companies that do not engage in environmental friendly activities (Estes 2009).

Whilst literature on reverse logistics has been growing over the past years, limited research has been undertaken in the automobile industry. For example, Veiga (2013: 26-34) analysed the efficiency of reverse logistics programme for pesticide packaging under the Brazilian Waste Management Policy in the agricultural industry. In China, Lau and Wang (2009) investigated whether current reverse logistics theories and models can be applicable in developing countries like China using the electronic industry as a case study. Again, much of the existing research on reverse logistics and its implementation are focused on advanced countries, with little attention being paid to developing countries such as South Africa (Correa & Xavier 2013:12). Furthermore, Abdulrahman, Gunasekaran and Subramanian (2014:2) concluded that the benefits and the implementation of reverse logistics have yet to be fully researched and realised in developing countries. Alnuwairan (2016) also agrees that reverse logistics has not received the desired attention in emerging economies and is mostly carried out by unorganised sectors. This leaves a gap in South African literature, which provides a justification for the research study.

RESEARCH OBJECTIVE

The aim of this paper is to explore the implementation of reverse logistics by the automotive industry in Port Elizabeth. To that end, the paper is organised as follows: The next section reviews literature by first providing a brief background of the South African automotive industry, then discusses the reality of end-of-life vehicles and scrap, followed by the explanation of the concept of reverse logistics. The literature review will be followed by a section describing the research methodology employed in the study. The next section presents the findings and analysis thereof. Finally, the paper concludes and offers some recommendations emanating from the study.

LITERATURE REVIEW

Background of the automotive industry

The automobile industry is made up of all activities involving the manufacture of motor vehicles and components such as engines and bodies, excluding tyres, batteries, and fuel (Menk & Cregger 2015:3). The major products are passenger automobiles and light trucks such as pickups, vans, sport utility vehicles and commercial vehicles. The industry was born out of the advent of the technological revolution that occurred in Europe during the early 1800s and continues a century later with the ground-breaking efforts of American manufacturers to start mass-car production (Nieuwenhuis 2014:20). According to Blazquez-Diaz and Gonzalez (2016:128), the modern global automotive industry involves the main manufacturers such as General Motors, Ford, Toyota, Honda, Volkswagen, and DaimlerChrysler, all of which operate in a global competitive marketplace. As a result of the building of important overseas facilities and establishment of mergers between large multinational motor manufacturers the last half of the 1990s saw an increase in the globalisation of the automotive industry (Ambe & Badenhorst-Weis 2011:345).

Initially, the automotive industry and the global market were by far dominated by the American companies until the Japanese entered the industry in the 1960s and 70s.

Following World War II and the impact of this modern era of globalisation, Germany joined the United States and Japan as the top three automobile manufacturing countries in the world (Swift 2009:11). Currently, the picture has changed somewhat, with China's motor industry estimated to be twice that of the United States, followed by US, Japan, Germany, and South Korea (Carley, Duncan, Esposito, Graham, Siddiki & Zirogiannis 2016:19). McKinsey and Company (2013:13) states that 'the automotive industry's economic centre of gravity will continue to shift, as sales volumes and market share keep moving toward emerging markets'. Having said that, since the end of the Second World War, the automotive industry has been the bedrock of the manufacturing industry and one of the key drivers of technological advancement in the United States of America, Japan and different parts of Western Europe (Pavlínek 2012:19). In countries such as the United Kingdom, Japan, France, Italy, Sweden, Germany, and South Korea, the sales of motor vehicles is significant to the maintenance of healthy international trade balances (Amighini 2012:350).

Whilst some big motor industries own manufacturing plants in countries other than their own, generally the development of the auto industry in developing countries was mainly limited to assembly operations. In the quest to increase the local content of motor vehicles assembled in their respective countries, governments embarked on the promotion of localised automotive component manufacture plants (Börzel, Hönke, & Thauer 2012:89). Globally, motor manufacturing is scattered across Asia Pacific, Europe, NAFTA, Europe, Central and South America, and the Middle East and Africa. Table 1 shows the vehicle production volume over a period of 15 years.

Table1: Vehicle production volume over the past 15 years

No.	Year	Cars produced in the world
1	2014	68,494,568
3	2012	63,081,024
4	2011	59,897,273
5	2010	58,239,494
6	2009	47,772,598
7	2008	52,841,125
8	2007	53,201,346
9	2006	49,918,578
10	2005	46,862,978
11	2004	44,554,268
12	2003	41,968,666
13	2002	41,358,394
14	2001	39,825,888
15	2000	41,215,653

Source: International Organization of Motor Vehicle Manufacturers (OICA 2015)

End-of-life vehicles and scrap

An end–of-life vehicle (ELV) is any automobile that has come to the end of its useful life following many years (usually ten) of wear and tear through regular use, after which it can then be de-polluted and recycled and sold as scrap metal (Go, Wahab, Rahman, Ramli & Azhari 2011:1539). Some vehicles can also come to the end of their useful life prematurely through irregular means such as accident, fire, flood or vandalism damage. In such cases the vehicle may be sold complete as damaged-repairable salvage or dismantled and the parts sold separately (CPCB 2016:1-73; CIWM 2014).

End-of-life vehicles are among some of the most well recycled products in the world. Their valuable components are removed by auto dismantlers for refurbishing and for re-use in spite of the fact that this sector seems to be slowing down due to the current leaning towards newer, more reliable vehicles with long warranty periods. (Rumpold & Antrekowitsch 2012:695). The ELV is shredded by metal recyclers and the metal fraction, accounting for approximately 70% of materials by weight, is then recycled while the remaining part of the ELV, known as residue (mostly plastics, seat foam, glass and rubber) is sent to landfill as waste. According to Hopewell, Dvorak and Kosior (2009:3), recycling levels produce positive environmental outcomes, which mostly compensate for the significant effects that occur in the production and in-service life span of vehicles. The environmental impacts of ELVs should not be considered in isolation from total life cycle impacts. For example, Nel, Madler, Velegol, Xia, Hoek, Somasundara and Thompson (2009:551) posit that while the increased use of plastics in cars may produce detrimental EOL consequences they are more likely to produce net environmental gains given reductions in energy use and emissions during the vehicles' operational life.

An ELV has an effect on the environment through pollution and resource loss. The pollution impact on the environment possibly arises from landfilling waste from metal shredders. There are also poor environmental practices at some auto dismantlers and other ELV treatment facilities and vehicles abandoned in the environment that contribute to pollution. Oil, coolant, fuel, brake and other fluids; air-conditioning gases; and heavy metals including lead, hexavalent chromium, cadmium and mercury are all considered as materials with likely negative environmental consequences in ELVs. The extent of environment exposure has been considerably reduced by existing regulatory requirements in relation to some of these materials (Hawley 2011:6). When the reuse of ELV and material recycling is not maximised, this leads to waste and resource loss, which also has an effect on the environment.

The unrecyclable portion of ELVs, which is normally non-metal materials makes up about 30% of the entire vehicle with a total aggregated amount estimated at between 70,000 and 195, 000 tonnes of waste produced each year (Achternbosch, Kupsch, Sarademan & Braugtigam 2009:387). In addition to the environmental impacts, it is expected that ELVs will also result in further financial and economic benefits through the promotion of resource efficiency, which is achieved by promoting recovery and re-use of valuable materials and components thereby reducing raw material and energy costs. Local government can save costs if the expenses of dealing with abandoned cars are reduced. The problem of vehicle crime and fraud can also be addressed through an enhanced system of deregistration (Kazmierow, Cessford, Wilson, Mayhew & Morrison 2009) by enhancing the efficiency and sustainability of the treatment sector; raising professional and environmental standards and promoting modernisation of operations; reducing the costs of landfill to firms and the public; and by increasing rates of reuse, recycling and recovery (Zorpas & Inglezakis 2012:74).

ELVs are a known source of the hazardous pollutants such as cadmium, lead, poly-aromatic hydrocarbons (PAHs), and zinc, as well as mercury and nickel. -the incorrect handling of ELV fluids and components when dismantling could result in polluted storm water runoff and subsequent environmental damage (Sawyer-Beaulieu, Stagner & Tam 2014:238). Oils from ELVs, such as engine fluids, transmission fluid, and antifreeze, are of particular concern because they contain a large quantity of these metals. ELVs are normally handled in the open where they can be exposed to storm water such that when it rains, untreated storm water can wash harmful substances into creeks, rivers, lakes, and coastal waters (Arbitman & Gerel 2003:6-7). One main concern for environmentalists is that about 6% all of ELV fluids and air conditioning refrigerant are released into the environment (Beukens & Zhou 2014:2005).

Reverse logistics

More recently, environmentalists have influenced companies' perceptions and practices on supply chains (Holt & Ghobadian 2009:933). The result has been the need to develop supply chains and logistics practices sensitive to the environment (Walker, Di Sisto & McBain 2008:69). This attempt, among other things, has given rise to the affirmation of a specific branch in the theory of supply chain management called reverse logistics. According to Stoyanov (2012:40), reverse logistics is typically seen as rather a new field of research, which has received attention during the last two decades. Some reverse logistics practices (recycling, solid waste management) have in their own right been common long before this period of time and have in some cases been a subject of interest for different researchers. Although the trend of reverse logistics was in existence for a quite some time, it did not gain recognition until recently (Benjaafar & Daskin 2013:102). This area has triggered interest in many people in terms of the impact it has had and continues to have on the business world. It has thus become a moderately serious issue in recent times primarily due to retailers having been forced, as a result of increased competition, to take a soft stand as far as returns are concerned (Bennekrouf, Aggoune-Mtalaa & Sari 2013:67).

Reverse logistics is a process that involves the movement of goods from their final destinations which are the customers or end users back to the manufacturers or suppliers, for the sole reason of recapturing value through remanufacturing, re-use, refurbishment or recycling, and proper disposal of accumulated waste (Amemba, Nyaboke, Osoro & Mburu, 2013:51). It involves the backward flow of goods from the final destination to a manufacturer or supplier for the purpose of attaching value to the products returned and proper disposal (Salema, Barbosa-Povoa & Novais, 2010:336).

According to Jindal and Sangwan (2015:397), the four basic drivers for reverse logistics include regulations, customer pressures, social responsibility and estimated business profits. Guang Shi, Lenny Koh, Baldwin and Cucchiella (2012:61) concur that environmental regulations and consumer pressures to improve customer service are the driving forces behind organisations focusing on reverse logistics. Reverse logistics can be enhanced by the interactions between supply chain partners, increased profits through reduced costs, and improved efficiencies and higher recovery rates for returns (Guang Shi *et. al* 2012:61). The implementation of automotive reverse logistics not only helps to improve enterprise logistics service levels and improve operational efficiency, but it also reduces production costs. Automotive reverse logistics in the social perspective can minimise the adverse impact on the environment by effectively increasing resource utilisation, while also promoting the development of green logistics (Lai & Wong 2012:278).

In recent times, reverse logistics as a greening instrument has attracted interest from many industries (Jamshidi 2011:253). A manufacturer uses reverse logistics as a tool to gather products at the end of the life cycle from the point of the consumer for recycling and re-manufacturing (Agrawal, Singh & Murtaza 2015:87). At the heart of this is a lack of awareness about reverse logistics activities in the firms. Furthermore, Yang, Lin, Chan and Sheu, (2010:218) observed that manufacturing industries have a very low level of environmental consciousness. The fact that reverse logistics practices are generally not so popular and the various possibilities uncertain, many companies are dissuaded from implementing such practices. Even if companies are aware of the possible outcomes of reverse logistics activities, they would rather pay attention to other operational activities within the company. Also, the potential outcomes of reverse logistics activities are thought to be short-term (Lee *et al.* 2012).

Cost and environmental effects can be seen as the striving force behind reverse logistics (Lambert & Gupta 2016:34). Sundin and Dunback (2013:3) observed that the remanufacturing sector in general and the automotive industry, in particular, have over the years, shown to be beneficial to the environment and economically lucrative to the companies involved as well as to their customers. Abdulrahman *et al.* (2014) identified the following four barriers to the implementation of reverse logistics in the Chinese motor industry:

- **Management barrier**: The first key barrier to the implementation of reverse logistics is low commitment and lack of expertise at the management level.
- **Financial barrier**: Lack of initial capital and funds for returns monitoring systems.

- **Policy barrier**: There are two key policy barriers to the implementation of reverse logistics in the automobile industry which are lack of enforceable laws, regulations and directives on take-back of end of life vehicles and lack of government supportive economic policies.
- **Infrastructure barriers**: Lack of systems (hardware/software) to monitor returns is the major hurdle to reverse logistics implementation in the manufacturing companies.

Kapferer (2012) states that it is a generally held view that when a product is recycled or remanufactured the quality cannot be the same as a new product. The perception of poorer quality product acts as a challenge for the companies because in the eyes of customer it is expected that the same quality level must be offered after processing the returned products. According to Rogers, Lembke and Benardino (2013), companies can no longer afford to treat reverse logistics management as an afterthought; rather as a central part within the supply chain organisation. For years, most shippers paid little attention to returns. This trend seems to be changing as industries are progressively realising that understanding and properly managing their reverse logistics programmes can not only reduce costs, but also increase revenues. It can also make a difference in retaining consumer loyalty and protecting the brand (Dey, LaGuardia & Srinivasan 2011:240).

RESEARCH METHODOLOGY

Research approach

This study adopted a qualitative research paradigm, which is fundamentally exploratory in nature. Since literature on reverse logistics in the automobile industry and its implementation is emerging and still limited, an exploratory design was chosen in order to be conversant with the basic details, settings and concerns. In this regard, Yin (2011:5) states that the researcher in a qualitative research aims to ascertain a deeper understanding of the management dilemma and conceptualises ways of solving them. This study sought to explore the implementation of reverse logistics in the automotive industries with a view to providing empirically-supported recommendations that would enable the industry to curtail environmental waste. One important characteristic of qualitative research is that the process is inductive rather than deductive in that researchers gather data to build concepts, hypotheses or theories rather than deductively testing theories or hypotheses (Gill & Johnson 2010:12). Thus this study gathered primary and secondary data with a view to understanding reverse logistics in the automotive industry.

Selection of participants

Participants in this study were selected purposively. This form of selection is also known as judgemental or selective ‘sampling’, since the selection of participants depends on the judgement, knowledge and experience of the researcher (Cresswell & Plano Clark 2011:87). In the case of this study, the researcher’s knowledge and experience of the South African automobile industry enabled him to carefully select and approach individuals who would participate in the study. These participants were high profile logistics professionals in the automobile industry from four companies. These had to be involved in reverse logistics in their respective companies. Twelve participants agreed (three from each of the four companies) to participate in this study and were able to share their insights into reverse logistics practices in the industry with the researcher.

Data collection

Primary data were collected using semi-structured interviews while secondary data constituted the literature reviewed throughout the study and some few internal publications provided by participants as well as publicly available data relevant to the topic being observed. Semi-structured interviews are flexible, allowing new questions to be brought up during the interview as a result of what the interviewee says (Goddard & Melville 2005:49). Where necessary, open-ended questions were used during the interview in order to elicit in-depth information on the constraints and successes of implementing reverse logistics in the South African automobile industry. After the twelfth respondent, the researcher felt that there was no longer any fresh inputs from the respondents and accordingly determined that the primary data had reached saturation. It was therefore no longer necessary to continue with more interviews.

Data treatment

There are different ways of recording data in a qualitative research, including note-taking and using electronic devices such as tape recorder, video recorder or digital voice recorder (Boeiji 2010:3). In this study, after seeking permission from the respondents a digital voice recorder and note taking were used to record proceedings of the interviews. In supplementing their information, some participants made reference to company material during the interview. Each recorded interview was transcribed, reviewed, combined with field notes and analysed. The data were analysed with a view to determine themes emerging repeatedly from the transcripts. The meaningful and symbolic content of qualitative data was examined mainly during data collection (Braun & Clarke 2006:88). Hence, data was examined as it accumulates to observe any major emergent themes or patterns. To this end, coding, which served to summarise, synthesise and sort many observations made of the data was used. Coding involves compressing data under broad headings and sub-categories which allows subsequent retrieval for the purpose of comparison (Kagan 2010:43). Resultantly, five themes emerged from the study.

Trustworthiness

In order to ensure the trustworthiness of the study, certain measures were taken. To that end, the study's credibility and dependability were ascertained as discussed next.

- ***Credibility***

Credibility criteria entails establishing that the results of qualitative research are credible or believable from the standpoint of the participant in the research (Scheyvens 2014:5). Since the purpose of qualitative research is to describe or understand the phenomena of interest from the participant's view, the participants are the only ones who can rightfully judge the credibility of the results. Participants were constantly made to feel that their role in the study was necessary and appreciated in order for them to feel trusted with their contributions. The fact that these participants, being decision makers in their respective companies agreed to participate gave credence to the study.

- ***Dependability***

According to Warcup (2015:3), a dependable study needs to be precise and consist and that one of the ways of determining the precision and consistency is through inquiry audit, which refers to the scrutiny of data and relevant supporting documents by an external reviewer. In this regard, the environmental audits, reports and figures provided by the participants from the automobile industries in South Africa and their role players such as external consultants, confirm the dependability of the data collected.

DISCUSSION OF THE RESULTS

Notwithstanding the growing interest in and the apparent benefits of reverse logistics in the automotive industry in South Africa, the current study identified a few challenges that the industry need to overcome. These include lack of collaboration, knowledge sharing and standardised application of reverse logistics processes; lack of strict adherence to environmental policies; failure of consequence management for non-compliance; absence of clear policy and legislative direction; perception around the cost of implementing reverse logistics; and inadequacy of leadership. These challenges are discussed below.

Lack of collaboration, knowledge sharing and standardised application of reverse logistics processes

Although the majority of participants acknowledge the existence of some form of reverse logistics processes being implemented in their respective companies, they do admit to a lack of collaboration, knowledge sharing and standardised application of reverse logistics processes across the different departments within their companies. The respondents further stated that there seems to be no deliberate and strategic management policy or structural arrangements to incorporate reverse logistics in some departments. In some cases, they observed that issues of return and recycling are outsourced to different companies. One respondent indicated for example, that each department deal with spare parts and waste differently and that there is no uniform way of handling this. He stated:

> First of all we recover all good components and fluids that may be recycled and re-used like fuels, oils, coolants, ferrous and non-ferrous metal components, etc. Then secondly, we remove all those negative elements of a vehicle that are potentially harmful to the environment such as tyres, mercury switches and airbags. These are done by each department differently….so there is no uniformity in disposal or salvaging of waste in the organisation. (Respondent 11)

Yet, Dixon (2011:13) recommended that for reverse logistics processes to be effective, firms usually require specialised infrastructure with unique information systems for identifying, tracking, dedicated equipment and collaboration between the functional departments for the processing returns. According to Armstrong and Lehew (2011:32) reverse logistics needs to be a collaborated practice in every department in an organisation.

Lack of strict adherence to environmental policies, monitoring and control systems

The respondents indicated that there are currently strict environmental policies and monitoring systems in place to ensure that automobile companies comply with systems that monitor levels of pollution and contamination to the environment. However, the respondents mentioned that the laws and regulations are not being prioritised and some only implemented because it is a requirement. Respondent 1 observed the following:

> Top Managers are not aware of government legislation and regulatory trends requiring firms to develop reverse logistics processes. This does not ensure proper end-of-life management in our industry. I am sure it is because government is not enforcing their legislation in terms of taking care of the environment so we as a company do not practice reverse logistics fully.

To ensure that all supply chain activities take place in a manner that maximises the positive environmental impacts and negates the negative impacts environmental control, management and monitoring needs to take place at all levels where necessary to ensure that strict adherence to environmental protocol is maintained by every organisation. Yang *et al*. (2010:218) observed that the environmental consciousness of manufacturing industries remains very low.

Automotive industries all over the world are generally committed to protecting the environment and continually striving to improve their products, and processes to reduce waste and improve recycling activities (Saica 2009:7). Government is urging companies to minimise the health and safety risks to all people and communities in which they operate through effective engineering controls, management controls, training, and awareness programmes. To conserve the environment, industries need to continuously improve on their environmental performance by encouraging technical innovations and recycling initiatives, and by complying with relevant environmental legislation, regulations and other requirements (Eberhard *et al* 2014).

Failure of consequence management for non-compliance

There are policies and legislative instruments that govern the operations of automotive industries. The industries see environmental management as compliance with regulations while evaluating trade-offs between environmental and economic performance. Government regulation usually mandates companies to reduce or eliminate their toxic air and water pollution and proper disposal without leaving a footprint. Respondents feel that the policy framework is lacking in specific consequence for non-compliance. Respondent 9 observed:

> We certainly ensure that we operate within the ambit of the law. What we make falls within the policies and regulation set out by government, example the carbon footprint, dust emissions etc. and in terms of the environment…. more needs to be done by the government in terms of policies and regulation, where legislation is forced as there's still lot of emerging automobile scrapping companies which can do the right thing from the initial stages by procuring low energy plants, and investing in process that minimise the fumes released into the air.

Respondent 10 commented:

> Ensuring that this is a matter of urgency, I believe this can only be realised if the laws and regulation by the government is prioritised, if the government does not treat its own laws seriously, then there will be no pressure to management to enforce it. Yes. I think the policies for environment are not as strict maybe like the safety policies.

On the same question, Respondent 12 stated:

> At all costs we have to by the environmental laws like the safety laws are well thought of… for instance we cannot go ahead and produce cars that are not safe or will potentially harm the environment. That's where the ISO certification comes from.

In this regard, one respondent recommended the revision of current policies and for legislation to be stricter; and that non-compliance to environmental policies should be met with severe penalties. As was noted earlier, environmental regulations and consumer pressures to improve customer service are the driving forces behind organisations focusing on reverse logistics (Guang Shi *et al*. 2012:61). Clearly, enforcement of the regulations is vital for the effective implementation of reverse logistics.

Perception around the cost of implementing reverse logistics

One of the major challenges facing the implementation of reverse logistics according to the respondents is cost. Cost emerged as a critical theme. Nearly all the respondents are convinced that the implementation of reverse logistics is very expensive as it requires new, world class technologies and plants to recall and re-manufacture obsolete vehicles or faulty parts. In this regard, Respondent 2 stated:

> There is a high cost involved in employing responsible processes in disposing of waste and end of life products as opposed to the previous, conventional waste disposal methods.

Respondent 9 further explained:

> I think the biggest hindrance is the cost associated with the implementation of reverse logistics. Because the implementation will mean new skills, replacements of existing plants and processes and this plant has been built many years ago and changing it will require major capital injection of which I do not think the company can afford. If there is money available in the scrapping industry, there would be better improved products and monitoring services performed that they do not release harmful substances to the air, and probably build systems that would channel and automatically recycle waste.

Respondent 5 posited:

> Energy for treatment is very expensive as well as fuel so it is of no use recycling our parts as is much cheaper to scrap them than to send them back for recycling in Europe. Another challenge is lack of co-operation among automotive manufacturers and suppliers in terms of knowledge sharing and development.

The issue of sustainable environment recycling or going green is very costly. Just as sales fulfilment impacts all facets of an enterprise, handling returns does too. From customer relations all the way to the point of remanufacturing, there are layers of cost incurred if your returns process is not automated. As expected, Chan *et al* (2011) agree that lack of initial capital for the implementation of reverse logistics is seen as a major financial barrier to reverse logistics in all sectors and for both local and international companies. Returned goods suffer in a logistics system as these costs increase (due to obsolescence, pilferage and damage), decreasing overall product value. Furthermore, inventory-carrying costs and cost for return monitoring system as a percentage of product value increase, further reducing profit margins (Estes 2009:78).

The cost of reverse logistics remains a big barrier in its implementation in the automotive industries because profit is the main objective. The respondents were convinced that should attention and resource be allocated, the implementation of reverse logistics would be possible. Yet, Srivastava *et al* (2008) argue that a growing number of companies are finding that there is money to be made by sending things back. More businesses have come to understand that their work is not complete until their customers are happy, and it looks good. Smith (2005:118) added that corporate executives have now recognised that their companies can realise dramatic cost savings by applying reverse logistics in their operations. The respondents' observations are in keeping with Abdulrahman *et al*. (2014:2) sentiments when they concluded that the benefits and the implementation of reverse logistics have yet to be fully realised in developing countries.

Inadequacy of leadership

One of the challenges identified by respondents is inadequate leadership. Respondents suggest that although in many instances there are processes in place for reverse logistics, it has yet to find its place as a strategic issue. The lack of skills and shortage of high level managers in the area of reverse logistics was also highlighted as one of the key challenges facing the industry. In some cases, respondents identified commitment and top management awareness by senior management as a deficiency. In this regard, Respondent 3 indicated:

> The need to want to change, you know the challenges in implementing reverse logistics in this company should be pushed by the top management and the workers at the bottom will follow suit. Our activities are connected to the company's corporate BBBEE strategy. If policies are made by management so that we do business with other industries that are mindful of the environment, then the logistics department will adapt and make this a top priority.

Respondent 11 also noted:

> I don't really know about challenges but I can only think that the challenges exist. If we take structural change and change management, people don't know what it's all about and are reluctant to change even if it's for their own good. If something is done continuously for a long time, it becomes difficult to switch overnight. It has been so why do you bother with it? Just let it be. That's the attitude that is people's attitude towards your environmental risk that's out there, simple and short and, ja, changing people's minds…difficult.

One responded noted that people take rather long to fully embrace reverse logistics and that he believes management needs to commit to by enforcing a culture and investing money in new technologies in line with the global change. Interestingly, apparently due to the fact that reverse logistics practices are generally not so popular and the various possibilities uncertain, many companies are dissuaded from implementing such practices. The fact that Lee *et al*. (2012) observed that while companies are aware of the possible outcomes of reverse logistics activities, they would rather pay attention to other operational activities within the company and the fact that companies generally consider the potential outcomes of reverse logistics activities are thought to be short-term, points to inadequacy of leadership to provide direction.

Penna and Geels (2015:1035) observed that the present state of affairs in environmental degradation calls for an urgent need for a complete paradigm shift in manufacturing philosophy. It has been established by respondents that the implementation of reverse logistics demands a change in management. They also explained that management should play a leading role in bringing about this change. Issues of the environment are gradually becoming a management function. Respondents have confirmed that environmental protection should no longer be left with workers at the operational level but should be a management task. According to Luthra, Garg and Haleem (2013), there are multiple ways of sharing the environmental protection burden on automobile industries through the involvement of all stakeholders in the supply chain, including supply chain practitioners. For instance, optimisation of the environmental performance through good housekeeping and total quality management, recycling of waste and non-renewable products, substitution of, or an embargo on the use of environmentally unfriendly products, or by incremental and more drastic technological innovations.

MANAGERIAL APPLICATIONS AND CONCLUSION

The aim of the paper was to explore to explore the implementation challenges of reverse logistics by the automotive industry in Port Elizabeth. The paper provided a brief context and background of the automotive industry locally and internationally. The concepts of end-of-live vehicles (ELV) and reverse logistics were also discussed at some length. In this regard, it was interesting to note that ELV vehicles are among some of the most well recycled products in the world. Yet, it was also conceded that some auto dismantlers and other ELV treatment facilities maintain poor environmental practices. The paper also observed that in spite of the advantages of reverse logistics activities, the barriers towards the implementation remain.

This study makes two sets of contributions to the existing body of knowledge insofar as reverse logistics is concerned. The first set of contributions is theoretical in nature in that the study contributed to the latest literature of reverse logistics as it applies to the automotive industry. The second set is practical or managerial in nature. The implications of this research have great value for organisations as they prepare to implement reverse logistics initiatives and programmes. It has highlighted empirically challenges and barriers that need to be overcome by management as they seek to implement reverse logistics. The need for collaboration, knowledge sharing and standardised application of reverse logistics processes by various parts of the company was underscored. Knowledge sharing in reverse logistics will allow stakeholders to develop new technologies for effective actions.

Furthermore, management must ensure strict adherence to environmental policies, monitoring and control systems. Companies need to act responsibly by protecting the environment while creating value for all stakeholders. This responsibility must be towards the internal and external customers of the organisation. If these policies and systems are not in place relating to the return, repair and reuse of goods and the removal of scrap they will hurt their image and frustrate their stakeholders. At the same time authorities need to enforce the implementation of environmental regulations and hold non-complying companies accountable.

The implementation of reverse logistics requires a huge capital investment in the long term and industrialists need to balance low cost and innovation practices by maintaining proper environmental performance. Reverse logistics encompasses the reduction, reuse and recycling of materials in the process of manufacturing. The implementation of reverse logistics cannot be successful without proper and adequate leadership. It is imperative that such management and leadership be provided throughout the company. To that end, companies need to ensure that environmental management capabilities are developed, training programmes are provided for all stakeholders, and that the reverse logistics philosophy and system is constantly shared with stakeholders. This is a major prerequisite for achieving an effective implementation of reverse logistics. Company leadership need to realise that implementing an effective reverse logistics system is a change management exercise. Change management initiatives needs to be pursued by top management in the automotive industry to create awareness among the supply chain stakeholders.

This can be done by conducting environmental awareness programmes and conferences to educate manufacturers and suppliers about the benefits and importance of reverse logistics programmes, ensuring the sharing of information and offering rewards to stakeholders for pursuing the programmes. One difficulty concerning returns management is to grow awareness among senior managers of the need to formalise reverse logistics Managers need to understand that formalised implementation of reverse logistics could bring social and economic benefits. Apart from that managers should obtain feedback from both workers and customers to assess the feasibility of the policies from a practical viewpoint, and should insure that reverse logistics policies are consistent with firm strategic goals. This study suggests that future research should develop a reverse logistics implementation model that will take into account the implementation challenges that have been established by this study.

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