
WASTE MANAGEMENT IN THE AUTOMOTIVE INDUSTRY:

A CASE STUDY

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Internship report
Master in Management

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2018/2019

Bibliographic note

Inês Cristina Teixeira da Silveira Soares Morais was born on 21st June of 1994 in Vila Real, Portugal. Even though she completed the high school under the course of Science and Technology, she started her academic path in the area of Communication Sciences at Faculdade de Letras da Universidade do Porto. In the last year of her Bachelor's degree, advisory specialization, she did a curricular internship at Central de Informação, where she had her first professional experience.

In addition to her academic background, she had always been involved in extracurricular activities. The Coaching training in ANJE, as well as her participation in the StartUp Program, promoted by Junior Achievement Portugal confirmed her fascination for the corporate world, business and management. For all these reasons, she decided that a master's degree in Management would be an excellent complement to her academic training.

During the master's degree, she had the opportunity to spend a semester at IÉSEG School of Management, in Paris. The experience of facing a new city on her own, contacting with different cultures and adapting herself to a completely different curricular plan has made her grow and enrich at all levels. In the last year of the master, Inês did a six-month internship at Grupo JAP, in the Quality department, in the area of waste management, which was the basis of this internship report.

Acknowledgements

I present my gratitude to my parents and grandparents for their unconditional support and for teaching me how to make my dreams come true and strive for my goals.

I want to thank my brother, for being my all-time companion, for his trust in me and for making me proud every day of what he is and can achieve.

I want to thank my boyfriend, for his support in all the moments of this journey and for giving me all the encouragement, friendship, trust and love.

I want to present my gratitude to my supervisors, Professor Maria do Rosário Moreira and Professor João Ribeiro for guiding me along this way, for the share of knowledge, their availability, rigor, patience and friendship.

Lastly, I want to thank my internship supervisor, Fernando Gonçalves, and my colleagues, specially to Sara Sousa, for the good reception and integration in the work team, the flexibility at several times and for providing me with the necessary information to carry out this internship report.

Abstract

Waste management is a key issue that arises with the growing human population and the current economic scenario as huge quantities of natural resources are being used and increasing amounts of different types of waste are being produced. Hence, good practices and strategies in this area urge to be developed to prevent the negative effects on the environment and human health while bringing a lot of value to the business.

The main aims of this study are to improve the current waste management system and looking for strategies to implement an integrated waste management system that may help the automotive organization under study enhance its legal and environmental compliance as well as its business performance.

In order to understand the current state of the system, an interview and a questionnaire were carried out to the mechanics, workshop managers and quality director, because they feel the difficulties regarding this system and can give suggestions for its improvement. On the other hand, the semi-structured observation was also performed in two time periods, before and after a training session, in which participant observation was performed. The observation was applied for the researcher to understand how things happen in setting. Internal documents were very useful for understanding the context and the system operations.

Results show that there are several gaps related to all the participants in the current waste management system, being them the mechanics' performance, the supervisors' guidance, the operator's functioning and even the quality department and organization's support.

Overall, this research has some theoretical and practical contributions. On one hand, it explores an increasingly important issue in organizations and society, presenting a framework that may be applicable to this and other companies in this sector or even in other industries. On the other hand, this study presents suggestions to improve the current system and contributes for further implementation of an integrated waste management system, which may cause a positive impact on the organizational scenario.

Keywords: waste management, training, integrated waste management system

JEL-codes: L89, M19

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1. Introduction

The automotive industry has a significant weight worldwide, going through substantial changes across the years. Its expansion caused by globalization has entailed a significant overall environmental burden, which affects other industries around the globe. As a result, the growing concern about the global ecological issues is having impact on the automotive industry's policies, which leads to the incorporation of sustainable practices in their daily activities (González, Sarkis, & Adenso-Díaz, 2008).

In this sense, it would be interesting to study the adoption of environmental management practices, focusing specifically on waste management, so that companies develop a “greener” conscience, obeying to legal and ecological standards while improving its financial performance.

This project combines scientific research with fieldwork experience obtained in an internship in Grupo JAP, whose wastes are originated in the repair and collision sectors. Nowadays, this automotive organization is underdeveloped in the waste management area and aims to become more organized and efficient regarding this subject. Therefore, this study can be a useful contribution to help the company achieve its objectives and, at the same time, it is an important research challenge as it is a specific area of study to which this project can contribute.

Along with technology development and global population increase, the number of vehicles is expected to increase over the next years, having surpassed 1 billion in 2011 and being expected that there will be 1.7 billion cars by 2035 (Swan, 2015). Also, as already stated by McAuley (2003), long-term projections forecast that there will be from 2 to 3.5 billion light vehicles by 2050 and, as a consequence of the global vehicle growth, the environmental impact will substantially increase, so important changes within the automotive industry need to be implemented in order to reduce the negative issues.

Therefore, due to the improving concern with long-term sustainability and limited quantity of resources on the planet, waste management becomes a critical issue to companies. Besides, the waste elimination can be severally costly, considering the hazardous waste that must be paid for its disposal. The automotive industry specifically produces great quantities of waste, so it is important to find sustainable practices to reduce its impact and manage to turn what can be an expense into a profit. On the other hand, it is important to consider that the companies need to be permanently aware of the

environmental legislation to avoid incurring in severe fines that can harm their economic health and also their image to all the stakeholders.

Thus, the implementation of beneficial organizational practices can be an asset to avoid this kind of risk, which can start with raising awareness of employees regarding good environmental attitudes (Orth, Baldin, & Zanotelli, 2014). It is important to state that the topic of waste management combined with the automotive industry is a specific area of study. However, it is an emergent issue that deserves investigation as the automotive industry is one of the most global industries and, as mentioned before, it is forecasted to expand in the next few decades. Lastly, this study can contribute to the development of a useful waste management system that may help the organization increase the efficiency of the waste-to-value process and have a positive impact on the overall organizational success.

This study aims to improve the waste management system, identifying the existing gaps and looking for strategies to solve them, which may contribute to improve its legal and environmental compliance while enhancing its business performance. In this way, the research questions that guide this investigation are the following:

- How to improve the current waste management system within Grupo JAP?
- How to implement an integrated waste management system within Grupo JAP?

To answer these research questions, it will be required information from organizational documents, semi-structured observation, participant observation, as well as semi-structured interviews and questionnaires with mechanics, workshop managers and the quality director. Finally, this report is structured as follows: besides this section, in Chapter 2, a literature review is presented about waste management, process mapping, integrated waste management systems, training and motivation of employees. In Chapter 3, the methodology of the present study is made. Afterwards, in Chapter 4, the case study is described as well as the analysis of the results and its discussion. Finally, conclusions, limitations and future research are presented in Chapter 5.

2. Literature review

This chapter starts with the explanation of the topic of waste management, exploring its definition according to several authors, as well as its associated concepts, such as circular economy and corporate social responsibility. Afterwards, the issue of waste management system is approached, followed by the explanation of the importance of process mapping to the optimization of the waste system. Furthermore, it is important to present the topic of integrated waste management systems once one of the main aims is to understand how an integrated waste management system can be implemented within the organization. The last section goes through the importance of training for the development of environmental awareness as well as the forms of motivating the employees.

2.1. Waste management: background to the topic

As a consequence of the continuous growth of the world human population and the economic growth pattern, great amounts of goods are being consumed and huge volumes of waste are being produced, which causes harmful consequences for the environment (Lee & Min, 2014; Ordoñez & Rahe, 2013). It is considered that the production of industrial waste is one of the main forms of environmental degradation, so industries are increasingly striving to make their production processes less harmful in what concerns the generation and management of waste (Orth et al., 2014).

In order to prevent the negative effects of waste on the environment and human health and to encourage the optimization of resources usage, the concept of waste management arises. However, in the first place, it is essential an appropriate definition of waste, so it is possible to determine the best action upon it (Pongrácz, 2006). Waste can be defined by taking into consideration legislation of some of the most important world organizations, as the European Commission, which developed the European Waste Catalogue where are listed substances or objects that are rejected by their holders (Pongrácz, Phillips, & Keiski, 2004). According to the Waste Directive of the European Council, waste is “any substance or object, which the holder disposes or is required to dispose of pursuant to the provisions of national law in force” (Cheyne & Purdue, 1995, p. 153).

However, Pongrácz (2006) considers that the major problem with legal definitions is that they are concerned only with waste which has already been generated and its subsequent treatment as the environmental laws are committed to control the waste

disposal and eliminate its potential threat. Though, the author considers essential to know the reasons for the waste generation, being possible to establish four classes of waste. The first one is related to undesirable and unintentional things not possible to avoid and comes up related to purposeful activities, as it is the gaseous emissions. The second class involves things that once created for a finite purpose become waste after fulfilling it. Class three contains things created for a precise purpose, but its structure got damaged, so its performance does not match with the purpose for which they were created and thus are no longer suitable. Lastly, the fourth class integrates things created for a precise purpose that turned into waste because their users did not use them correctly according to their planned purpose. From all these nomenclatures, it comes up a re-definition of waste as a thing made by humans that has no purpose, or it is not capable of performing according to its purpose anymore. This definition states that the uselessness of waste can often be temporary until giving it a purpose, so it can be transformed into non-waste (Pongrácz, 2006).

Cheyne and Purdue (1995) also declared that the problem with defining waste is when waste in its definition is associated with unwanted objects, once it excludes those that are still able to be used even if the producer no longer wants them. Thereby, some authors consider that, in a first instance, it is important to identify waste as a resource from which it is possible to extract value (Demirbas, 2011; El Hagggar, 2010; Griffiths, Williams, & Owen, 2010). According to Pongrácz et al. (2004), turning wastes to non-wastes encompasses waste management actions. Besides, it is key to analyse the activity that generates waste, trying to adopt measures that help industries take the necessary procedures for a correct waste management (Pongrácz, 2006).

There are several definitions of waste management in the literature and Table 1 shows some examples. According to Cheyne and Purdue (1995) and Kainth (2009), waste management includes the process of waste creation, transportation, storage, treatment and disposal and Cheyne and Purdue (1995) also add its recovery. In turn, for Demirbas (2011) and Suzy, Yefta Andi Kus, Jony Oktavian, and Winata (2015) waste management includes the collection, transport, processing, recycling, disposal and control of waste, although Suzy et al. (2015) also add the storage, which was included in the first two aforementioned authors. From all these processes, European Council (1991) only includes collection, transport, recovery and disposal, highlighting the importance of supervising such operations and looking after the disposal locations. Finally, unlike the other authors,

Pongrácz et al. (2004) presents a definition of waste management more generic about what it includes, focusing more on its goals than the specific processes it comprises.

Table 1 – Definitions of waste management found in the literature

Authors	Waste management definition
Cheyne and Purdue (1995)	Group of policies related to the cycle of waste creation, transportation, storage, treatment, recovery and final disposal.
Demirbas (2011)	Collection, transportation, processing, recycling, disposal and control of waste materials.
European Council (1991, p. 33)	“Collection, transport, recovery and disposal of waste, including the supervision of such operations and after-care of disposal sites.”
Kainth (2009)	Approach to the process of waste production, storage, transportation, treatment and its disposal.
Pongrácz et al. (2004)	Control of activities related to waste, aiming at promoting the conservation of resources and protecting the environment and human health.
Suzy et al. (2015)	Collection, transportation, processing, recycling, storage, disposal and control of waste, taking into consideration economic, legal, environmental, technical and institutional issues.

Source: author own elaboration

Kainth (2009) states that companies must manage their waste in an environmentally friendly way, so the foundation for good management practices should recall the “3Rs” policy of reducing, reusing and recycling. Thus, the 3Rs policy value the waste reduction over reuse and recycle that avoids its consequent treatment or disposal in landfills (Orth et al., 2014). Besides, it is important to consider the waste management hierarchy that sets waste prevention as the priority, reducing waste in its source. This is followed by reuse, recycling or composting, recovery (e.g. energy recovery) and disposal in landfill (Demirbas, 2011; Fischer, Potter, Donaldson, and Scott, 2011; Kurdve, Shahbazi, Wendin, Bengtsson, and Wiktorsson, 2015; Suzy et al., 2015). However, unlike the other authors, Demirbas (2011) considers that there are six levels once recycling and composting appear separated in two different stages. Suzy et al. (2015) consider that these are the steps to attain a strategic waste management. Following this line of thought, Orth et al. (2014) state that it is important to avoid excessive consumerism as well as precocious and unnecessary disposal of materials and prefer materials that can be reused or recycled.

This idea leads to the concept of circular economy (CE), whose main purpose is to institute the model “take, make and reuse” that will replace the traditional economic model “take, make and dispose” (Vegeera, Malei, Sapeha, & Sushko, 2018). Ordoñez and

Rahe (2013) consider that in its final stage of life, waste can be incorporated into a new cycle, as it can be used as an input material for production, so its supposed final stage of life leads to the beginning of a new one. Some definitions refer to CE as a closed loop of material flow in all the parts of the economic system and in which throughout the whole process all products and materials maintain their highest value of utility (Geissdoerfer, Savaget, Bocken, & Hultink, 2017). Thus, Frosch (1992) considers that a correct waste management system and its introduction at all stages of industrial processes can be the most important cornerstone for improvements. The transition from open to closed loops of energy and materials, such as the CE, will lead to more efficient, less expensive and waste free processes.

Thereby, waste management is becoming currently a subsector of CE. Companies are changing their view on waste, which leads them to look for new methods and innovative technologies that will prematurely convert this waste into valuable resources. Hence, contrary to what happened in the past, where waste management was just seen as a simple method of discarding waste, CE and waste management together seek to improve waste recovery processes by preventing the negative impact that they have on the environment (Ghisellini, Cialani, & Ulgiati, 2016).

According to Pongrácz et al. (2004), waste management involves strategic planning, decision making and effects assessment in order to reduce the quantity and toxicity of waste generation, preventing environmental pollution and preserving resources. Furthermore, Kainth (2009) considers that an effective waste management system integrates the planning, implementation, examination and revising processes, so it is essential to understand the existing system, settle goals, communicate the new procedures and allocate specific roles and responsibilities. Continuous monitoring and evaluation of performance is essential to ensure that the goals are being achieved, otherwise new actions need to be developed. Lastly, review and follow up of the all process must be done in a regular basis to continuously improve. Thus, Debnath (2015) states that waste management should be part of the management strategy of improving environmental efficiency of processes to effectively contribute in a positive way to business thinking.

It has long been recommended and even compulsory that companies reconsider their role and their business functions and impact in society as the culture changes over time (Davis, 1960). Along with the creation of weighty social regulation, it was recognized the business responsibility over significant stakeholders, as environment, employees and consumers (Carroll, 1991). Hence, on one hand, managers must consider that they

oversee an economic unit that must positively develop the community and contribute to society welfare, in what concerns employment or maintenance of competition. However, on the other hand, managers also have the duty to develop human values that, despite not being measured on an economic value scale, are essential to the public well-being, as cooperation, motivation or personal fulfilment at work. Thus, both socio-economic and socio-human responsibilities are integrated in the term of social responsibility (Davis, 1960).

According to Carroll (1991), the definition of Corporate Social Responsibility must entail the accomplishment of the company's economic, legal, ethical and philanthropic responsibilities in order to completely integrate the whole range of duties that business has to society, which constructs the pyramid of CSR developed by Archie B. Carroll. This pyramid is supported by the economic performance as without it the other responsibilities become irrelevant, so the main role of a company is to provide goods or services to consumers, being profitable in this process. The next layer is related to the legal framework to which the companies have to obey once it states the acceptable behaviour, which coexists with economic responsibilities. Afterwards, the company has the obligation to do what is right and fair and reduce harm to stakeholders, so the business is expected to be ethical. At the top of the pyramid is the philanthropic responsibility that involves some corporate contributions to society and improvements in their quality life, since companies are expected to be good corporate citizens (Carroll, 1991).

2.2. Waste management system

It has been said that efficient and innovative waste management systems lead to more sustainable and value-added businesses (Kurdve, Shahbazi, Wendin, Bengtsson, & Wiktorsson, 2015). In order to improve the system, it is important to use the process mapping as a way of visualizing and controlling the company's activities, which allows the analysis of its business processes (Klotz, Horman, Bi, & Bechtel, 2008). In turn, Debnath (2015) states that integrated waste management systems can be approached as a business strategy that can support organizations in the incorporation of waste management in its competitive advantage. Besides, Demirbas (2011) considers that the training of staff is also a way of enhancing the effectiveness of the waste management system and reduce environmental and health damages. Still related to employees, motivation is key for them to assume a proactive attitude and get more involved in the environmental improvement (Govindarajulu & Daily, 2004).

2.2.1. Process mapping

Process mapping was identified as one of the most used methods in process improvement (Bowles & Gardiner, 2018). It enables an organization to visualize and monitor its activities, allowing an illustration, understanding and analysis of its business processes, being an intermediate stage in process improvements. Therefore, process maps provide information about the actions to be taken, the agents that will do that actions, the time and place where the actions will happen and who or what depends on it being done. It is a communication tool that allows both managers and employees to see the process in the same way (Pojasek, 2006). As considered by Klotz et al. (2008), as a visual tool for organising work processes, process maps contribute to align system elements in the same direction.

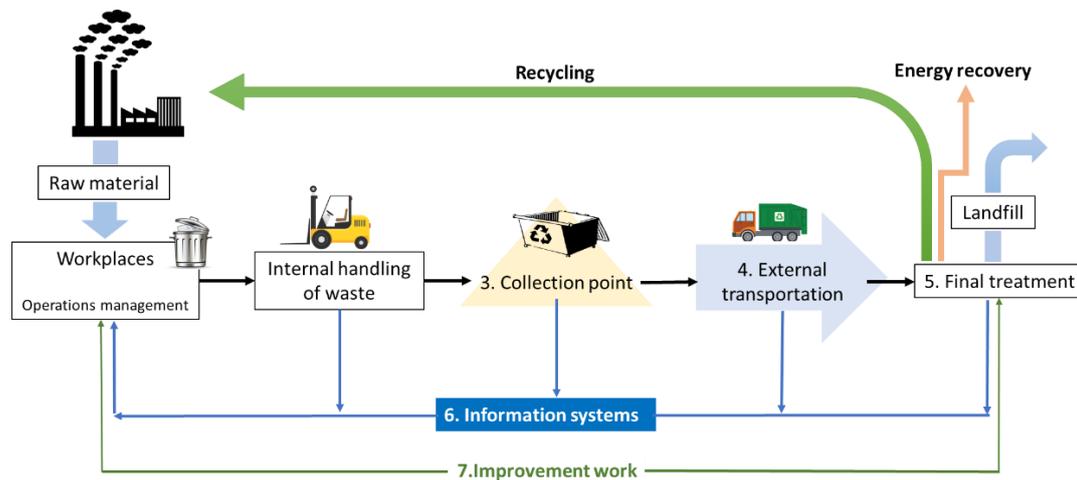
Moreover, process mapping has been characterized as something that improves transparency, which allows individuals to increase their participation in the processes and their contributions to improve the system. It is important that elements such as status recognition, problems, responsibilities, interdependencies, easiness of understanding, communication, feedback and enabling of decision making are presented in a process, as it defines its transparency. In lean theory, transparency is defined as the capability of individuals to see the whole picture, enabling, in turn, the discovery of ways to create value, being key to continuous improvement (Klotz et al., 2008).

Kurdve et al. (2015) says that nowadays companies are more and more concerned about improving their environmental status. As a result, methods and tools have been applied to operational and environmental integration in order to achieve better results in waste management supply chain focusing on lean principles. Waste management practices can be analysed using the Waste Flow Mapping (WFM). For Klotz et al. (2008), the WFM methodology offers a basis to examine the current process and provide benefits to plan and implement a better future state map.

According to Kurdve et al. (2015), the waste management system can be divided in a material flow where five subprocesses are included (see Figure 1). The first one refers to the internal collection point on the workplace, that includes data on the number and type of containers, cost of ownership or rent, the time individuals take to maintain containers. The second one refers to the internal handling of material from operations to the external waste-handling operator. In the third subprocess, it is developed the mapping of the containers' layouts and equipment for separation, categorisation and housing. The fourth subprocess refers to the external transportation that is mapped by the type and

cost. Afterwards, disposal or final treatment operations correspond to the final subprocess of material flow, which is analysed by type of disposal or recycling code, cost and place. Finally, there are another two subprocesses that are integrated in the informational flow, which incorporates information system and improvement work.

Figure 1 – Seven subprocesses of waste management



Source: adapted from Kurdve et al. (2015)

Implementing a waste management system always entails costs, so it is important for companies to adopt integrated strategies for the various connected processes such as collection, transportation, treatment, recycling and disposal. Therefore, managers should decide for an affordable waste management that balances economic, environmental, regulatory, technical and other social factors (Allesch & Brunner, 2014).

2.2.2. Integrated waste management systems

Integrated waste management is defined by the selection and implementation of suitable procedures and management programs to attain certain waste management goals (Shamshiry et al., 2011). The main drivers towards the paradigm of integrated waste management are to address human health, environment, land-use, resource insufficiency, public awareness and participation as well as economic concerns (Marshall & Farahbakhsh, 2013). Therefore, an integrated waste management system allows to manage the produced waste according to the three main dimensions of waste management, which are environmental effectiveness, social acceptability and economic attainability (Debnath, 2015; McDougall, White, Franke, & Hindle, 2008).

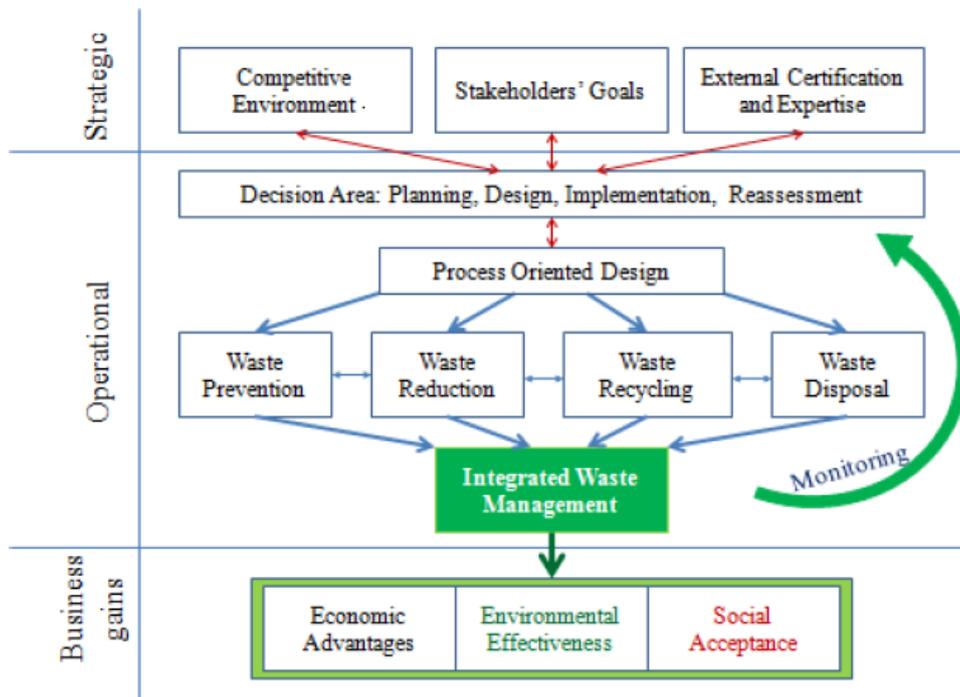
Moreover, Joos, Carabias, Winistoerfer, and Stuecheli (1999) state that public acceptance and participation, changing value systems and consumer behaviour are so

important as technical and economic issues in waste management decision-making. Thus, according to Zarate, Slotnick, and Ramos (2008), a waste management program is successful when it entails public collective and collaborative action, transparency, communication, people participation and empowerment, as well as networking. For Marshall and Farahbakhsh (2013), integrated waste management systems are adapted to community objectives, integrating stakeholders' needs and viewpoints, the local context and the ideal combination of reduction, recovery and disposal.

Unlike the past, when the term waste had a negative connotation as something that was not wanted by the owner who disposed it, in the context of integrated waste management the term only acquires negative connotation if it cannot be considered a resource that still has potential to be used (Dijkema, Reuter, & Verhoef, 2000; Van de Klundert & Anschutz, 1999). In this sense, McDougall et al. (2008) considers that a properly optimized waste management system must be integrated, flexible, acceptable by society and oriented to the market, so it allows continuous improvement. Besides, this author adds that its operations should be visibly interconnected, so the collection and sorting methods cause impact in the way materials can be recovered or in the capacity for marketable compost production. Debnath (2015) also states that the integrated waste management model relies on the interrelation of all the processes in order to reduce waste along the business value chain, helping organizations to attain better environmental performance.

Hence, this author proposes an integrated waste management framework (see Figure 2) for the incorporation of waste management within organizational business approach, which starts with a strategic direction that includes the investment in external certification, redesigning processes, employee trainings and auditing. Besides, Debnath (2015) considers that the information flow allows management to take appropriate decisions that help further improve the system.

Figure 2 - Integrated waste management system



Source: retrieved from Debnath (2015) study

2.2.3. Training for an environmental performance improvement

Attaining positive outcomes is not enough, being also required to provide value to the company and to society (Aguinis & Kraiger, 2009). As a result, governments, the market and society are putting pressure on companies to make their processes cleaner. Therefore, the companies that want to improve their image and reach new markets while obeying to several norms and laws instituted need to incorporate environmental issues in a more effective way (Orth et al., 2014).

In this sense, an effective environmental education is key to contribute to a successful environmental management endeavour, once it offers workers the tools and the knowledge to make conscious decisions within the company (Perron, Côté, & Duffy, 2006). Thus, Aguinis and Kraiger (2009) state that training can bring helpful information and skills for employees to incorporate good practices, habits and even strategic knowledge, so that they know when to apply a specific skill or procedure. Moreover, Wong (1998) also defends that training favours the adaptation of employees to change, enhances their capabilities to improve continuously, inspires them to be more proactive and improves awareness of the need for quality.

For Orth et al. (2014), providing environmental education is an effective and low investment tool to improve the awareness of the employees while affirming values and

actions and constructing concepts, skills and attitudes, that contributes to the rational use of materials and, thus, to human and social transformation and ecological preservation. However, Perron et al. (2006) considers that there are some constraints, as the organization's culture and change management, that can limit the conversion to an environmentally responsible company. These difficulties can be surpassed by providing employees with environmental consciousness training, for them to be aware of the policies practiced by the company and to recognize its environmental impacts, which empowers them with wisdom and discernment of how the context can influence and be influenced by their decisions.

When companies establish a set of goals needed to be fulfilled in order to achieve the expected environmental performance, employees are key to implement the required changes in behaviours and routines to reach that goals (Perron et al., 2006). Thus, Orth et al. (2014) defends that the strategy for the training should assent on action and participation of the employees, which enables the development of environmental awareness through the stimulation of curiosity, the construction of knowledge and the practical realization and quantification of concepts that are often abstract. Besides, such participation can potentially diminish resistance, build ownership of the change and stimulate employees to make the change effort work (Perron et al., 2006). However, as referred by Govindarajulu and Daily (2004), lack of training can lead to employees' inability and unwillingness to participate in the environmental performance improvement.

Moreover, it is stated that positive feedback is one of the most relevant factors that encourages the transfer of training to the workplace (Al-Eisa, Furayyan, & Alhemoud, 2009). In fact, as changes in the system occur over time as it is supposed to evolve, employees should be continuously given feedback about their effectiveness and impact on environmental enhancement efforts because without proper communication and feedback, workers' efforts may be in vain (Govindarajulu & Daily, 2004). They need to know about the environmental effects of their activities as the possibility of the waste generated end up in landfills, where they will stay for many years, what will be bad for the future generations. The waste generation is caused by the irrational use of the materials, the bad work habits and the lack of knowledge and training about the good environmental practices (Orth et al., 2014). Thus, contributing to form positive attitudes towards waste can potentially inspire employees to manage it appropriately (Teo & Loosemore, 2001).

That inspiration can be strongly related to managers' environmental attitude, that can be influenced by the institutional environment and internal policies (Suzy et al., 2015).

Therefore, it is important that supervisors receive feedback, both negative, so that they change their behaviour and improve performance, and also positive, as it is a way of recognition that encourages positive behaviour, enhancing engagement and motivation (Porter, 2017). In turn, supervisor's attitude will influence employee's attitude towards the environment (Suzy et al., 2015). Supervisor's support is, thus, essential to the transference of the competences developed during training to employees' daily job, namely in what concerns the involvement in training selection, training learning and participation in training (Govaerts, Kyndt, Vreye, & Dochy, 2017). In addition, it is related to motivation to learn and is indirectly associated with influencing the employee's trust of their capabilities to complete tasks and achieve the outcomes (Al-Eisa et al., 2009).

Besides supervisor's support, transfer of training is influenced by employee features, as readiness to learn and self-efficacy, employee motivation to apply what was learned and to achieve the expected outcomes, but also work environment, as colleague support, performance coaching, manager punishment, and personal capability to perceive the content importance, to apply and to use depending on the opportunities that arise (Aguinis & Kraiger, 2009). Hence, employees must be encouraged to actively take part in the environmental action for it to produce the best results (Perron et al., 2006). It is, thus, fundamental that managers understand what really motivates employees if they want to maximize the company's performance (Lee & Raschke, 2016).

2.2.4. Motivation for environmental compliance

Employees are motivated when they desire to work harder and to have higher work performance in the company (Chiu, Wai-Mei Luk, & Li-Ping Tang, 2002). It is stated that managers can benefit from spending some time in understanding what motivate the workforce (Durant, Kramer, Perry, Mesch, & Paarlberg, 2006).

According to Govindarajulu and Daily (2004), commitment from management, feedback, rewards, as well as employee empowerment are the four essential aspects that contributes to improve employee motivation for better environmental performance. Therefore, management commitment involves deciding the environmental plan to be established, the communication that is needed and the training level. Concerning communication, inform about the goals is crucial to motivate employees to action. Besides, empower employees, that is, gives them the autonomy and responsibility to be more proactive, makes them more willing to improve their environmental performance.

In turn, rewards can boost motivation and employees' commitment to the environmental programme and can be financial or related to recognition. However, a

research of environmental organizations around the globe showed that few times financial rewards are connected to improved environmental performance (Govindarajulu & Daily, 2004). Also Kohn (1993) refers that researches demonstrate that financial incentives only create temporary compliance, but not enduring commitment. This way, praise is frequently a stronger factor as workers look forward to gratitude for their effort from supervisors, coworkers and even relatives.

Moreover, Govindarajulu and Daily (2004) states that feedback is also essential to the environmental management system attain long-term success, as employees get to know their performance outcomes. In addition, supervisor support is related to motivation to learn and is indirectly associated with influencing the employee's trust of their capabilities to complete tasks and achieve the outcomes (Al-Eisa et al., 2009).

Current research on employee motivation aims to revolutionize traditional motivation theories, involving not only the traditional perspectives of management, organization behaviour and human resources, but also new perspectives in neuroscience, psychology and biology (Lee & Raschke, 2016).

According to Nohria, Groysberg, and Lee (2008), people are guided by four drives that represent basic emotional needs: acquire (attain scarce goods, both tangible as housing and intangible as social status), bond (create relations with individuals and groups), comprehend (make sense of the world around us) and defend (promote justice and protect against threats).

Organizations must enhance overall motivation scores by fulfilling the four drives together, as a poor performance on one significantly reduce the impact of high scores on the others. Thus, it is suggested that for each drive there is an organizational lever that best satisfies it. The reward system fulfils the drive to acquire as it assigns rewards to performance, distinguishes between good and poor performers and gives opportunities for advancement to the best employees, what, in its turn, enhance the recognition of individual achievement and status. Culture fulfils the drive to bond as a culture that set a familiar tone and encourages collaboration, friendship, camaraderie and openness form bonds and enhance the sense of teamwork and the proud of belonging to the company. Job design addresses the drive to comprehend by making the jobs fulfilling, challenging, meaningful and interesting. Performance-management and resource-allocation processes, if fairness, transparency and trustworthiness are ensured, address the drive to defend as build trust within the company (Nohria et al., 2008).

Apart from this current research of motivation, there are several traditional theories regarding this topic, as Maslow's hierarchy of needs, Herzberg's two factor theory, Vroom's expectancy theory, Adam's equity and justice theory, Latham and Locke's goal setting theory, Deci's cognitive evaluation theory, Hackman and Oldham's work design theory and Skinner's reinforcement theory. All these theories provide managers with information about important elements and useful company levers to motivate individuals (Lee & Raschke, 2016). A brief explanation of each of these theories is presented below in Table 2.

Table 2 - Traditional employee motivation theories

Author	Theory	Motivational force
Adams (1963)	Equity and Justice	Employees compare themselves with other employees, seeking equity and justice and assessing fairness of their reward. If they perceive that there is inequity, a state of dissonance appears, and they try to restore equity and relieve tension through increase or decrease their contribution to work.
Deci (1971)	Cognitive evaluation	External elements affect internal motivation and it is preferable that individuals are intrinsically motivated as it reduces associations of their behaviour with monitoring external factors.
Hackaman and Oldham (1976)	Work design	The five job features, as skill diversity, task identity, task meaning, autonomy and feedback, promote good individual and firm outcomes.
Herzberg (1959)	Two factor theory	Motivation is grouped in two factors: motivators or intrinsic factors, as attainment and recognition produce job satisfaction, and hygiene or extrinsic factors as job security and pay produce job dissatisfaction.
Latham and Locke (1990)	Goal setting	The performance increases with the difficulty of the goal or when feedback about the progress made towards the goal is provided. Easy goals or no goals not lead to such a good performance.
Maslow (1943)	Hierarchy of needs	Employees have five levels of needs: physiological, safety, social, ego and self-actualization, from which a lower level once satisfied, next level up is what motivates individuals
Skinner (1953)	Reinforcement	Managers should positively stimulate behaviours that conducts to positive outcomes, as applying extrinsic rewards, once individuals' behaviours that lead to good outcomes will be repeated.
Vroom (1964)	Expectancy	Behaviour is driven by the belief that individuals' effort will lead to a certain performance, which will lead to attain a desirable or undesirable reward.

Source: Adapted from Lee and Raschke (2016) study

2.3. Similar studies

As previously mentioned, waste management in the automotive industry is a specific area of study, but it is pertinent to be studied given the impact of this sector of activity in this type of automotive companies. Therefore, there are many studies about waste management, but few connecting both areas.

The chosen articles pointed out as similar to the present research were analysed and the most important aspects such as, the main goals, the main conclusions and limitations/future application are summed up in Table 3.

In all the studies, authors concluded that waste management systems improve companies in a global way, having positive repercussions with preponderance in financial, environmental and legal aspects. In this sense, these studies were selected to better understand the topic under analysis.

Table 3 - Relevant similar studies

Author(s)	Aim of the study	Main conclusions	Limitations/ Future Applications
<i>Caetano, Depizzol, and Reis (2017)</i>	Defining strategies for the waste minimization at the source or to improve the waste disposal, when created.	Waste management improves profitability of the company and decreases impact on environment, economy and society.	
<i>Debnath (2015)</i>	Suggesting an integrated waste management framework, which can help hospitality companies to develop waste management as part of its business strategy.	Integrated Waste Management (IWM) links strategic decisions with the operational level, helping companies to adjust every process to reduce environmental and social negative consequences. However, despite IWM helps to saving costs, infrastructural investments and environmental certifications are costly and challenging to adopt this framework.	The benefits of implementing IWM framework in the hospitality sector cannot be generalised as it is a single case study. Integrated waste management practices can be implemented in other industries like transportation, manufacturing or media to bring productivity of practice, which would be valuable to develop and fully visualize it.
<i>Kurdve et al. (2015)</i>	Studying how environmental and operations management can be incorporated into the waste management system.	Waste flow mapping method is beneficial regarding the implementation of a waste management, revealing flaws and identifying points of improvement, essentially when there are several institutions involved.	Scarce previous preparation to do the process mapping resulted in time-consuming data collection Later on, it would be beneficial develop a technical support for visual tool communication that can help at operational and team levels
<i>Orth et al. (2014)</i>	Studying the generation of solid waste in the production process of an automotive industry, aiming at the presentation of reduction actions.	Companies that want to improve market positioning and obey to legal framework should adopt more effective environmental management policies, and reduction at source has priority over recycling. It is also important to adopt an environmental education program.	

Source: author own elaboration

3. Methodology

This section states the methodology applied to the current research that comes within an internship project in the waste management area, in Grupo JAP, an automotive organization. In this sense, and considering the characteristics of the present study, the method that best applies is the case study model.

The case study model provides a good research method in the evaluation of individual, corporative, social and political phenomena, which makes it a research strategy adopted by many areas of knowledge. This type of research strategy, unlike the others, is not only an exploratory strategy but also descriptive and explanatory. In order to avoid huge mistakes, it is fundamental to choose the more advantageous research strategy which is based in three main conditions, 1) research question; 2) investigator control over events and 3) focus on contemporary events (Yin, 2009).

The classification of the research question is the first condition to take into consideration. The research questions “How to improve the current waste management system within Grupo JAP?” and “How to implement an integrated waste management system within Grupo JAP?” belongs to the how/why category. This type of questions, according to Yin (2009), lead to more explanatory researches that use case studies as the ideal approach. In what concerns the other two conditions, case studies are devoted to current events and when the investigator has no control over them. Direct observation and systematic interviewing are the methods that distinguishes case studies from the other methods of research (Yin, 2009).

The core of the case study strategy is to help in the decision-making process trying to understand the decisions made and their implementation in real life context, which could be extremely relevant to the phenomenon of study. In this way, a case study research proves to be distinctive because there are more variables of interest than the available data, so it is necessary to gather different sources of evidence that will lead to one result. The collection of data will benefit when supported in advance by a theoretical revision (Yin, 2009).

3.1. Case study design

Defining the plan for the case study is the next duty. A research design is a strategy that orients the researcher in the process of collecting, analysing and interpreting observations, what allows to establish causal relations between the variables in study. It also allows the generalization of the obtained interpretations to different situations or to

greater populations. The components of a research design are the study's questions, its propositions, its units of analysis, the logic linking between data and the propositions and the criteria for interpreting the findings. Furthermore, it is important to judge the quality of any research design according to four tests: construct validity, internal validity, external validity and reliability. Construct validity is based on the establishment of accurate operational procedures for the concepts under study, internal validity is found by the establishment of a causal relationship, through which determined conditions appear to lead to other conditions, distinguishing itself from false relationships, external validity sets how the results can be generalized to other situations, reliability represents the consistency of a measure (Yin, 2009).

3.2. Methodological aspects of similar studies

The methodological aspects of the similar studies were analysed in what concerns several aspects, namely their data sources. These methodological aspects are summarized in Table 4. All these similar studies use the case study model and used several data sources, which enabled the investigator to cross information and eliminate some biases.

Table 4 - Relevant similar studies: methodological aspects

Author(s)	Country	Industrial sector	Methodologic al analysis	Data sources
<i>Caetano et al. (2017)</i>	Brazil	Furniture Industry	Case study	Documents Interviews Review of bibliographic material Questionnaire Participant observation
<i>Debnath (2015)</i>	India	Hospitality industry	Case study	Operational documents Semi-structured and unstructured interviews with departmental contacts Inputs from extant literature Onsite study
<i>Kurdve et al. (2015)</i>	Sweden	Automotive industry	Case study	Quantitative analysis of inputs, processes and outputs Qualitative analysis with: on-site visits, walkthroughs, interviews, layouts, photographs and environmental reports Statistical data: volumes and costs of treatment of waste fractions and costs of external services.

<i>Orth et al. (2014)</i>	Brazil	Automotive industry	Case study	Documents and company files Observation in loco Participant observation Photographic records Measurements Estimates
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Source: author own elaboration

3.3. Data collection

The present research requires information from company internal data, semi-structured observation, participant observation, semi-structured interviews, questionnaires and critical analysis made from the internship.

Integrating different methods, although not simple, is highly fruitful. The main aims are examining the object under analyse in greater depth and length while exploring different parts or angles of a process, which, in turn, enables to answer the same research questions from diverse viewpoints. Besides, multiple methods allow to complement the information collected from different sources and to corroborate one source with another, avoiding inconsistencies and misunderstandings (Mason, 2002).

Firstly, organizational documents, which many times cannot be found in the public domain, offer valuable contextual information about the company, being useful to gather data about its past managerial decisions and actions (Bryman & Bell, 2015). This way, company operational documents, waste operator's contract, monthly reports, minutes of meetings, internal and external electronic correspondence and tables were analysed. These documents enable to know the development of the waste management area, what was being done in the past, how it was resulting, but also the current processes, operations and stakeholders involved, its roles and responsibilities. Thereby, it is possible to use the data to strategically plan in terms of costs reduction and process optimization.

Secondly, observation is important to record in detail the participants' behaviour, aiming to develop a narrative report of that behaviour (Bryman & Bell, 2015). Semi-structured observation presupposes an agenda of issues, but the data to fulfil these issues is collected in a less predetermined way. Knowing previously what it is desired to be observed, mapping the occurrence and regularity of elements and pretending to compare situations between each other, it is more time efficient to have an observation schedule prepared before going into a situation (Cohen, Manion, & Morrison, 2007). Through observation, it is possible to understand the dynamic nature of what happens in setting, how it is organized and how it operates, what generates meaningful knowledge on

situational dynamics of 'real-life' organizational settings (Mason, 2002). In this way, it enables to get further evidence and detailed information through the observation of workers' attitudes, actions, practices, routines, behaviours, assumptions, motivations, habits, conversations and orientations. Observations will be recorded attending to an observation guide, which can be observed in Appendix 1.

Thirdly, participant observation allows to observe and experience at first hand a set of situations, so the researcher has the opportunity to perceive behaviours, listen to what is said in conversations, interact with people and ask questions, participating in their daily operations, what entails immersion and involvement in the social setting (Bryman & Bell, 2015). It encompasses relatively informal conversations, discovering how people see and talk about the situations they experience, involving the participation in the social world and allowing first-hand engagement with it (Hammersley & Atkinson, 2007). Therefore, training actions enables to perceive more hidden details through the contact with workers and how they are adapted to the waste management system, realizing their attitude and openness towards it. Also concerning this method, an observation guide was made to record some aspects of the attitudes and features of workshop managers and mechanics (see Appendix 2).

Fourthly, semi-structured interviews further generate data of the social reality on people's opinions, knowledge, perceptions, interpretations, motivations, judgments, relations and experiences, which the research questions are intended to explore (Mason, 2002). Besides, it allows to gather data on the more intangible aspects, as assumptions, problems, beliefs, enabling interviewees to explain their own ways of defining the scenery and pursuing issues that matters to them and that are not included in the schedule (Cohen et al., 2007). It allows room to explore topics of interest that emerges as the conversation flows, being possible to address feelings, motivations, strategies, organizational culture and management style and perceiving how the interviewees frame issues by what they perceive as important in explaining (Bryman & Bell, 2015). The interviewees were selected by their different roles and responsibilities in the waste process, being them the quality manager to assess the company's strategy regarding the topic and the workshop managers and the mechanics to assess their degree of motivation and compliance with good environmental practices. Their involvement in different stages of the process allows to better understand its complexity, as well as people's experiences, practices and organizational changes, so they can provide useful insights of its functioning and implementation. An interview guide based on the literature was made (see Appendix 3).

Fifthly, a questionnaire is one of the most used tools for obtaining information because it is a primordial instrument regarding quantitative methods. Through this method, the investigator is able to gather data in a standardized way, so it allows easier data processing as it ensures the normalization and comparison of the information of all the respondents (Vriens, 2006). A questionnaire based on some of the interviews' questions was designed to complement and corroborate the answers given by the interviewees (see Appendix 4).

3.4. Case study analysis

After the case study data collection process, all the evidence is analysed and gathered in a database, so it is possible to find logic correlations between the information, to mitigate inconsistencies and to extract reliable conclusions. These findings will help Grupo JAP improve its processes and practices and objectively define the actions it has to take to make the whole system more organized, fluid and optimized. In addition, it will allow to present the actions that have to be implemented to not only comply with the legal procedures but also to reduce costs and improve the image for all the stakeholders.

4. Case study: developing a waste management system at Grupo JAP

Firstly, in this chapter, a description of the case study's object is depicted. Thus, it is provided useful information about Grupo JAP's history to understand its evolution throughout the years and to contextualize its current business areas, from which an analysis of the organisational design and structure of the organization is provided. The organization's mission, vision and values are also overviewed. Moreover, it is made a more detailed analysis regarding the Quality Department, its areas and activities performed, highlighting the area of waste management, on which the internship is focused. Thus, it is explained what happens within the waste management system and the main contributions of the internship to its development.

Secondly, this chapter intends to find the answers to the research questions of this study. Hence, the information obtained through the application of the different methods within Grupo JAP is analysed and discussed in order to find ways to improve the current waste management system. Furthermore, as a result of the internship experience and the literature, it is presented a framework to help Grupo JAP in the implementation of an integrated waste management system.

4.1. Grupo JAP

This section generically describes Grupo JAP, the quality department and the area on which the internship focused as well as the main contributions of it to the waste management area.

4.1.1. History, strategy, mission and values

Grupo JAP history goes back to the early beginning of the 20th century, more exactly in 1904. It all started in Marco de Canaveses with a carriages repair shop, owned by José Augusto Pinto. In 1927, when the first vehicles appeared, the company expanded its activity in car assistance and with the natural evolution of the automobile industry over the years, Grupo JAP now holds the retail rights of some of the major automobile brands, as Renault, BMW, Volkswagen, Audi, Mitsubishi, Nissan and Dacia.

Grupo JAP is also responsible for the launching in the market of Matrizauto, based on an innovative concept, being the first and largest megastore of used and semi-new vehicles, implemented first in the city of Braga and later in Porto, Sintra, Aveiro and recently in Leiria. Besides operating in the car retail area and in technical assistance in the

repair and collision sectors, Grupo JAP operates in other business areas such as the trade of parts for any brand through JAP Parts, car hire, with JAP Rent-a-Car being the exclusive franchise in Portugal from Sixt - one of the world's largest Rent-a-Cars, and services provision, as insurance, financing solutions and fuels, with two BP stations.

Throughout the years, Grupo JAP improved its national positioning as it maintained a posture of continuous diversification of its products and services portfolio, enlarging its core business. This emerged as a need for constant adaptation to the needs and requirements of the market and to broaden its horizons towards new competitive directions, which is part of the strategic plan to mitigate risk and to foster synergistic growth as an integrated business system.

With more than 35 points of sale and service and employing more than 1500 employees, Grupo JAP is currently one of the largest automotive groups in Portugal, being also present in the international scenario, in the Angolan market, with Automatriz, since 2010 and the exclusive representation of MAN Trucks & Bus also in Angola, in 2015, accentuating the presence in this market.

Grupo JAP's mission is to serve the customer better and better with continuous gains in efficiency in management, improvement of profitability that sustains the growth of the organization and the well-being of employees. Its values are based on professionalism, ethics, transparency, responsibility, nonconformity and resilience. A chart of Grupo JAP structure and brands is presented bellow in Figure 3.

Figure 3 - Grupo JAP structure and brands



Source: retrieved from organizational documents

4.1.2. Quality department

In the quality department, whose organization chart is presented in Figure 4, there are some important functions which are transversal to the good working of the whole organization.

Quality director is responsible for ensuring customer satisfaction and loyalty by working to increase the level of quality perceived by the customer. He aims to ensure the maximization of the brands' quality bonuses by complying with the brands standards represented by Grupo JAP. Together with the chief executive officers, he participates in the definition and implementation of improvement action plans that will be followed by the brand quality technicians. He sets goals to achieve high levels of performance, as well as procedures and rules to meet these goals, ensuring the accomplishment of procedures, including environmental requirements. Besides, as a director, he accompanies the performance of the Quality team to achieve the proposed goals.

For its turn, brand quality technicians are responsible for comply and enforce the procedures established by the brands and publicize their culture and goals within the organization. Thus, they conduct diagnostic audits of all establishments and send inputs to the brands periodically related to quality indicators and compliance with the certification. Besides, they monthly extract the results of the represented brands and analyse the results obtained by the several concessions and disseminate them, providing the improvement of performance and maximization of the bonuses assigned.

The main tasks of customer quality technician are listening customers, prepare diagnostic reports, detect the causes of customers' dissatisfaction, propose improvement solutions, develop strategies to increase the quality level perceived by the customer, visit establishments, perform diagnostic audits to all the establishments, follow-up the plans implemented and evaluating its effectiveness.

The complaints manager ensures the proper handling of complaints, analysing and handle them according to the procedures instituted. Knowing the instructions and legislation applicable to each business area or department within Grupo JAP, she is able to prepare a response to the client. She maintains communication channels with internal and external customers and quality director, being responsible for developing statistical reports and report the main points of intervention.

The main functions of technician customer relationship are communicating directly with customers to measure their satisfaction, make a personalized monitoring of their

dissatisfaction, proceed to telephone attendance of complainants, listening to the client and prepare diagnostic reports with action plans and follow up.

The health and safety at work technician checks the work conditions within the organization, surveys the needs for personal protective equipment needed by new workers, as well as whether employees are wearing them. Thus, she makes site visits to check if they are meeting the established safety rules. In addition, she is responsible for chemical safety data sheets as well as check what happened in case of an accident.

For its turn, the environmental manager guarantees quality control and compliance with environmental standards, ensuring obedience to existing laws, while works to achieve the best possible economic performance through the correct waste handling. This function within Grupo JAP is more directed to the management of waste, as it is detailed in the following section.

Figure 4 - Quality department organization chart



Source: author own elaboration

4.1.3. Environmental area

The environmental area within Grupo JAP is primarily focused on waste management since it is the area that is more representative due to its activity. Thus, the organization's several car repair shops along the country produce many tons of waste per month that must be properly managed.

The waste management area works directly with the waste operator, workshop managers, mechanics, the purchasing department and external regulatory entities. There have been defined routes for waste collection since the beginning of the contract with the operator. These routes involve the combination of car repair shops by locations proximity and each route is assigned a specific day, aiming to attain a more organized and efficient service.

Hence, workshop managers have to ask for the type of waste and the number of containers to be transported the morning before the collection day, so the waste operator organizes the service, specifically the number and type of trucks to do the collection. At the end of the service, the workshop manager signs a transport guide and keeps the copy

that is supposed to be sent by email to the environmental managers, so there is a centralized internal control.

The several types of waste are introduced by the operator on a platform for fulfilment of legal requirements, with the specific waste quantities, which generates an e-gar (electronic waste tracking guide). This electronic document is validated later by the environmental managers within Grupo JAP.

At the beginning of each month, a consolidated report is sent by the operator, containing the types of waste collected in the previous month in each establishment, its quantities, costs or revenues with each waste and the costs with transport and rental. Hence, the environmental managers process these elements sent in the report on an internal platform and send the order forms to the purchasing department for validation. Once validated, these order forms are sent to the operator for billing and a spreadsheet with costs and revenues taken from the report is updated.

4.1.4. Contributions of the internship to the organization

Regarding this internship's main contributions to this whole system, it has allowed the development of important tools, documents and processes that contributed to the improvement of this area within the organization. It is important to note that the beginning of the internship coincided with the change of the waste operator, since the previous one often did not meet the container collection deadlines, which disturbed the operations of the car repair shops. As a result, routes were created for better system organization and efficacy. However, as there was no track record to this extent, the quantities of waste produced and the number of containers had to be analysed to determine the collection frequency for each establishment.

The waste identification plates (see Appendix 5) were made to help workers distinguishing the different types of waste more easily by containing pictures and the description of the waste that should be placed in each container according to the codes of the European Waste Catalogue. It is important to highlight that the picture in the waste identification plates is an important element because it helps to quickly identify the waste and clarify doubts and it is more appealing. Before the internship, there were just the labels stuck on the containers that are required by law and are placed by the waste operator. However, these labels only contain a descriptive in small letters of what is supposed to be placed, so it is not as accessible and appealing as the waste identification plates.

Moreover, several documents needed to be created. A detailed informative document was made specifically addressed to the workshop managers to inform them about their responsibilities, the existing type of containers in Grupo JAP, routes, periodicity and day of collection, how early the order should be placed, who to contact and how to place the order. This document was really needed as the workshop managers are the ones who manage waste on site and requests its collection, so they must have the information organized to avoid confusion and misunderstandings. More examples of documents include the procedures to inform about the rules established by the quality department that required to be fulfilled by the agents involved in the system, such as the procedure for handling the batteries and delivering them in the warehouse. Documents with environmental fines attributed to the carelessness of workers with certain waste were made and posted in car repair shops to alert them about the consequences of their actions. Furthermore, documents to support the operational processes were made, such as the auxiliary waste collection form (see Appendix 6).

Some economic feasibility studies regarding waste operators were done to evaluate other market options. Thus, the costs and revenues for each type of waste and the costs of transport were compared, considering a forecast based on the volume of production and the frequency of waste collection. That type of studies was also made for studying the possibility of exchanging contaminated absorbents, which are one of the most widely produced types of waste in Grupo JAP and have a great economic impact, for cloths that are washable.

Concerning the economic control of the waste management activity, when the new waste operator started its activity, a spreadsheet was created and monthly updated to monitor the costs and revenues with each type of waste for each establishment, as well as the costs of transport and rental of the 6m³ containers, used in the collision establishments (see Appendix 7). This spreadsheet contains information of the monthly reports sent by the operator and it is very important to measure the evolution of the expenses that the car repair shops have.

4.2. Analysing and improving a waste management system within Grupo JAP

This section aims to gather information from the methods applied, that were company internal documents, semi-structured observation, participant observation, semi-structured interviews and questionnaires, so it makes possible to identify the gaps and consequently find strategies to solve them in order to improve the current system.

4.2.1. Understanding the strategical dimension

This chapter aims to analyse and discuss the results of the different methods used in this study, which helps to find ways to improve the current waste management system at Grupo JAP, identifying the existing gaps and looking for strategies to solve them.

It is important to analyse the system from the top-down, studying first this issue within the organization from the strategic point of view and then from the operational. The analysis of internal documents and internal messages from the administration allowed to understand that there is no strategic direction regarding waste management within the organization, since this issue is not addressed as a strategic goal or even a competitive advantage.

Moreover, the quality director, when asked in the interview about the integration of this topic within Grupo JAP strategy replied that it should be more integrated. As he stated, “despite the top management is quite concerned about everything that represents a cost, legal requirement and may affect customer perception, there is still no great environmental awareness within Grupo JAP”. Besides, in what concerns the importance of corporate social responsibility within the organization, the quality director answered that it should also have more relevance, “once this issue is related with fines avoidance and foster a good image for all the stakeholders”. He added that this concern about corporate social responsibility “is still at an intermediate level, once the responsibility for now is to comply with the legislation”.

Therefore, all efforts at the operational level are not in line with the organization’s strategy, making it difficult to implement certain procedures and rules and for employees to comply with the waste management activity requirements. As mentioned in the literature, top management commitment acts as a framework that fosters the improvement of the environmental performance, so a missing strong framework makes difficult to motivate the workforce to make the effort to positively contribute to environmental enhancement (Govindarajulu & Daily, 2004).

As cited by Perron et al. (2006), organizational culture can constrain the conversion to an environmentally responsible company, so to attain the new goals, the organization must reorient its behaviours and attitudes. Furthermore, Suzy et al. (2015) states that managers' environmental attitude is influenced by the institutional environment. Since it is a chain of influences from top management to mechanics, it is essential that this issue be integrated into the company's strategic line. Thus, regular communication about the organization goals regarding waste management and the environmental programs must be provided, so all the participants in the system know what is expected from them and what are the goals to be achieved. In the questionnaire, communicating goals and priorities to motivate employees to act was considered the second most important factor in motivating employees to the environmental issue.

The lack of top management commitment constrains the development of an environmental culture within Grupo JAP, which has an impact on the involvement of supervisors (workshop managers), who do not take this issue seriously, what, in turn, influences the mechanics attitudes.

Thus, it is key to introduce an environmental culture where attitudes and behaviours are reoriented to achieve new goals, encouraging participation in the organizational change (Perron et al., 2006). The introduction of an environmental culture was the most pointed solution to the system gaps, so it can be concluded that, in fact, this a factor that most employees value.

4.2.2. Understanding the operational dimension

After analysing the strategical dimension, it is essential to focus on the operational dimension.

The semi-structured observation was performed in five car repair shops chosen for convenience in terms of closeness, as they were the investigator's workplaces. These establishments will be further on indicated as place to which a number will be assigned for easier designation. The conditions of the semi-structured observation is presented below in Table 5.

Table 5 - Semi-structured observation conditions

Car repair shops	JAP Automotivo de Paredes – Place 1 Hendo de Paredes – Place 2 JAP Colisão de Paredes – Place 3 Hendo Colisão Premium de Paredes – Place 4 JAP Automotivo de Amarante – Place 5
Semi-structured observation periods	1 week for the four establishments in Paredes before and after training 1 week for the establishment in Amarante before and after training
Schedule	Monday to Friday Twice a day (once in the morning and in the afternoon) 45 minutes each observation moment
Participant observation (training sessions) periods	1 week 1 day for each of the five establishments
Schedule	Monday to Friday One training session per day 45 minutes each session

Source: author own elaboration

The record of the two semi-structured observation periods is detailed in a table in Appendix 8, which allows easier presentation of information and easier comparison. From that table, it is possible to observe that in the first observation period none of the parameters fulfil what is required, which improved in the second observation period after the training session, although not yet very significantly.

Comparing the two periods of observation, despite slightly improving, sorting and separation quality, filling rate of containers, floor free of waste and card flattening remained aspects that are poorly fulfilled. Before all, it is important to note that cardboard is one of the most produced waste in the Grupo JAP and its poor packaging interferes with the filling rate of the cardboard containers, which results in more transportation costs. As confirmed by Orth et al. (2014), bulky waste increases company’s transportation expenses. Besides, the filling rate also leads to card scattered on the ground and consequently to poor space organization. It is important to note that the filling rate is complex as it depends not only on the proper packaging, but also on the frequency with which containers are requested, the delays of the operator in the collection or even the largest production volume, so it is essential the supervisor control to avoid chaos.

Furthermore, it is important to consider the influence of waste collection by the operator. It has been found that after the waste collection by the operator, the status of the car repair shops improved, but not every time, because of the lack of involvement by the workers due to the poor environmental awareness within the organization and the lack of control by supervisors. In fact, regarding the supervisors’ behaviour, they only

checked the containers to ask for their collection and even there were waste mixtures, in none of the establishments the supervisor warned workers. There were also no records in any of the observation periods of help and attention among mechanics.

Finally, in the second time that were observed, all establishments had waste identification plates, as their placement is the responsibility of the quality department. The lack of labels and the poor conditions of containers that are the responsibility of the operator remained unmet, and further pressure on the operator is required to be more rigorous on these parameters. However, it can be said that it is also the responsibility of supervisors to report system failures, such as the lack of waste identification plates, labels or the poor condition of containers, which have an impact on the image of the car repair shop for all stakeholders and even in their own working conditions.

In turn, the interview and the questionnaire were conducted with the same sample, namely with 81 people, including 60 mechanics, 20 workshop managers and the Grupo JAP quality director. For each establishment, the interview was conducted with three mechanics and the workshop manager. The sample has an average age of 35 years and an average of 11 years regarding the years of work in Grupo JAP. Most of the sample (53%) has an education level between the 9th grade exclusive and the 12th grade inclusive. The interview results are systematized in Appendix 9 and the questionnaire results are presented in Appendix 10.

It is noticeable that there was evolution in Grupo JAP recognized by all respondents, and the largest separation of waste was the most cited aspect. This response has often arisen in connection with the waste identification plates for containers and the increased number of containers over the years. A few years ago, as the older mechanics pointed out, there was a single container where all the waste was dumped and over time there were more containers, as well as a consequent concern to help employees change the habits once formed. As the quality director stressed “now there is a waste management that before was neglected”. For Ghisellini et al. (2016), in the past, waste management was seen just as a way of discarding waste in landfills or through incineration, while lately waste is seen in a different way, becoming waste management part of a circular economy, seeking for the recovery of resources, minimizing the environmental damage.

The waste identification plates were also a very positive contribution recognized by most interviewees. According to one mechanic, “it has helped to clear up some doubts and to distinguish the various types of waste by containing pictures because before it was just that label with a little phrase we couldn't even read”.

Also the increase in training in Grupo JAP is an aspect that respondents recognize as part of the evolution, although still little cited by the sample, as several establishments have not had yet any session. For the gaps pointed out, the solution most referred by respondents in the interview was investing in training and awareness raising actions, which was the second solution most pointed out in the questionnaire. Training was the most mentioned critical success factor in the interview, as well as a factor that both supervisors and mechanics considered it would improve mechanics' motivation, being the leading factor in the questionnaire in this regard. It should be noted that most employees highlighted that "there is no lack of knowledge but of willingness", so it is important to invest in awareness raising actions. As mentioned in the literature, environmental education offers employees the knowledge and tools to adopt an environmentally aware behavior and make conscious decisions, being essential to an effective environmental management endeavor (Perron et al., 2006). Other authors as Orth et al. (2014) and Teo and Loosemore (2001) stated that environmental education contributes successfully to raise employees' awareness of the consequences of their activities.

Despite all mechanics recognize that their responsibility is the correct separation of waste and some of them still added that it is also their role to be aware of their colleagues' behaviour, the main gaps evidenced by the respondents in the interview were the incorrect separation and carelessness and even resistance of some workers to comply with the rules. This last aspect was pointed out both by workers and workshop managers as the main difficulty concerning this system, being mentioned as the main system gap in the questionnaire. In fact, it is noticeable that within Grupo JAP there is still a lot of waste mixture, what was verified during the observation periods and during some visits to establishments, so awareness actions must be provided.

As mentioned before, between the observation periods there was a training session given in each car repair shop. In all establishments, the supervisor was very cooperative, revealing a facilitative attitude towards the success of the training. Regarding mechanics, some of them expressed their doubts about the waste management system and reported flaws in the current process, making suggestions and showing interest in trying to find a solution together. However, in all establishments it was registered that there were workers that were not paying attention and were not committed to listen what was being said and some even had an attitude of discontent and protest rather than a constructive one.

Therefore, to ensure the success of the training sessions, it is key to understand what employees associate to be important or beneficial about waste management. Both in the

interview and the questionnaire, most respondents consider waste management important or beneficial because it contributes to the environmental sustainability, it has an impact on human health, it changes people's attitudes towards waste handling, it helps to manage company's environmental obligations and risks and it controls resources consumption. Thus, it is possible to realize that the most valued aspects are related to the environmental, community and legal issues, so training must reinforce all these aspects. Furthermore, some mechanics stressed that knowing they are helping the environment and future generations is enough to motivate them for the waste management system. As stated by Orth et al. (2014), employees should be informed about the consequences of their actions, because if they are sensitized not only contribute to improving the environmental quality in their workplace but also in the social environment.

Still related to workers' positive attitude towards the environment, although all the mechanics responded to be motivated to the waste management system, both workshop managers and mechanics indicated that receiving more help, support and feedback from the supervisor would improve more their motivation. Hence, it is important to highlight that when asked about their main roles and responsibilities, most workshop managers admit that is staff counselling, guidance and cautions, so they themselves confess that is an essential aspect. However, this lack of control was pointed out as a gap in interviews, being the second most mentioned solution giving more feedback, follow-up and guidance. Furthermore, monitoring of employees by the supervisors is also one of the most suggested procedures to improve the current waste system, being also referred as a critical success factor. This aspect is also related to the success of training, as the help of workshop managers is absolutely necessary. As stated by Govaerts et al. (2017), supervisor's support is fundamental to the transference of the competences developed during training to employees' daily job.

In this sense, feedback was also an aspect evaluated in this study. Employees need continuous feedback about their performance outcomes and their effectiveness on the improvement efforts of the environmental system, otherwise it may not evolve (Govindarajulu & Daily, 2004). In the questionnaire, continuous feedback on employee impact and efficiency in environmental improvement efforts is the second most mentioned way to motivate employees. However, in the interview some inconsistencies were discovered, once the great majority of supervisors (80%) said they give feedback, and more than half of the mechanics say they don't receive feedback (58%). Since there is one supervisor for every three mechanics, only 20% of mechanics would not receive

feedback. In 30% of establishments, the response from supervisors and mechanics is not consistent, as all mechanics respond that they do not receive feedback and supervisors respond that they give feedback. In 40% of establishments the answer is in agreement. In 30% of establishments, the supervisor says he gives feedback and some mechanics say they receive and others not. Despite this, looking to the type and frequency of the feedback from both sides (supervisors and mechanics), it can be concluded that it is not given on a regular basis. This aspect was confirmed during the two observation periods because, although the observation moments are not long, no occurrences were recorded.

Monitoring of containers' filling also makes part of the supervisors' responsibilities, as they themselves recognize, what need to be more rigorous, as its lack of control was stated as one of the existing gaps. In turn, this aspect is associated with the late request for waste collection, so waste accumulation left mechanics with no space to place the waste, which results in mixtures and disorganization. In fact, as confirmed during the observation periods, the containers were often above their capacity level, being some caused by spikes in production and others due to the lack of control and late request.

Moreover, there must be provided all the conditions to employees and a monitoring of the needs must be done on a regular basis, as they change according not only to the evolution of the automotive industry with the new components that arise, but also to the growth and evolution of Grupo JAP. Thus, the lack of containers was indicated in the interview as one of the shortcomings. According to the respondents, the solution would be to study the most produced waste and request more containers for such waste. Having more containers was also one of the aspects that would increase the motivation of some workers and one of the main critical success factors pointed out both in the interview and the questionnaire. However, car repair shops have a limited space for more containers and a more optimized layout, as it was also mentioned as a gap. Furthermore, some outside containers do not have a cover, being exposed to adverse weather conditions. Thus, it was suggested an infrastructure investment to increase car repair shops or create a space specially reserved for waste. Another solution would be having small containers next to workers whose waste would be sorted at the end of the day in larger containers, which would also help to minimize waste of time.

Organization and cleanliness of the workplace is also highly valued by respondents, having been mentioned as a reason for the importance of waste management and as one of the main responsibilities of mechanics by themselves. However, it was observed that there is still waste on the floor, which can be a consequence of containers being full, an

operator's delay or because of the workers' habits. Besides, he said that "workers tend to work better in clean and tidy places, so as it is a business that lives a lot of the customer, it is fundamental creating a good image for customers, partners and suppliers".

Therefore, the waste operator also has a great impact in the success of the system. Some occasional delays were reported by the interviewees which often lead to rapid accumulation of waste and consequently great disorganization in places. Moreover, it was noticed during the observation periods the lack of placement of some legal labels and poor containers conditions, such as unpleasant smell and deterioration, which affect the image for all the stakeholders and even the workers' productivity. Thus, it is needed that supervisors' continuously report the errors to the quality department instill more rigor in the operator's service. From the analysis of operational documents, several errors in the monthly reports sent by the operator are often detected, which delays the process of making orders forms. Therefore, it can be suggested that both supervisors and quality department must do a monthly report with both operational and administrative operator errors and monitoring them over time with possible penalties implementation.

Regarding the financial aspect, it was more valued by workshop managers and the quality director as a reason for the importance of waste management. However, in the questionnaire, considering all respondents and that mechanics are most of the sample, the financial aspect is the least valued aspect both regarding the importance of the waste management system and the expected benefits. Thus, the higher the position rises in the company, the greater the concern with this issue, as the pressure to meet the budget and achieve results is greater. Indeed, the quality director states that "one of the main goals of the waste management is getting lower costs with waste". Improving the environmental performance of the organization can contribute to a better financial performance instead of incurring in higher costs (Suzy et al., 2015). As mentioned before, this is one of the main concerns of top management, because as it was cited by Carroll (1991), at the bottom of the corporate social responsibility pyramid is the economic performance once without it all the other responsibilities cannot be supported.

After conducting a system analysis and identifying gaps, it is important to identify responsibilities and solutions to define what needs to be fixed, who should correct it, and how the system can be improved. A summary of these elements is given below in Table 6.

Table 6 - Analysis and improvement of the current waste management system

Responsibility	Gaps	Solutions
Quality department	<ul style="list-style-type: none"> - Lack of containers - Some missing signaling - Poor layout of the containers - Some outside containers do not have a cover, being exposed to adverse weather conditions - Some places in the same route have different waste production rates - Lack of training - Lack of staff involvement - Lack of feedback and information on the state of car repair shops in terms of evolution of waste generation and costs and compliance with the rules 	<ul style="list-style-type: none"> - More containers in place according to the highest waste filling rates - Needs assessment and placing the missing waste identification plates - Study the available space to place more containers or rearrange the existing ones - Suggesting to the administration an evaluation of an infrastructure investment to increase car repair shops or create a space specially reserved for waste - More frequent audits from the quality department - Adjust some routes and collection frequency - Organize regular training sessions, setting a timetable and program content for each one - Create an online open document for mechanics and supervisors to ask their questions, needs and suggestions to improve this system - A monthly or quarterly release of results should occur for each car repair shop to make people aware of the progress in the waste management area - Study the possibility of assign a bonus to the places where people most fulfil what is required
Workshop managers	<ul style="list-style-type: none"> - Lack of workers' supervision what leads to waste mixtures - Waste over containers' limit - Waste on the floor 	<ul style="list-style-type: none"> - Select one worker per week to check waste separation daily - Regular monitoring of containers from supervisors to control the filling rate, the separation quality and the card flattening - Giving some time to organize the space at the end of each day

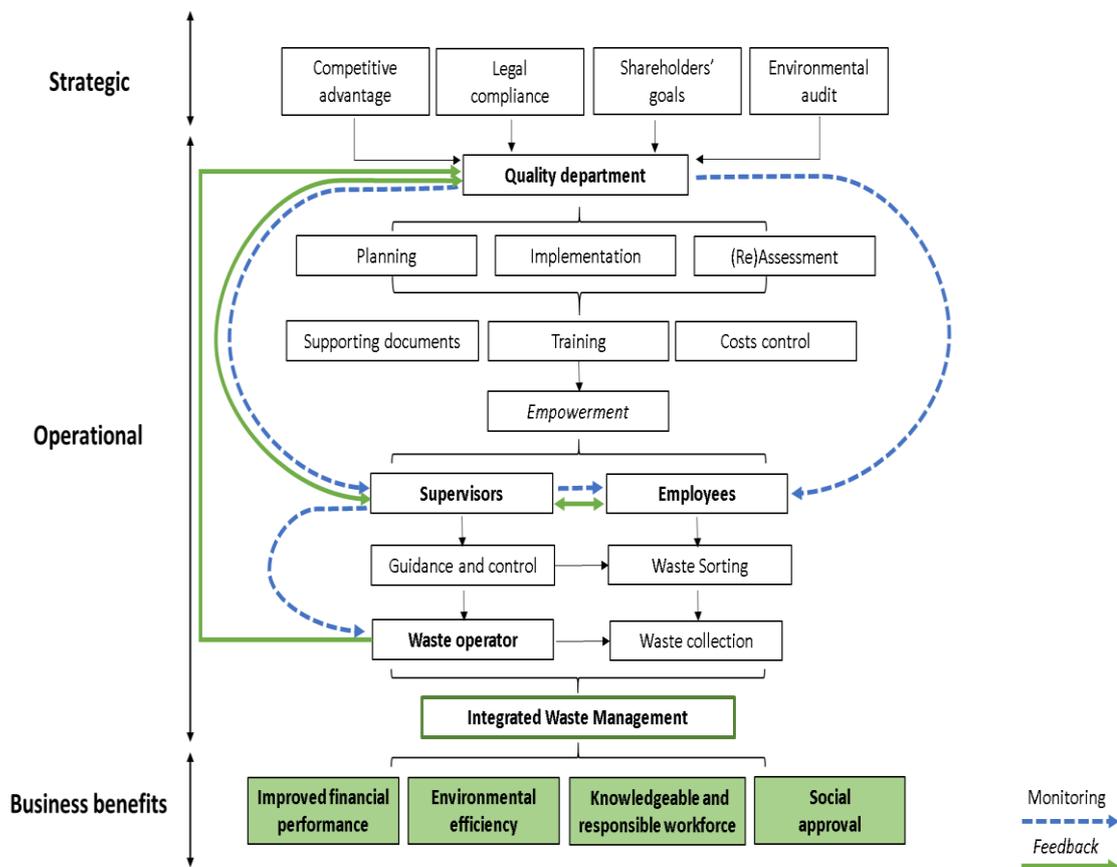
	<ul style="list-style-type: none"> - Lack of communication regarding failures within the waste management system 	<ul style="list-style-type: none"> - Provide regular feedback to quality department and warn as soon as a failure on the place is identified, such as missing a waste identification plate, label, bad condition of containers or operator delay
Mechanics	<ul style="list-style-type: none"> - Incorrect separation of waste - Waste over containers' limit - Carelessness in card flattening - Waste on the floor 	<ul style="list-style-type: none"> - Training/awareness raising actions to reduce the carelessness and resistance of some workers and to improve the knowledge of the workers regarding this topic - More feedback from supervisor, by warning them when they are doing something wrong but especially recognizing what they are doing well and motivating them with encouraging words to take steps to improve the system
Waste Operator	<ul style="list-style-type: none"> - Some occasional delays - Poor containers conditions - Lack of placement of some legal labels - Errors in the reports sent by the operator 	<ul style="list-style-type: none"> - More feedback exchange between supervisor and quality department to report errors - Quality department must instill more rigor in the operator's service - Both supervisors and quality department must do a monthly report with both operational and administrative operator errors and monitoring them over time with possible penalties implementation

Source: author own elaboration

4.3. Articulating people and processes: an integrated waste management system

The present section aims to understand how to implement an integrated waste management system within the organization. Therefore, as a result of the internship experience and the literature, a framework is suggested to help Grupo JAP in the implementation of an integrated waste management system (see Figure 5).

Figure 5 - Integrated waste management system framework



Source: author own elaboration

An integrated waste management system starts with defining a strategic route to incorporate waste management as part of the business strategy (Debnath, 2015). As stated before, waste management is not currently integrated into the company's strategy, so it does not set well-defined objectives regarding this topic, nor there is communication from the top management to mentalize and involve everyone in this issue. Ramus (2001) confirmed that when there is lack of purpose and clarity, employees tend to feel less

motivated to get involved or accept new responsibilities. Therefore, top management must formalize the waste management system and communicate its importance for the organization strategic goals.

Furthermore, as referred by Suzy et al. (2015), incorporating environmental practices like as waste management in organization's strategic decisions enhance the chances to obtain competitive advantages in the market as companies which are perceived as more sustainable than competition tend to be preferred by customers, what increases its financial performance. According to Kiernan and Levinson (1997), strategic environmental management is pointed out by evidence as enhancing competitiveness, profitability, sustainable quality of outcomes and shareholder value, being broadly recognized by financial analysts and investors that exists a robust, positive correlation between environmentally organizations and their competitiveness and financial performance measured as ROI, ROE or overall stock market return.

Kiernan and Levinson (1997) added that, in the longer term, the potential for superior performance will be even bigger once the capital markets become more fully sensitized to the competitive and financial consequences of environmental efficiency, what will lead them to reward even more strongly better organizational performers. Still from the strategic point of view, for Suzy et al. (2015) companies are obliged to comply with the environmental laws as governments and regulatory entities threaten or even block the organization's operations according to their environmental performance. Within Grupo JAP, it was noted that staff are more alert when the subject of fines is addressed, as there are several rules that if are not fulfilled the organization may incur in severe environmental fines that could compromise its financial performance.

Furthermore, the implementation of this system foresees that periodic audits are carried out to verify that the operation is being well performed. For Debnath (2015) environmental auditing helps the company to control its resources consumption and organizational practices while integrating waste chain in the daily processes.

After the strategic goals for waste management are defined and the objectives outlined, it is important to proceed to the operationalization and implementation of the strategy. The edge between strategic and operational plans is carried out by the quality management department that, being aware of the institutional policies and organizational goals, is responsible for the planning and implementation of the waste management system, its further assessment and continuous reassessment in order to understand if it is being well accomplished. According to Suzy et al. (2015), the institutional environment,

in its turn, influences the managers' awareness and compliance behaviour towards the environment and managers who develop positive environmental attitudes are prone to the development and implementation of environmentally friendly policies, which make organizational environmental values clearer.

Managers can, thus, be determinant in inspiring others to take part in pro-environmental practices in order to attain sustainable development, having impact on the employees' willingness to implement environmental practices. Therefore, the company policies should be shared with all the personnel for them to be aware of the company's goals and be supportive to the integration of the waste management system.

Quality managers are responsible for the development of supporting documents, the costs control, but also the training programmes that educate and sensitize both supervisors and employees for the environmental issue. Orth et al. (2014) considers that training initiatives are a critical tool to sensitise employees to the environmental issue, by instilling values and developing attitudes and skills for them to adopt the new mindsets and act accordingly with the organizational policies. Perron et al. (2006) states that the companies that plan and implement environmental education programmes, having set goals, need to assess and measure the outcomes of these programmes, as the retained knowledge and the change in culture or behaviour, to guarantee the training was successful in what concerns company's expectations.

Also according to Perron et al. (2006), such participation in the environmental management initiative empowers them with wisdom and discernment of how the context can affect and be affected by their decisions, building ownership of the change and stimulating employees to make the change effort work. Concerning empowerment, Govindarajulu and Daily (2004) considers that empowered personnel are more likely to participate in the environmental effort and to be more committed and motivated.

The control and monitoring of the whole waste chain belong to the quality department that establishes frequent contact with the supervisors to find out that their responsibilities are being fulfilled and some contact with the employees during the sporadic visits to the fieldwork, perceiving if they are complying with the established system. In turn, supervisors are in charge of monitoring employees' daily environmental practices, essentially if employees are complying with proper waste separation, and controlling whether the waste operator is meeting deadlines and performing well its tasks. It is important to highlight the role of the supervisor in providing support and orientation, which motivates employees to transfer the competences learnt during the training to their

workplace (Govaerts et al., 2017). Moreover, supervisors are responsible for controlling the working area in what concerns the filling rates of containers, calling the waste operator to do the waste collection, when they perceive it is needed.

Along this waste chain, the information flow supports the management in taking appropriate decisions and enhance the practices (Debnath, 2015). Communication between the whole participants in the system helps to streamline the processes and enhance them. Quality department, as the head of the system, gives feedback to supervisors about the ongoing processes, new strategic procedures and updating project outcomes. The feedback is bilateral as supervisors report on employees' environmental attitude, problems and concerns with some aspects of the operation and about operator performance. Besides, quality department gives feedback to the waste operator based on the outcomes of the process and the feedback received from supervisors and receives feedback from the operator about problems or difficulties with the operation. According to Molina-Azorín, Claver-Cortés, López-Gamero, and Tarí (2009), managing effectively the relationship with key stakeholders that provide key resources to the organization, through developing and nurturing the ties, contributes to improved financial performance. Supervisors, in turn, give feedback to the employees about their environmental performance and receive feedback from them about their feelings, difficulties, complaints and improvement aspects concerning this issue.

Integrated waste management connects, thus, strategic decisions with the operational areas, guiding companies towards a value-oriented approach that generates business benefits (Debnath, 2015). According to Molina-Azorín et al. (2009), waste management has a positive influence on the financial performance, impacting not only the level of company differentiation but also in terms of reducing costs and increasing revenues. Furthermore, Ambec and Lanoie (2008) state that consumers are attracted by sustainable policies, resulting in sales raise as well as social approval and greater legitimacy. Good environmental performance may, thus, enhance the global company's image and reputation. Moreover, Debnath (2015) considers that implementing an environmental management system, through the redesigning of procedures and training programmes, improves environmental efficiency of business processes and increases awareness within the company, which helps towards the accomplishment of its social duties.

In succeeding at enhancing the awareness of the organization's workforce, enduring knowledge is produced and employees, at all the levels of the company, are likely to orient themselves in an environmentally conscious manner, making organizational responsible

decisions (Perron et al., 2006). This way, Govindarajulu and Daily (2004) concludes that society, community, companies and employees themselves profit from improved environmental performance and the organizational benefits include better financial results, diminished environmental impact, more conscious and knowledgeable employees and supervisors and improved public image.

5. Conclusions, limitations and future research

Waste management is an issue of increasing global concern once both the growing human population and the demanding economic scenario lead to greater exploitation of natural resources and more generation of waste. However, as Kurdve et al. (2015) states, despite its importance, it is an issue difficult to manage, once it involves various actors from different organizations.

This internship report intended to study Grupo JAP regarding its waste management system in order to understand what could be done to improve it and to implement an integrated system in what concerns all its actors and processes.

Throughout the analysis of the different methods applied, as main conclusions, it can be stated that the organization has several flaws that are related to the main players in the system. The major problem identified relates to the fact that the waste management is not integrated in the Grupo JAP's strategy, so all the operational efforts are not supported by strategic guidelines, making it difficult to implement certain procedures and rules. This explains why the quality director admits that this system is still on an intermediate level and why there is not much awareness within the organization yet. Therefore, the flow of information in this system is still poor, so the initiative to improve this flow should start from the top management with defining and communicating clear and precise environmental goals.

Furthermore, as it is possible to visualize in the suggested framework for the implementation of an integrated waste management system, the roles of all the actors are interconnected and influence each other, so it can be concluded that the poor performance of one can compromise the good functioning of the system. In this sense, feedback among all the actors, continuous monitoring and evaluation of the system are necessary, having the quality department a major role regarding these issues. Thus, quality managers should bet on sending periodic reports addressed to the workshop managers and doing regular visits and audits to the car repair shops. By introducing more rigor, workshop managers will take their role of supervisors more seriously and will assume an attitude of greater commitment to this system, which, in turn, will influence the positive attitude of employees on this issue.

As mechanics are the key actors in applying changes in routines and behaviours essential to attain the desirable results in the environmental performance of Grupo JAP, it is crucial to act on their habits. Hence, as recognized by most of the sample, the main

point should be providing training or awareness raising actions to all the workers, which will reduce resistance and sloppiness of some of them.

Moreover, it was noticed that the physical conditions, such as the layout of car repair shops, the lack of waste identification plates and the lack of containers, are factors that discourage the employees, so if the organization acts towards the improvement of the worker's conditions, their motivation to comply with the rules may be enhanced.

Lastly, it can be concluded that the waste operator is also an essential element in the waste management system, as its performance regarding the fulfilment of collection deadlines influences the organization in car repair shops. Therefore, operator's delays lead to an overaccumulation of waste and, consequently, waste mixtures, so the efficiency of the whole system is compromised.

Regarding the limitations of this study, it is important to note that the places sample chosen for the observational method was reduced, which was also due to the time available to perform this method. Thus, it would be interesting to do the observation in more places, which would help to better understand the dynamics of the other car repair shops and how their employees behave. In addition, the sample of other methods, namely interviews and questionnaires, was concentrated only in car repair shops in the north of the country. Thus, it would be important to gather information in the centre and south as well, because the quality department being centred in the north has less influence on other geographical points and therefore other perspectives may be gathered.

Finally, as future research is concerned, it would be interesting to test the application of the suggested integrated waste management system framework in this organization and other companies in this sector or even in other industries and assess its impact. It would also be interesting to define control KPIs related to this issue.

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Appendixes

Appendix 1 - Observation guide

Place:		Date:	Hour:	Number of participants:	
Evaluation			OK	N OK	Notes
1.	All the containers have a waste identification plate.				
2.	All containers have the labels required by law.				
3.	All the containers only have the corresponding waste.				
4.	All containers respect their maximum capacity.				
5.	All containers are in proper conditions.				
6.	The cardboard is flattened to optimize the container space.				
7.	The floor is free of waste.				
8.	Batteries have been delivered to the person responsible for their storage.				
9.	Workshop manager checks the containers.				
10.	Workshop manager alerts mechanics when he notices a bad waste separation.				
11.	Mechanics correct each other when one of them makes mistakes in separating waste.				

Appendix 2 - Participant observation guide

Place:	Date:	Hour:	Number of trainees:		
Evaluation			Yes	No	Notes
About the training session:					
1.	Workshop manager cooperates in the accomplishment of the training sessions, gathering the employees and operationalizing the situation.				
2.	Workshop manager reveals a facilitating attitude for the training success, helping the trainer if necessary.				
3.	Mechanics show attention.				
4.	Mechanics express their doubts.				
5.	Mechanics show curiosity about the right procedures, asking questions.				
6.	Mechanics report the gaps in the current process.				
7.	Mechanics make suggestions to help improving the waste chain.				
8.	Mechanics show commitment in interacting with the trainer or between each other in a constructive way.				
About the researcher sporadic visits:					
9.	Workshop manager shows availability to answer questions concerning the waste chain.				
10.	Workshop manager shows commitment in helping to improve the waste chain, when talking about the issue.				
11.	Mechanics show attention and availability to listen the researcher's explanations when confronted with poor separation of waste.				
12.	Mechanics express their doubts of their own free will.				
13.	Mechanics show curiosity about the right procedures, asking questions.				
14.	Mechanics report the gaps in the current process of their own free will.				
15.	Mechanics show the willingness to adopt the correct procedures when confronted with poor separation of waste.				

Appendix 3 - Semi-structure interview guide

Identification					
Name:			Age:		
Literary abilities:			Working years within Grupo JAP:		
Questions	Author	Detail	Quality Manager	Workshop manager	Mechanics
1. Has there been evolution of the waste management practices within Grupo JAP? 1.1. What has been the evolution?	No reference	- Company's background in this area - Perceive the rhythm of change and the importance attributed to this area	X	X	X
2. What are your main roles and responsibilities in what concerns the waste chain?	No reference	- Understand how people look at their integration into the waste chain - Understand their perception about the impact of their role in that chain - Perceive how do they reflect about their responsibilities and what are them	X	X	X
3. Is the waste management issue important? 3.1 Why?	(Suzy et al., 2015)	Increasing number of organizations started to integrate waste management practices into their business strategy to: - obtain competitive advantages in the market as companies perceived as more sustainable than competition are preferred by customer (Suzy et al., 2015). - achieve great business and environmental performance, improving economic and financial performance (Suzy et al., 2015).	X	X	X
4. What are the main goals for the waste management strategy?	(Debnath, 2015) (Kiernan & Levinson, 1997)	- manage its environmental obligations and risks, avoiding the consequences of non-compliance with environmental laws and regulations once governments and regulatory entities threaten or even block the organization's operations according to their environmental performance (Suzy et al., 2015). - monitor organizational practices through environmental auditing (Debnath, 2015). - increase shareholder value, through increasing competitiveness, sustainable quality of outcomes and financial performance measured as ROI, ROE or overall stock market return (Kiernan & Levinson, 1997). - control company's resources consumption and organizational practices while integrating waste chain in the daily processes(Debnath, 2015).	X		
Questionnaire on reasons for carrying out waste management					

<p>5. Is the waste management integrated in the Grupo JAP strategy?</p> <p>5.1. How is it integrated?</p>	<p>(Debnath, 2015)</p>	<ul style="list-style-type: none"> - Waste management must be part of management strategy in developing a whole system and enhance processes' environmental efficiency. - Waste management must be integrated within the business processes in an economically feasible and environmentally effective way, considering also social acceptance. Therefore, all the processes must be integrated and interconnected in a way that helps companies to accomplish better performance along the waste chain. 	<p>X</p>		
<p>6. What are the critical success factors of the waste management system within Grupo JAP?</p>	<p>(Pietzsch, Ribeiro, & de Medeiros, 2017)</p>	<ul style="list-style-type: none"> - Governance and planning: create educational programmes to employees, using communication and signalling - Operationalization: use tools to assess environmental performance; invest in labour training 	<p>X</p>	<p>X</p>	<p>X</p>
<p>Questionnaire on critical success factors of the waste management system</p>					
<p>7. What are the expected benefits of the waste management system within Grupo JAP?</p>	<p>(Pietzsch et al., 2017)</p>	<ul style="list-style-type: none"> - Benefits to the community: changes in people' attitudes on waste handling and consumption patterns; minimization of the risks to public health. - Economic and financial benefits: reduction in costs and increase in the profits, because waste generation is reduced, and waste is segregated at source; prevention of costs of environmental repair and losses associated with the inefficiency of the process. - Environmental benefits: less waste generation and its consequent negative impacts, reduced incineration and disposal of waste in landfills; improved environmental protection. - Specific benefits for industries and their stakeholders: increase in organizations' competitive potential through customer satisfaction and enhanced reliability; better efficiency; encouragement to the elaboration of a sustainable chain of suppliers. 	<p>X</p>	<p>X</p>	<p>X</p>
<p>Questionnaire on the expected benefits of the waste management system</p>					
<p>8. Is the topic of corporate social responsibility (CSR) important within Grupo JAP?</p> <p>8.1. What is its importance?</p> <p>8.2. How the waste management is related to the corporate social responsibility?</p>	<p>(Ambec & Lanoie, 2008)</p> <p>(Molina-Azorín et al., 2009)</p>	<ul style="list-style-type: none"> - Several stakeholders put pressure on firms to minimize their negative environmental impact, what is seen as companies' social responsibility, often referred as "corporate social responsibility" (Ambec & Lanoie, 2008). - Minimizing environmental impacts may enhance companies' global image and prestige, increasing customers' loyalty (Ambec & Lanoie, 2008). - Both companies and communities are increasingly attentive to the idea of CSR (Molina-Azorín et al., 2009). - Proactive environmental strategies may increase sales as a result of greater market legitimacy and better social approval (Molina-Azorín et al., 2009). 	<p>X</p>		

<p>13. Is anything done to motivate the employees for this issue?</p> <p>13.1. What can be done to improve the workers motivation and commitment?</p>	<p>(Govindarajulu & Daily, 2004)</p>	<p>- Management commitment: establishing a participative culture, communication of goals and priorities are key to motivate employees to act; adopt a democratic and open communication style regarding environmental ideas; on-the-job training and frequent educational efforts to increase employees' awareness of the need for environmental control and quality and to enhance adaptability to change and proactive attitudes (Govindarajulu & Daily, 2004).</p> <p>- Employee empowerment: Give the employees the freedom, autonomy and decision-making power to make suggestions, to actively identify problems and to implement good environmental practices, what fosters their involvement (Govindarajulu & Daily, 2004).</p> <p>- Rewards: monetary rewards, such as incentives, bonuses, or increase in salaries, and non-monetary rewards like time off from work, paid vacations, gift certificates, favoured parking, recognition and praise (Govindarajulu & Daily, 2004).</p> <p>- Feedback and review: continual feedback concerning employees' impact and efficiency on environmental enhancement efforts (Govindarajulu & Daily, 2004).</p>	<p>X</p>	<p>X</p>	
<p>14. Are you motivated for the waste management system?</p> <p>14.1. What conditions would improve your motivation and commitment with this issue?</p>	<p>(Nohria et al., 2008)</p>	<p>- Reward system (drive to acquire) (Nohria et al., 2008).</p> <p>- Culture that encourages collaboration, friendship, camaraderie and openness but also sharing of best practices help to form bonds and enhance the sense of belonging and teamwork (drive to bond) (Nohria et al., 2008).</p> <p>- Job design by making the jobs fulfilling, challenging and interesting, which promote a sense of contribution to the company (drive to comprehend) (Nohria et al., 2008).</p> <p>- Performance-management and resource-allocation processes, if fairness, transparency and trustworthiness are ensured build trust within the company (drive to defend) (Nohria et al., 2008).</p>			<p>X</p>
<p>Questionnaire on employee motivation (at the end of the table)</p>					
<p>15. To conclude, what procedures do you consider necessary to improve the current waste system?</p>	<p>No reference</p>	<p>- Understand the different points of view of what can be improved in the current system</p>	<p>X</p>	<p>X</p>	<p>X</p>

Appendix 4 - Questionnaire guide

Identificação	
Nome:	Idade:
Habilitações literárias:	Anos de trabalho no grupo:

- Sobre a questão 3

Dos seguintes motivos para a realização de uma gestão de resíduos, ordene por ordem de importância, atribuindo 1 ao mais importante e 6 ao menos importante.

	Obter vantagens competitivas no mercado, uma vez que as empresas percecionadas como sendo mais sustentáveis do que a concorrência são preferidas pelos clientes.
	Alcançar bom desempenho económico e financeiro.
	Contribuir para a sustentabilidade ambiental.
	Gerir as suas obrigações e riscos ambientais, evitando as consequências da não conformidade com leis e regulamentos ambientais.
	Monitorizar práticas organizacionais através de auditoria ambiental.
	Controlo do consumo de recursos, integrando a cadeia de resíduos nos processos diários.

- Sobre a questão 6

Dos seguintes fatores críticos de sucesso do sistema de gestão de resíduos, ordene por ordem de importância, atribuindo 1 ao mais importante e 6 ao menos importante.

	Criar ferramentas didáticas para os funcionários, usando comunicação e sinalização (ex: placas de identificação para a separação).
	Utilizar ferramentas para avaliar o desempenho ambiental (ex: folha de cálculo para registar a quantidade de resíduos e acompanhar a sua evolução).
	Investir na formação da mão de obra (ex: palestras).
	Processos rigorosos e bem definidos sobre o sistema de gestão de resíduos (ex: entregar baterias velhas no armazém).
	Disponibilidade de recursos essenciais (ex: contentores, luvas, espaço).
	Modelo organizacional que apoia os funcionários – (ex: a chefia orientar e tirar dúvidas).

- Sobre a questão 7

Dos seguintes benefícios esperados do sistema de gestão de resíduos, ordene por ordem de importância, atribuindo 1 ao mais importante e 6 ao menos importante.

	Benefícios para a comunidade: mudanças nas atitudes das pessoas em relação ao manuseio de resíduos e padrões de consumo.
	Benefícios para a comunidade: minimização dos riscos para a saúde pública.
	Benefícios económicos e financeiros: redução de custos e aumento de lucros, pois a geração de resíduos é minimizada e os resíduos são separados na fonte.
	Benefícios económicos e financeiros: prevenção de custos de reparos e perdas ambientais associados à ineficiência do processo.
	- Benefícios ambientais: menor geração de resíduos e consequentes impactos negativos, redução da incineração e eliminação de resíduos em aterros; melhor proteção ambiental.
	- Benefícios específicos para as indústrias e para clientes/fornecedores: aumento do potencial competitivo das empresas através da satisfação do cliente e maior confiabilidade; melhor eficiência para as indústrias; incentivo à elaboração de uma cadeia sustentável de fornecedores.

- Sobre a questão 9

Das seguintes lacunas (falhas) do sistema de gestão de resíduos, ordene por ordem de importância, atribuindo 1 à mais crítica e 5 à menos crítica.

	Difícil alinhamento de iniciativas e de serviços entre as chefias, a operadora e os trabalhadores.
	Difícil atribuição de responsabilidades devido ao facto de a cadeia de fornecimento ser complexa e envolver muitos intervenientes.
	Falta de colaboração e partilha de informações entre os intervenientes.
	Mau conhecimento do processo por parte dos intervenientes.
	Resistência à mudança de comportamentos quando a organização estabelece novas metas para se tornar mais sustentável.

Das seguintes soluções para as lacunas do sistema de gestão de resíduos, ordene por ordem de importância, atribuindo 1 à mais importante e 5 à menos importante.

	Utilizar métodos que permitam encontrar a causa raiz do problema do sistema (ex: discussão aberta, geração de ideias).
	Utilizar práticas estruturadas de trabalho (procedimentos bem definidos) que permitam a medição de forma mais objetiva do desempenho, permitindo apurar responsabilidades de forma mais fácil.
	Utilizar métodos de alinhamento entre os participantes da cadeia de fornecimento.
	Introduzir uma cultura ambiental, incentivando a participação de todos na mudança organizacional para aumentar a motivação e diminuir a resistência a novas iniciativas.
	Fornecer formação para melhorar a consciencialização ambiental dos funcionários e o conhecimento dos processos, fomentando a adoção de novas atitudes e mentalidades.

- Sobre as questões 13 e 14

Das seguintes formas de motivação, ordene por ordem de importância, atribuindo 1 à mais importante e 7 à menos importante.

	Comunicação de objetivos e prioridades para motivar os funcionários a agir.
	Adotar um estilo de comunicação democrático e aberto em relação às ideias ambientais.
	Formação no trabalho e esforços educacionais contínuos para aumentar a consciencialização dos funcionários sobre a necessidade de controlo ambiental.
	Dar aos funcionários a liberdade, autonomia e poder de decisão para fazer sugestões, identificar ativamente problemas e implementar boas práticas ambientais.
	Recompensas monetárias, tais como incentivos, bónus ou aumento de salários.
	Recompensas não monetárias, como folgas do trabalho, cartão presente (ex: vouchers de compra), estacionamento favorecido, reconhecimento e elogios.
	Feedback contínuo sobre o impacto e a eficiência dos funcionários nos esforços de melhoria ambiental

Appendix 5 - Example of a waste identification plate



Appendix 6 - Auxiliary waste collection form

JAPgest SGPS

Formulário auxiliar de recolha de resíduos

Estabelecimento: _____		Quantidade (un)	Tipo de recipiente		
Data: _____			200L	1m3	6m3/ 10m3/ 20m3
08 01 11	Resíduos de tintas e vernizes contendo solventes orgânicos ou outras substâncias perigosas				
13 07 03	Mistura de combustíveis				
15 01 01	Embalagens de papel e cartão				
15 01 02	Embalagens de plástico				
15 01 04	Embalagens de metal				
15 01 10	Embalagens contaminadas				
15 01 11	Aerossóis diversos				
15 02 02	Absorventes contaminados				
15 02 02	Papel de pintura				
15 02 03	Materiais filtrantes (filtros de ar)				
16 01 07	Filtros de Óleo, Gasóleo e Gasolina				
16 01 12	Pastilhas de travão				
16 01 13	Fluidos de travões				
16 01 14	Fluidos Anticongelantes contendo substâncias perigosas				
16 01 17	Metais Ferrosos (Sucata metálica)				
16 01 18	Metais Não Ferrosos (Alumínio)				
16 01 19	Plástico (rígido)				
16 01 20	Vidro e para-brisas				
16 01 21	Outros componentes perigosos				
16 01 99	Componentes não anteriormente especificados				
20 01 36	Equipamento elétrico e eletrónico fora de uso				

		Quantidade (nº de unidades)
16 01 03	Pneus usados	
16 06 01	Acumuladores de chumbo (baterias)	

		Tipo de recipiente	
		Caixa	Caixa estanque
08 03 17	Resíduos de tonner de impressão contendo substâncias perigosas		
20 01 21	Lâmpadas fluorescentes		

Nota: O Operador de Resíduos só recolhe as quantidades mencionadas no pedido mesmo que no momento da recolha existam mais recipientes cheios do que as quantidades solicitadas. Para este caso, recomenda-se a emissão de novo pedido e enviar de imediato para o Operador agendar nova recolha.

Responsável: _____	Observações: _____
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Appendix 7 - Spreadsheet to control waste

	JAPAUTOMOTIVE - PAREDES		JAPAUTOMOTIVE - AMARANTE		JAPCOLISÃO - PAREDES		HENDO - COLISÃO PREMIUM		YESAUTO - TORRES VEDRAS		JAPCOLISÃO-VILA REAL		JAPBLUE - ALGARVE		TOTAL GRUPO
Tipo de resíduo	Qtd. (ton)	Valor (€)	Qtd. (ton)	Valor (€)	Qtd. (ton)	Valor (€)	Qtd. (ton)	Valor (€)	Qtd. (ton)	Valor (€)	Qtd. (ton)	Valor (€)	Qtd. (ton)	Valor (€)	
Absorventes contaminados	0,11	36,75	0,05	16,80	0,28	97,65	0,88	308,70	0,08	26,60	0,20	70,35	0,06	22,05	3 288,95 €
Materiais filtrantes	0,14	11,20	0,04	3,20	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,04	3,20	108,80 €
Acumuladores de chumbo	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-2 019,95 €
Embalagens de madeira	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	2,00 €
Outros componentes perigosos	0,00	0,00	0,13	11,88	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	43,92 €
Embalagens contaminadas	0,00	0,00	0,09	11,05	0,09	12,22	0,12	15,21	0,08	10,01	0,00	0,00	0,12	5,72	353,34 €
Aerossóis	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	28,80	0,00	0,00	0,03	33,60	284,40 €
Embalagens de metal	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-1,60 €
Papel/Cartão	0,28	-6,65	0,10	-2,37	0,38	-9,01	1,00	-23,71	0,00	0,00	0,12	-2,85	0,10	-2,37	-125,16 €
Embalagens de plástico	0,06	-8,78	0,02	-2,93	0,02	-2,93	0,00	0,00	0,00	0,00	0,04	-5,85	0,07	-10,24	-139,40 €
Equipamento elétrico e eletrónico	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00 €
Filtros de óleo	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,17	22,41	0,00	0,00	0,00	0,00	295,21 €
Fluidos anti congelantes	0,16	13,92	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	88,40 €
Metais ferrosos	0,00	0,00	0,00	0,00	0,90	-135,00	0,68	-102,00	0,00	0,00	0,00	0,00	0,00	0,00	-900,00 €
Outros solventes e misturas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00 €
Metais não ferrosos	0,00	0,00	0,00	0,00	0,00	0,00	0,10	-105,00	0,00	0,00	0,00	0,00	0,00	0,00	-420,00 €
Mistura de resíduos urbanos	0,00	0,00	0,00	0,00	0,00	0,00	0,72	40,32	0,00	0,00	0,26	14,56	0,00	0,00	191,52 €
Pastilhas de travão	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-174,00 €
Plástico rígido	0,00	0,00	0,00	0,00	0,18	-7,20	0,24	-9,60	0,00	0,00	0,00	0,00	0,00	0,00	-76,80 €
Resíduos sem outras especificações	0,00	0,00	0,10	5,60	0,24	13,44	0,00	0,00	0,00	0,00	0,14	7,84	0,00	0,00	256,48 €
Vidro	0,00	0,00	0,00	0,00	0,12	3,60	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	4,80 €
Água com óleo	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00 €
Lamas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00 €
Outros combustíveis	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,11	-2,78	-7,43 €
Resíduos de tintas e vernizes	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	112,14 €
Encargos	0,14	1,39	0,27	2,70	0,24	2,38	0,72	7,12	0,00	0,00	0,40	3,96	0,04	0,40	98,18 €
Contentores 6m3	0,00	0,00	0,00	0,00	6,00	434,64	9,00	819,40	0,00	0,00	5,00	605,76	0,00	0,00	3 511,12 €
Transporte	4,00	445,15	4,00	169,00	5,00	295,60	13,00	711,65	1,00	116,30	2,00	211,30	4,00	246,27	10 525,75 €
Hidrolimpador	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00 €
Custos		508,41		220,23		859,53		1902,40		204,12		913,77		311,24	19 105,01 €
Proveitos		-15,43		-5,30		-154,14		-240,31		0,00		-8,70		-15,39	-3 864,34 €
Totais	0,75	492,98	0,53	214,94	2,21	705,40	3,74	1662,09	0,34	204,12		905,07		295,85	15 240,67 €

Note: Since there are many car repair shops throughout the country, some columns have been hidden to the worksheet fit on this page.

Appendix 8 - Semi-structured observation

1° week of semi-structured observation			2° week of semi-structured observation	
Parameter	Evaluation	Notes	Evaluation	Notes
Waste identification plates	Two out of the five establishments didn't have all the waste identification plates in their containers	Place 1 Place 5	All the establishments studied have all the waste identification plates in all the containers	
Legal labels	Two out of the five establishments didn't have all the labels that are left by the operator	Mainly liquid waste containers (e.g. oil, antifreeze) Place 1 Place 3	One of the five establishments had labels still missing	Place 1: after a waste collection, the operator forgot to leave labels to the new containers
Sorting and separation quality	All the establishments registered waste mixtures	Mainly until waste collection and at the end of the week Place 1, 2 and 4: until and after collection Places 3: until collection of 6m3 containers Place 5: until collection	Three out of the five establishments registered waste mixtures	Place 1: until collection Place 3 and 4: waste mixtures were found in the 6m3 until the operator's collection
Filling rate	All the establishments registered waste above the capacity of the containers	Mainly before collection or even after, when there were containers not replaced at the time of collection Places 1, 3: before and after collection Place 2: after collection Place 4 and 5: until collection	Four out of the five establishments registered waste above the capacity of the containers	Place 2: slight accumulation of waste in two containers Place 3 and 4: waste was accumulated in the 6m3 containers over their limit until collection Place 5: accumulation at the end of the week because collection was only in the following week

Card flattening	Four out of the five establishments had poor card wrapping registrations	Place 1: only fulfilled at one of the observation moments (the afternoon of the collection day) Place 2: cardboard on the floor as containers were full Place 3: until the collection had some boxes not flattened and after collection began to be flattened Place 5: until the collection had some boxes not flattened and in the day after returned to be badly packed.	Two out of the five establishments had poor card wrapping registrations	Places 1 and 5: some of the waste on the floor were unpacked cardboard boxes
Floor free of waste	Four out of the five establishments had waste on the floor	Place 1: waste at the back of the car repair shop, such as wooden pallets and windshields Place 2: containers were full, so there was cardboard boxes and contaminated packaging on the floor Places 3 and 5: cardboard boxes and contaminants on the floor, even if their containers were not full	Two out of five establishments failed had waste on the floor	Place 1: it kept accumulated waste at the back of the car repair shop Place 5: at some of the observed moments there was waste on the floor, but they arrived at the end of the week with the car repair shop organized
Containers' conditions	Two out of the five establishments had some containers in poor conditions	Place 1: all the times observed, there were containers with rust and some deterioration Place 2: after collection, the left containers had an unpleasant smell and some deterioration	Two out of the five establishments had some containers in poor conditions	Place 3 and 4: after collection of the 6m ³ containers, the ones left in replacement had traces of dirt and stones in the bottom
Supervisors' checking of containers	Three out of the five establishments didn't register any containers checking	Place 2, 4 and 5: no check occurrences Place 1 and 3: Supervisor checked the containers once in that week with the waste collection request sheet	Three out of the five establishments didn't register any containers checking	Place 3, 4 and 5: no check occurrences Place 1 and 2: Supervisor checked the containers once in that week with the waste collection request sheet

Supervisor warnings	No occurrence in any establishment	In none of the establishments the respective supervisor scolded the employees for the poor separation of waste.	No occurrence in any establishment	In none of the establishments the respective supervisor scolded the employees for the poor separation of waste.
Mechanics mutual help	No occurrence in any establishment	In none of the car repair shops the mechanics corrected each other in the studied period	No occurrence in any establishment	In none of the car repair shops the mechanics corrected each other in the studied period

Note: For a better understanding of this table, it is noted that the collection is weekly in Paredes and is held on Tuesdays of the 1m³ containers and 200 liter containers and on Thursday of the 6m³ containers, which exist only in collision establishments. In Amarante is bimonthly, on Wednesdays.

Appendix 9 - Semi-structured interview

Questions			
1. Has there been evolution of the waste management practices within Grupo JAP?	✓ All respondents answered yes		
1.1. What has been the evolution?	<ul style="list-style-type: none"> - greater separation of waste (64%) - containers waste identification plates (44%) - more containers along the years (35%) - increased employee training, information and awareness (19%) - increased organization and cleanliness (11%) - Greater rigor and control by the supervisor and the company (11%) - Operator more regular and efficient in the collections (5%) 	Notes:	<p><u>Workshop managers highlighted:</u></p> <ul style="list-style-type: none"> - More control, with more frequent visits from the quality department (40%) - More interaction and coordination between the department and them <p><u>Quality director highlighted:</u></p> <ul style="list-style-type: none"> - changing many mindsets, starting to have a waste management system that previously was not, with greater organization and integration
2. What are your main roles and responsibilities in what concerns the waste chain?	<p>Mechanics</p> <ul style="list-style-type: none"> - Correct separation of waste (100%) - Alerting colleagues and helping them (13%) - Keep the space clean and organized (12%) - Pack well the waste to fit in the containers (5%) 	<p>Workshop managers</p> <ul style="list-style-type: none"> - Staff counselling, guidance and cautions (70%) - Supervising and controlling the waste sorting (55%) - Managing collection requests (40%) - Monitoring the filling of containers (35%) 	<p>Quality director</p> <ul style="list-style-type: none"> - Set and communicate the rules, procedures and good practices - Find the best suppliers and design a system that is practical and understandable for everyone
3. Is the waste management issue important?	✓ All respondents responded yes		
3.1 Why?	<ul style="list-style-type: none"> - Environmental impact (95%) - Impact on self-health and global health (28%) - Legal impact (21%) - Organization and safety at work (21%) - Financial impact (16%) - Company's image to the customer (10%) 	Notes:	<ul style="list-style-type: none"> - Financial impact was more mentioned by workshop managers and quality director <p>Quality director highlighted:</p> <ul style="list-style-type: none"> - It is such an important issue that when there is poor waste management, it can become a chaos to work in a car repair shop

4. What are the main goals for the waste management strategy?	<ul style="list-style-type: none"> - Achieve the correct separation of waste - Obey to all the environmental and legal requirements - Higher value in waste or lower cost 	
5. Is the waste management integrated in the Grupo JAP strategy?	✓ Quality director answered yes, but considered it should be more	
5.1. How is it integrated?	- At the strategy level, administration is concerned with costs, legal requirements compliance and the customer perception	
6. What are the critical success factors of the waste management system within Grupo JAP?	<ul style="list-style-type: none"> - Staff training, specifically sensitization actions (44%) - Collaboration among the whole team (35%) - Proper work conditions (space for containers, enough containers, waste identification plates) (20%) - The correct separation of waste (20%) - More control of employees and containers by the workshop manager (10%) - Regular waste collection by the operator (9%) - Incentives for employees (5%) 	<p>Quality director highlighted:</p> <ul style="list-style-type: none"> - In an organization with such a geographical spread, it is essential that everyone know their tasks and responsibilities - Monthly or quarterly release of results to make people aware of the progress in this area - Lots of feedback and information exchange between everyone
7. What are the expected benefits of the waste management system within Grupo JAP?	<ul style="list-style-type: none"> - Contribute to the environmental sustainability (94%) - Contribute to people's health and well-being (22%) - Create a desirable workplace (20%) - Increase waste income and reduce costs (17%) - Comply with the law, avoiding fines (7%) 	<p>Quality director highlighted:</p> <ul style="list-style-type: none"> - Workers tend to work better in clean and tidy places - Create a good image for customers, partners and suppliers
8. Is the topic of corporate social responsibility (CSR) important within Grupo JAP?	✓ Quality director answered yes, but considered it should have even more relevance	
8.1. What is its importance?	<ul style="list-style-type: none"> - Avoid fines - Good image for the stakeholders 	

8.2. How the waste management is related to the corporate social responsibility?	<ul style="list-style-type: none"> - It contributes positively to the environment - It is still at an intermediate level, once the responsibility for now is to comply with the legislation 	
9. Are there any gaps in the current waste management system?	<ul style="list-style-type: none"> ✓ 83% answered yes ✗ 17% answered no 	
9.1 What are they?	<ul style="list-style-type: none"> - Incorrect separation (35%) - Carelessness and even resistance of some workers (25%) - Lack of control of the supervisors related to the filling of containers (12%) - Late request by the workshop managers for waste collection (11%) - Low of formation or sensitization (11%) - Lack of containers (10%) - Limited area for a more optimized layout (3%) 	<p>Quality director highlighted:</p> <ul style="list-style-type: none"> - The routes and collection requests are not yet working optimally - The still poor flow of information between all actors at national level - Some errors in the monthly reports sent by the waste operator
9.2. How can they be solved?	<ul style="list-style-type: none"> - Invest in training and awareness actions (32%) - More feedback, follow-up and guidance of the staff by supervisors (26%) * - Regular control of the filling rate of containers by the supervisors (10%) * - More containers for the most produced waste (6%) - Investment in infrastructure to extend the car repair shops (6%) - Assign a bonus (5%) - Small container next to workers whose waste would be sorted at the end of the day (4%) - Improvement should start with workers who should pay attention to separation (4%) 	<ul style="list-style-type: none"> - 26% and 10% are percentages that include supervisors' own answers as they admit they should pay more attention to these aspects <p>Quality director highlighted:</p> <ul style="list-style-type: none"> - More audits and site visits - More awareness actions
10. Are there difficulties in complying with the correct waste handling procedures?	<ul style="list-style-type: none"> ✓ 56% considered there were difficulties ✗ 44% considered there were no difficulties 	
10.1. What are the main difficulties?	<p>Mechanics</p> <ul style="list-style-type: none"> - Unwillingness and carelessness of some workers (32%) 	<p>Workshop managers</p>

	<ul style="list-style-type: none"> - Lack of time for the correct waste separation (8%) - Lack of space for containers and their arrangement (8%) - Specific doubts with some materials that have blending components (7%) - Lack of waste identification plates (5%) 	<ul style="list-style-type: none"> - Changing the mentality of some workers and make them to comply with the rules (70%) - Ordering according to the filling rate of containers (15%) 	
11. Do you give feedback to workers about their performance concerning the waste handling?	<ul style="list-style-type: none"> ✓ 80% of the workshop managers replied they give feedback ✗ 20% replied they don't 		
11.1. What has been your feedback?	<ul style="list-style-type: none"> - Warning the workers when there are errors in separation (50% of the ones who give feedback) - Raise awareness and encourage proper separation (25%) - Give positive feedback with encouragement words(19%) - Only when the waste operator gives them feedback (19%) - Only when there are doubts from the employees (10%) 		
12. Do you receive feedback from your supervisors concerning the waste handling?	<ul style="list-style-type: none"> ✓ 42% say they do ✗ 58% say they don't 	Notes: 12% daily, 8% weekly, 8% twice a month; 4% triweekly; 44% monthly; 24% occasionally	
12.1. What has been the feedback?	<ul style="list-style-type: none"> - scolding when separation is not done correctly (48%) - positive comments (20%) - motivation for proper separation (16%) - scolding when the scenario is really bad (12%) - answer to workers' doubts (8%) 		
13. Is anything being done to motivate the employees for this issue?	<ul style="list-style-type: none"> ✗ All workshop managers responded that nothing is being done ✓ Quality director answered yes 		
13.1. What can be done to improve the workers motivation and commitment?	<p>Workshop managers</p> <ul style="list-style-type: none"> - daily monitoring of workers and feedback (55%) 	<p>Quality director</p>	Notes:

	<ul style="list-style-type: none"> - training or awareness actions (25%) - Having a clean space is enough for employees to feel motivated (15%) - bonus (10%) 	<ul style="list-style-type: none"> - Ranking of the most environmentally-friendly car repair shop should be created, which would be awarded annually or every six months 	<ul style="list-style-type: none"> - 20% of supervisors added to their replies that mechanics should not be rewarded to change their attitude because waste separation is part of their job
14. Are you motivated for the waste management system?	✓ All mechanics answered yes		
14.1. What conditions would improve your motivation and commitment with this issue?	<ul style="list-style-type: none"> - Receiving more support and feedback from the supervisor (30%), stressing the positive feedback (12%) - More collaboration from colleagues in organizing the workplace (23%) - Knowing they are helping the environment (20%), stressing health care and future generations (12%) - Training or awareness raising (17%) - Receiving a small incentive (15%) - More containers (7%) - Better presentation of containers by the waste operator (7%) - Placing some missing waste identification plates (5%) 		
15. To conclude, what procedures do you consider necessary to improve the current waste system?	<ul style="list-style-type: none"> - Awareness raising and training actions (31%) - Monitoring of employees and feedback by the supervisors (25%) - Increase the frequency of waste collection (12%) - Creation of a space specially reserved for waste (9%) - More containers in place according to the waste rate (9%) - Bonus for employees (7%) - More control of container filling (5%) - Improving the layout of space to have the most needed containers closer (5%) - More careful presentation of containers by the waste operator (4%) - Placing some missing waste identification plates (4%) - Manager detach two people per week for checking the waste separation (2%) 	<p>Quality director highlighted:</p> <ul style="list-style-type: none"> - Improve inward communication, regularly disclose results and improve communication with the operator 	

Appendix 10 - Questionnaire results

Question	Answers	Mean	Mode
Reasons for waste management	Gain competitive advantage in the marketplace, as companies perceived as being more sustainable than their competitors are preferred by customers	4,91	5
	Achieve good economic and financial performance.	4,72	6
	Contribute to environmental sustainability.	1,67	1
	Manage their environmental obligations and risks by avoiding the consequences of non-5 compliance with environmental laws and regulations.	2,38	2
	Monitor organizational practices through environmental auditing.	3,90	4
	Control of resource consumption by integrating the waste chain into daily processes.	3,42	4
Critical success factors of the waste management system	Create didactic tools for employees, using communication and signalling (eg waste identification plates for separation).	2,51	1
	Use tools to assess environmental performance (eg spreadsheet to record waste and track progress).	4,85	6
	Invest in the workforce training (eg lectures).	3,38	2
	Rigorous and well-defined waste management system processes (eg delivering old batteries at the warehouse).	3,86	4
	Availability of essential resources (eg containers, gloves, space).	2,96	3
	Organizational model that supports employees (eg, leadership guiding and clarifying doubts).	3,43	5

Expected benefits of the waste management system	Community benefits: Changes in people's attitudes towards waste handling and consumption patterns.	2,62	2
	Community benefits: minimization of public health risks.	2,00	1
	Economic and financial benefits: reduced costs and increased profits as waste generation is minimized and waste is separated at source.	4,72	5
	Economic and financial benefits: prevention of repair costs and environmental losses associated with process inefficiency.	4,63	5
	Environmental benefits: Better environmental protection. Less waste generation and consequent negative impacts, reduced incineration and waste disposal in landfills	2,20	1
	Industry and customer/ supplier benefits: Increasing companies' competitive potential through customer satisfaction and increased reliability; better efficiency for industries; encouraging the development of a sustainable supply chain.	4,84	6
The gaps of the waste management system	Difficult alignment of initiatives and services between managers, the operator and workers.	3,56	4
	Difficult attribution of responsibilities because the supply chain is complex and involves many actors.	2,94	3
	Lack of collaboration and information sharing among stakeholders.	2,53	3
	Poor knowledge of the process by stakeholders.	3,31	5
	Resistance to behaviour change when the organization sets new goals to become more sustainable.	2,70	1

Solutions to waste management system gaps	Use methods to find the root cause of the system problem (eg open discussion, idea generation).	3,22	5
	Use structured work practices (well-defined procedures) that allow a more objective measurement of performance, making it easier to determine responsibilities.	3,19	3
	Use alignment methods among supply chain participants.	3,89	5
	Introduce an environmental culture by encouraging everyone to participate in organizational change to increase motivation and reduce resistance to new initiatives.	2,06	1
	Provide training to improve employees' environmental awareness and process knowledge, fostering the adoption of new attitudes and mindsets.	2,68	2
Ways to motivate employees	Communicating goals and priorities to motivate employees to act.	3,78	4
	Adopt a democratic and open communication style regarding environmental ideas.	3,79	5
	On-the-job training and continuing educational efforts to raise employee awareness of the need for environmental control.	2,78	1
	Give employees the freedom, autonomy and decision-making power to make suggestions, actively identify problems and implement good environmental practices	3,79	4
	Monetary rewards such as incentives, bonuses or salary increases.	4,70	6
	Non-monetary rewards such as work breaks, gift cards (eg shopping vouchers), favored parking, recognition and compliments.	5,43	7
	Continuous feedback on employee impact and efficiency in environmental improvement efforts.	3,73	2