



A smarter approach to waste collection

**Graduation Internship at
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Case study: The expansion of the eGarbage system of Wellness Telecom into Smart Cities.

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Executive summary

This report is a case study for the International Trade and Export Consultancy firm Enternational and its client Wellness Telecom, an Information and Telecommunication Technology company. Wellness Telecom develops innovative technologies for among others Smart Cities. In the end of 2012, Wellness Telecom introduced the eGarbage system; a waste management solution for Smart Cities.

The purpose of this report was to examine the international environment for the expansion of the eGarbage system and to come up with strategic recommendations for Enternational and Wellness Telecom.

The research question was **“What kind of strategic approach should Wellness Telecom use in order to enter Smart Cities with their eGarbage system?”** The applied data in the report is deduced from literature, secondary desk research and information from internal and external experts.

The eGarbage system is focused on Smart Cities, where public mobile garbage containers located throughout cities are used to collect waste. A sensor in each container measures the volume of waste and by means of WIFI and/or 3G this information is sent to the main computer of the waste company. Then the most efficient collection route is calculated, based on the information of the sensor whether a container should be emptied or not. eGarbage enables cities to; reduce the operational costs of waste management, improve the living environment and encourage recycling.

Literature was used to study the current concepts, theories and ideas about Smart Cities and the need for smart technologies in waste management. Literature defines the concept of ‘smart’ as: thinking in a sustainable way; economically, environmentally as well as technologically. Cities strive to be entitled as ‘smart’ to acquire a stronger foothold within the global market. Growing environmental consciousness together with the need for transparency requests new kinds of technologies. Current waste collection systems show a lack of waste monitoring and tracking. Technologies as RFID, GPS and WIFI, are gradually introduced, however the situation can still significantly be improved.

The country analysis facilitates that Italy and Portugal are the most interesting countries to expand the eGarbage system to. The upcoming Smart Cities Turin and Oporto seem to have potential due to their interest in Smart Cities, their environmental and social awareness and the usage of mainly public mobile containers.

Furthermore, the Business Model Canvas has been exploited to measure the linkage between the value propositions of Wellness Telecom and the external clients, partners and channels. There can be

concluded that clients, partners and channels overlap and that the company can offer eGarbage to different buyers. Moreover, the competitive analysis displays that similar garbage systems exist, but that eGarbage consists of a more innovative technology.

The SWOT-analysis mentions that the main internal strengths of the company are the well-established R&D department, the innovative Smart City department and the cloud computing technology the company uses. Major weaknesses are the lack of references and international experience, poor brand awareness abroad and lack of financial resources. These internal factors are strategically combined in a confrontation matrix. The foremost important opportunities are the interest in Smart Cities, the growing social and environmental awareness in both Turin and Oporto and the sustainable organizations that are established as EURO CITIES and the Smart City projects that are developed. The usage of RFID in waste management offered by competitors and the expanding door-to-door collection method are the main threats that Wellness Telecom is facing.

The strategic challenges that arose from the confrontation matrix have been elaborated on in the marketing mix. The original eGarbage marketing mix was focused on the implementation of the system in the city of Seville, Spain. The new marketing mix focuses on adjust and reactive strategies meaning; fully optimizing the company's strengths to respond to the external threats and conquering the weaknesses to pursue opportunities.

There can be concluded that the eGarbage system on itself is not as desirable for Smart Cities as expected. It is recommendable for Wellness Telecom to combine several strategies to market its product in Turin and Oporto. The strategic approach that Wellness Telecom should apply to enter the Smart Cities Turin and Oporto is divided into short-term, medium-term and long-term strategies.

In the short-term, it is advisable for the company to collaborate with local companies and environmental and Smart City organizations that have interest in Turin and Oporto. Leaning upon companies that already have a connection with both cities will help Wellness Telecom to obtain funds and to acquire more easily brand awareness abroad.

In the medium-term Wellness Telecom has to diversify. Expanding the waste product & service portfolio will attract diverse customers and facilitate the company to respond to different needs.

The long-term recommendation is to expand the Smart City department by developing a consultancy service for Smart Cities. The consultancy service can use the knowledge on previous experience in the implementations of smart technologies, the intelligence of the Smart City department and the cognition of the highly developed R&D department.

Terms and definitions

3G	Third generation, internet network to send and receive information
Composting	Treatment of biodegradable matter
ERP	Enterprise Resource Planning; a system that integrates internal and external management practices within an organization
GDC	Green Digital Charter; declaration created to achieve the EU climate objectives
GHG	Greenhouse gases
GIS	Geographic Information System
GPRS	General Packet Radio Service
ICT	Information and Communication Technologies
IMC	Inter-Municipal Cooperation
Incineration	Thermal treatment of waste in an incineration plant
IT	Information Technology; computers and other equipment to store, send, transfer and retrieve data
Landfill	Depositing waste into or onto land, including specially engineered landfill and temporary storage of over one year
M2M	Machine to Machine
MSW	Municipal Solid Waste
MW	Municipal Waste
Recycling	Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes.
R&D	Research and development
RFID	Radiofrequency Identification
SME	Small and Medium sized Enterprises
SRS	Smart Recycling System
UHF	Ultra High Frequency
WT	Wellness Telecom

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1. Introduction

1.1 International & Wellness Telecom

Enternational was founded in 2010 by Pablo Delgado and Antonio José Peinado Serrano. During the years the company expanded and currently Enternational consists of five employees. Enternational is a micro-consultancy company, based in Seville, Spain and is specialized in international trade support. Enternational's main activity is export; Enternational acts as the export department for companies that endeavor to expand.

One of Enternational's biggest clients is Wellness Telecom. Wellness Telecom is an Information and Telecommunication Technology small and medium enterprise (SME) based in Seville, Spain. The company is specialized in system integration, creating; network designs, communication protocols, mobile platforms, security systems, wireless communication systems and so on. (Wellness Telecom S.L., 2012)

1.2 Research background

Wellness Telecom is currently focusing on Smart Cities. The concept of Smart Cities will be explained in section 2. One of the key factors of Smart Cities is sustainable management of waste. Currently there is only poor or no information available on the amount of garbage piled across cities. In some countries the system performs on a weekly calendar; mentioning the day(s) when people can drop their garbage in front of their doors and then a garbage truck will pass by to collect everything. However, the garbage system in other cities works with containers in every street where people can bring their garbage to. The last system could be greatly improved.

The technology that has been created by Wellness Telecom regarding waste is the eGarbage system. The system tracks information on the amount of garbage in each container and this can be monitored and managed according to. The main idea of the system is to reduce operational costs and to improve the environment for citizens. The system focuses on municipal waste, meaning waste created by households, commerce, offices and public institutions. (Eurostat, 2013) Although it is a very innovative and smart system, the use of it will not be as effective in every city. The system is developed for cities where the garbage is collected by public, mobile containers and not door-to-door.

1.3 Problem statement

Regarding the broad area of research, the time period and the amount of data available that had to be consulted, doing research globally is not feasible. The client Wellness Telecom is interested and

curious about the potential in different areas; therefore, the focus will be on **two Smart Cities, based in Italy, France, Russia, Portugal, Mexico or Turkey**. An extensive country analysis will justify the choice of two cities and enable the client, the company supervisor and the researcher with a sufficient and in-depth explanation on the best suitable option to expand the eGarbage system to. The research question is: **“What kind of strategic approach should Wellness Telecom use in order to enter Smart Cities with their eGarbage system?”**

The sub questions that are used to answer the research question are as followed:

1. How are Smart Cities defined?
2. Which two Smart Cities will have most potential and why?
2. Who are potential customers for Wellness Telecom and how should they be targeted?
3. What are Wellness Telecom’s largest competitors?
4. Which positioning strategies are possible?

1.4 eGarbage

In 2010, Wellness Telecom developed the eGarbage system, offering real-time data on waste. The aim of eGarbage is to improve the waste management systems of cities and to stimulate recycling. By means of a network of sensors placed in mobile public containers, the responsible (public authority or private waste company) can track whether containers need to be emptied and which collection routes will be the most efficient. The system should stimulate recycling, develop more points for bins to meet citizens, reduce the cost of collection and most importantly, improve the environmental conditions of a city.

The system has been developed by Wellness Telecom and funded by the European Regional Development Fund (ERDF). eGarbage has been developed in order to create an efficient managing tool for municipal waste collection services by capacitating the waste managers with information on the current condition of a container. The information is gathered by a RFID sensor that has been placed inside the container. The sensor is capable of monitoring; the amount of waste that is inside the container, the location of the container and the type of waste. This information is send to a central system via a wireless sensor network. The wireless sensor is placed on walls, traffic lights, or in other fixed places, with a close distance to a set of different containers. The central system computes the information and manages the collection system. From the central system, the most efficient routes are calculated and send to the GPS device of the most suitable truck. The truck follows the calculated route and collects the waste where necessary. See figure 1. (ICEX, 2010) (Wellness Telecom, 2010) (Wellness Telecom, 2012) (García Vega, 2013)

Figure 1. Waste collection system: eGarbage.

1.5 The current situation

At present, Wellness Telecom only introduced the eGarbage system in Seville. The project was seen as a pilot; it gave Wellness Telecom the opportunity to test the system, receive feedback and to see which adjustments were required. The project started during the last quarter of 2012 and was a collaboration between the Corporación Tecnológica de Andalucía (Technological Corporation of Andalusia) and Novasoft, a member of the foundation.

1.6 Company objectives

To be able to compete in the global environment, people and companies have to take sustainable initiatives. The secret of a successful "Smart City" is the relationship and cooperation between the core systems at an operational level. The six main items that should be distinguished in Smart Cities are: people, companies, transport, communications, water and energy. The effectiveness and efficiency of the integration of these items demonstrate how a city works and determine how successful it is in achieving its goals. (IBM, 2011)

Wellness Telecom endeavors to respond to this global trend by offering, among others, the eGarbage system. The aim is to introduce the system in countries outside Spain to broaden its horizon. The company strives to collaborate with container manufacturers, companies that offer waste modules, environmental organizations and governmental institutions. Large investments are required to implement the system and to adjust it according to the cities' needs and wants. (Respondent C)

1.7 Report outline

The report exists of the following chapters:

- Chapter 2: the literature review explains the concept of Smart Cities, the current environmental awareness and technologies used in waste management.
- Chapter 3: the methodology describes the approach of the research and what tools were used.
- Chapter 4: the consecutive chapters explain all the empirical findings that should answer the sub- and research question. The chapter is divided into the following sub chapters:
 - Country Analysis, Internal analysis, Business Model Canvas, Competitive analysis, SWOT analysis, Confrontation Matrix, Marketing Mix.
- Chapter 5: conclusion and discussion of the findings.
- Chapter 6: this chapter gives recommendations to the client Wellness Telecom and the internship company International.

2. Literature review

Smart Cities

In the current global market, 'smart thinking' is of great importance. From origin large, developed cities are now looking for the best ways to compete in the global environment. Therefore, three main key points are targeted; technology, economy and the environment. (Murray, Minevich, & Abdoullaev, 2011)

Cities that succeed in combining the three elements into a well-organized system are referred to as 'Smart Cities'. Smart Cities can be classified as developed metropolitan areas which are economically and socially developed and are still developing. In Smart Cities there is a high quality of life and a high percentage of adults with a college degree (Winters, 2011). However, regarding the fact that it is a relatively new concept, there are still differences in definitions. Hollands (2008) believes that cities label themselves quickly as being smart. In his opinion, Smart Cities have a networked infrastructure which enables the development of social, environmental, economic, and cultural elements (Hollands, 2008).

According to Shapiro (2006), the general perspective focuses on the share of city inhabitants with a college degree, productivity growth and the quality of life. He states that there is a correlation between population growth, human capital and the improvement of quality of life. This is also supported by the research of Berry and Gaiser (2005) who explain that cities that indeed have an adult population with higher levels of schooling, are noticing a faster increase in the amount of inhabitants obtaining a college degree.

The increasing environmental consciousness together with the awareness that cities have to change their management has created the term 'Smart Cities'. A real Smart City must be sustainable; economically, technologically as well as environmentally. By integrating these three types and developing innovative ICT systems that connect all stakeholders and provide them with access to important information, cities become more efficient and reduce their ecological footprint. (Murray, Minevich, & Abdoullaev, 2011)

Poor waste management: one of the causes of air pollution

During the last few years, climate change has appeared as one of the main challenges we are currently facing and it is one of the core barriers when it comes to sustainable development (Wheeler, 2008). Climate change is caused by the numerous emissions greenhouse gases (GHG) which enter the via the transport sector, chemical and industrial processes, solid fuel manufacture

and gas and waste disposal (Eurostat, 2011). To avoid an ecological collapse, there is an urge for cities to become sustainable (Kenworthy, 2006).

One of the challenges of changing the nature of city development is waste (Kenworthy, 2006). The enormous amount of waste that is produced by households, companies and industries causes pollution and greenhouse gas emissions. These gases are emitted through different forms of waste disposal; landfill, incineration, recycling and composting (European Union, 2010).

The waste produced by the public is called municipal solid waste (MSW) and is produced by households, commerce, offices and public institutions (Eurostat, 2013). The increase in public consumption enlarges the amount of waste that is produced by society (Phdungsilp, 2011) and the waste should be absorbed in a more natural way (Kenworthy, 2006). The aim is to increase the levels of recycling and to reduce the emissions of waste (European Union, 2010).

Need for technologies

Noticing that recycling waste can only be accomplished if all parties, from producers to households to processing companies, are involved, we can employ that there is a great need to encourage all stakeholders and to make them aware of the importance of it (Miafodzyeva, Brandt, & Andersson, 2013). Especially the transmission of information is a great element for cities becoming smart. Well-developed electronic infrastructures are required to enable rapid communication possibilities over long distances and to connect all stakeholders. (Eger, 2009)

The development of Smart Cities is happening little by little, owing to the absence of a well-developed technology architecture that can transform the current governmental business model. Several cities already implemented a full service providing business model; an IT model that involves all stakeholders, provides interaction and collaboration between companies, (governmental) institutions and citizens. (Kuk & Janssen, 2001)

Technologies to improve waste management

To optimize solid waste monitoring and to improve the availability of data for stakeholders, Radio Frequency Identification (RFID) is a frequently used ICT system for waste management companies. Sensors are placed in garbage containers and the sensor sends real-time information to a RFID reader in the truck, the General Packet Radio Services (GPRS) or Geographic Information System (GIS) server, the database server and the central database. It allows the reader to see the location of the container, the truck and how the garbage is managed. (Arebey, Hannan, Basri, Begum, & Abdullah, 2010)

According to Ustundag and Cevikcan (2008), using RFID reduces the amount of money required to collect waste, due to the waste collection route optimization. They state that in addition to identifying exactly which kind of waste is located where, RFID also enables waste management companies to bill its customers more precisely and to supervise the performance of subcontractors.

The usage of RFID contributes to a more efficient track and management system of inventory and it reduces transportation and fuel (Industry News, 2012). Furthermore, using RFID includes the ability to follow individual waste components and to see whether they are recycled or not and where they end up eventually (Greengard, 2010).

There are already several success stories on the usage of RFID in waste management; in some cases RFID is used to track waste at final disposal and other companies use it to link with a GPRS system to optimize collection routes. A company in the UK is using Nokia mobile phones that receive real-time data and for example in Germany RFID tags are used to modify the 'polluter-pays' principle. (Ustundag & Cevikcan, 2008) RFID, GPS and GIS systems are combined to improve the situation for customers and to estimate the amount of waste by means of technology. The systems reduce the responsibility of the truck driver and human estimations and therefore decrease the occurrence of errors. (Arebey, Hannan, Basri, Begum, & Abdullah, 2010)

Room for improvements

According to Arebey (2010), there are some severe problems in the current waste collection methods. Due to a deficiency of information about the collecting time and the specific areas, the lack of an appropriate monitoring and tracking system, insufficient estimates on the amount of waste and a lack of quick responses to client's and emergency situations, there is an immense need for new waste collection systems and methods. (Arebey, Hannan, Basri, Begum, & Abdullah, 2010)

Conclusion

Based on the literature review there can be concluded that although RFID is already used in waste management, the current waste management systems do not perform optimal and so there is a market for smart technologies. There is evidence that indeed opportunities exist for Wellness Telecom with regard to their eGarbage system to enter Smart Cities.

3. Case study methodology

The methodology strategically outlines the methods used to answer the sub questions and the research question. This chapter mentions the data sources that have been used and the way they were approached.

3.1 Research design

The research method used is in the form of a case study. A case study combines theoretical knowledge with real life examples and so provides a multi-perspective analysis. The subject of the case study is 'Smart Cities'. As already described in the previous chapter, the aim of the research is to find suitable Smart Cities where the eGarbage system could be of great added value. The boundaries that were set were based on the sub questions mentioned in section 1.3.

First of all, already existing literature has been consulted. Collecting adequate data from previous case studies, academic journals, organizational websites and reports have been the foundation of the case study. Afterwards the 'field research' started by requesting information from a study group. The study group included internal and external experts which were interviewed.

The establishment of the case study has been created with the help of the directors of Enternational, as well as the client Wellness Telecom. These persons can be referred to as experts in their area and their knowledge, opinion and vision has been utilized to perform the research. During the initial period of the internship, there has been investigated which potential interesting (external) experts on Smart Cities could be interviewed as well.

Several interviews, both internal and external, enabled a profound, valid research process. To strengthen the findings and to supply the client with a more reliable research result, the real-life information has been collected from different people.

An important part of the research is the collection of rival explanations, meaning different perspectives of participants and stakeholders and contrasting results from previous studies. The rival explanations are defined in the findings chapter. The aim of collecting rival explanations is to aggregate evidence to reject rival explanations or to prove them. (Yin, 2009)

3.2 Data collection

3.2.1 Literature research

The research process started with literature review by exploring all information related to this research and getting insight in other studies in literature regarding this topic. Secondary literature has been used in the form of already existing research on a similar topic and also gray literature was analyzed meaning books, reports, company websites and statistical websites to gather sufficient data on the topic. Moreover, it had to enable sufficient information for the qualitative research process. (Verhoeven, 2008)

3.2.2 Qualitative research

Qualitative research is conducted in the form of interviews. Interviews were held with the client Wellness Telecom, with the directors of Enternational, one employee of Enternational and with two external experts. The results from the interviews facilitated different kinds of information that was used throughout the report. The interviews were semi-structured; the questions in Appendix C only provided a certain guidance. The aim of the qualitative methods was to ensure that adequate understanding of the perception of the respondents could be obtained. (Verhoeven, 2008)

The selected respondents were:

Respondent A	Pablo Delgado	Enternational
Respondent B	Antonio Peinado	Enternational
Respondent C	Francesco Bernardo	Wellness Telecom
Respondent D	External expert	Employee Amiat, Turin, Italy
Respondent E	External expert	Employee Câmara Municipal do Porto Oporto, Portugal
Respondent F	Aurore Michelin	Enternational

3.3 Data analysis strategy

3.3.1 Data analysis

Based on the literature from scientific journals, information from websites and company reports, a bottom line was created for the further research. Literature provided information on Smart Cities, smart technologies and current waste management technology systems.

As already mentioned, interviewing experts has been an important part of the research process. To come up with a reliable and valid research, different information from different experts had to be attained in order to collect answers to the sub questions. The directors of Enternational as well as the client (Wellness Telecom) have been interviewed as internal experts; this to obtain appropriate information on the topic and the main areas of interest.

Then experts in the field of Smart Cities were contacted. The idea was to interview people who own a large share in Smart Cities. The first selected external expert was an employee of Amiat, the largest waste management company in Turin, Italy. The second expert that has been consulted was an employee of the city hall of Oporto, Portugal.

All the experts have been approached differently. The information and opinions of respondents A, B and F have mainly been used to establish a good structure for the report, to include the most appropriate theories and models, to justify the choices of two target cities, to expand the internal analysis of Wellness Telecom and to develop strategies. The information provided by respondent C has been very useful in understanding the eGarbage system and creating the internal analysis. Respondent D and E have helped to come up with an external analysis, by giving information on the current situation in the Smart Cities, including information on potential partners, competitors and clients.

3.3.2 External validity

The external validity is about the fact if the findings of the study could be applied to other cities in the specified countries as well. This kind of validity comprises the domain whether the case study can be comprised. The final strategies that have been created will not be likely to be entirely generalized. Nevertheless, there is a great probability that the plan of approaching the cities and the stakeholders involved can be generalized. (Yin, 2009)

3.3.3 Reliability

Finally, the reliability of the research process had to be tested. Reliability in the field of doing research is about the possibility that once the exact same case study will be conducted again, the outcomes will be the same. (Yin, 2009)

3.3.4 Interpretative research

Next to the information obtained from literature, the research process was mainly focused on information gained from 'the field'. Meaning that the opinion and information gathered from experts have been of great importance, this to base the case study on information, facts and examples of real life business cases. (Douglas, 2002)

3.4 Conceptual model

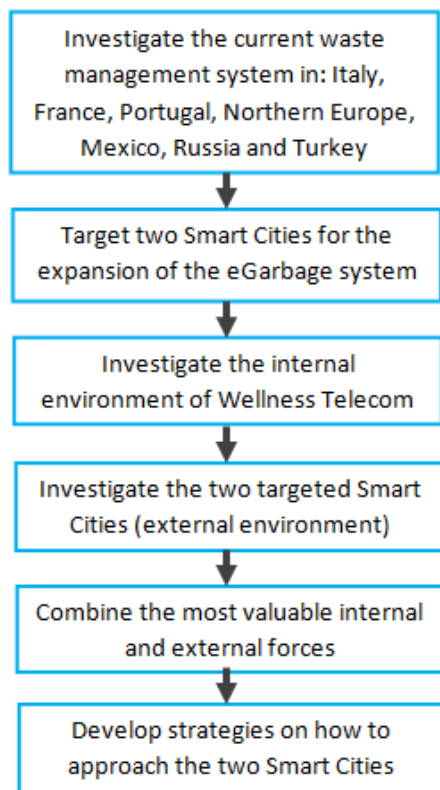


Figure 2. Conceptual model.

The conceptual model classifies the main research themes of this case study and their relation to each other. The model displays the major steps that have been taken during the research process. It identifies subjects that have been covered throughout the report in order to respond to the sub questions.

3.5 Ethical considerations

During the entire research process, the obtained data has been utilized respectfully. The information gathered from the internet, collected by interviews, via Skype or via phone, as well private as public information was used confidentially and has only been communicated among the stakeholders of the project.

The time and availability of the respondents and stakeholders has been appreciated greatly and there will not be any concerns about misuse of information. As long as the project was not finished, the data was kept internally and in case there were any doubts the information would not have been externally published.

Respect, trust and transparency are the key elements that were considered throughout the entire research process and everyone felt comfortable so that there could have been full confidence in succeeding the project.

3.6 Limitations & constraints

The research topic is based on a new system and therefore, an exact similar research does not exist. Literature can be found on Smart Cities and their interest in environmental improvements, but the eGarbage system and the construction of a strategic approach for the expansion of the product are completely new items that have been investigated.

However, similar systems, with outdated soft-and hardware have been discovered and constraints as well as limitations could have been found regarding the target market. Considering the fact that the research was focused on two different cities, the constraints and limitations differ per area. Cultural, political, economical and social events could have occurred that will oppose the creation of a strategic approach for that particular market. A monopolistic market could have been discovered, where new entrants have no chance at all, or a competitor could have created a smarter solution for garbage that will master the eGarbage system.

Factors that challenged this research process were mainly connected to cultural differences. One of the differences can be found in the value of time. As one might know, people in northern Europe are associated differently with 'time' as people from Southern European countries. According to Hall's theories, in monochronic cultures life functions on clock time, people are often focused on one thing at a time and appointments are fixed. On the other hand, in polychronic cultures, time is flexible and cannot be controlled, life functions on events rather than on clock time. This cultural difference had to be considered continuously when performing the research project regarding deadlines, maintaining relationships, avoiding miscommunications, avoiding frustration and trying to plan the research process adjusted to the time setting in Spain. (Nunez, Nunez Mahdi, & Popma, 2011)

This led automatically to differences in communication and interpretation, since people from monochronic cultures perform according to a schedule and people from polychronic cultures work according to interpersonal relations. Nevertheless, the researcher aimed to be clear and open about all its decisions and ideas and communicated them regularly to its clients, to avoid ambiguities.

4. Findings

This chapter demonstrates all the information, data and facts collected to answer the sub questions and ultimately the research question. To come up with answers to the questions first of all, an extensive country analysis has been conducted. Then an internal analysis of Wellness Telecom has been executed, followed by the Business Model Canvas. The competitor's analysis states the most important competitors in Italy and Portugal. Moreover, a SWOT analysis has been created, followed by a confrontation matrix and it concludes with the marketing mix. The information gathered is based on literature, secondary literature and the outcomes of the interviews with internal and external experts. The data collected from the experts differs per expert and has been used for different purposes.

4.1 Country analysis

During the first meeting between the client and the researcher, the countries; Italy, France, Portugal, Russia, Mexico and Turkey were chosen by the client to base the research on. Notwithstanding, the size of the research is too large for a 20 week internship and therefore, there has been decided on a country analysis, focusing on the current waste management systems in the countries mentioned. The country analysis has to enable the client, the researcher and other people involved to narrow the topic. Data on potential partners in each of the countries is attached in the appendix

4.1.1 Italy

General information on waste & social awareness

On average the kilograms waste produced per inhabitant is 537 kg per year. There are some differences in the amount of waste between the northern and southern part of the country. Also the awareness of separating waste is bigger in the northern part of Italy. (CIS, 2012)

Municipalities, consortiums, deputations

Italy consists out of 8,100 municipalities, of which the smaller municipalities joined inter-municipal cooperation to provide good services and decrease costs. Either this inter-municipal cooperation is forced by law, or the cooperation of consortiums is voluntary. The mandatory consortia for waste management are called ATO (Ambito Territoriale Ottimale). (Balducci, 2008)

Most Italian cities are divided into several districts that manage and perform their own local services. The services can be maintenance of buildings, waste management, education services or others. (Comune di Firenze, 2012)

Current waste system

In most Italian cities, citizens have to bring their garbage to public bins on streets. Often different containers are placed for different kinds of waste. However, in many cities, the door-to-door collection method has been introduced in a number of neighborhoods and is expanding gradually. (ESPER, 2011)

In general in Italy, waste management is very poor and is therefore one of the biggest concerns regarding environmental problems. In the last few years, Italy failed in meeting important objectives of the European directives on water and waste management. The European Commission sent several warnings regarding waste management. (Marketline, 2012) Moreover, Italy still landfills about 51% of its waste, has an under developed recycling system and an insufficient waste infrastructure (Hennon & Westernen, 2012). According to research from the European Environment Agency (EEA) and AirBase database (2010), in 2008, 17 cities of the 30 most polluted cities in the European Union were located in Italy; Turin for example is even ranked as second on the list. Recent news from the European Commission (2013) has shown that the environmental measures taken by the Italian government are still not sufficient enough.

Smart Cities

EUROCITIES is a European organization that strives to network European cities. The organization works together with European institutions and (local) governments and supports projects, activities and events throughout Europe which focus on climate, inclusion and recovery (EUROCITIES, 2012). According to the EUROCITIES (2013) website, cities in Italy that are working towards becoming Smart Cities are: Bologna, Cesena, Florence, Genoa, Milan, Naples, Palermo, Pisa, Rome, Salerno, Turin and Venice. The ones that specifically pay attention to waste management are Florence, Genoa, Milan and Venice (EUROCITIES, 2013).

4.1.2 France

General information on waste & social awareness

Waste is more and more recycled in France. Especially in the recycling of paper and carton an increase of more than 30% was noticeable between 2006 and 2010. 33.5% of the household waste collected is recycled, 29% is used for energy recovery. The waste produced per year is 543 kg per capita (Wullt, 2010).

Municipalities, consortiums, deputations

37,000 municipalities, called communes, can be found in France; many of them only exist out of 1,000 residents. Because of the small sizes of many villages, the government stimulates communes

to merge as 'communautés urbaines' to collaborate with several associations, known as 'syndicats intercommunaux'. (Swift & Kervella, 2003)

Current waste system

In many parts in France, people bring their garbage to public bins, however, in other parts of France waste collection is carried out from door-to-door (European Environment Agency, 2010). The increase in door-to-door waste collection improves the separation of waste. MSW is collected, managed and treated by local authorities. (European Environment Agency, 2010)

Nevertheless, the management and policies have to be adjusted both regarding production and consumption. As stated by the European Environment Agency (2010), the main objective for the outlook of 2020 is to execute an incentive-based pricing system for households; this is to encourage people to separate and to reduce their waste production. Government subsidies are given to stimulate recycling and reuse of waste (Elzas, 2011).

Smart Cities

According to the EUROCITIES (2013) website, about 20 cities in France are on their way to become a Smart City. The ones that specifically pay attention to waste management are Lille, Nantes, Paris, Strasbourg and Toulouse (EUROCITIES, 2013).

4.1.3 Portugal

General information on waste & social awareness

In 2008, the total urban waste in Portugal was 4.787 billion tones, resulting in 1.3 kg per inhabitant per day (European Environment Agency, 2010). In some parts of the country, the door-to-door waste collection method has been introduced. The waste collection company that dominates the market in Portugal, called EGF, believes that increasing door-to-door collection methods will improve the economic stability. (Recycling International, 2013)

Municipalities, consortiums, deputations

Portugal has 275 municipalities, 30 services spread throughout the country, 12 municipal systems and 11 inter-municipal services (Russo & Marinheiro, 2012). In Portugal, waste management is executed by municipalities, private companies and concessions; private and public companies dedicated to waste management. The collection of waste is mainly done by municipalities. The municipalities can set their own fees on waste collection, water supply, electricity and public transport (OECD, 2008).

Current waste system

In order to meet the requirements of the European Union, Portugal introduced the PERSU I, a Strategic Plan for MSW in 1997. This Plan was focused on the closure of open air landfills, the construction of MSW infrastructure and improving recycling, these goals were supposed to be achieved between 2000 and 2005. But unfortunately, the goals were not accomplished; only the open air landfills and incineration objectives were achieved. Because of the poor outcome of the first strategic plan on waste management, the PERSU I had to be reviewed. PERSU I was followed up by PIRSUE (Strategic Solid Urban Waste Plan) in 2006. In 2007, PERSU II was created; the objectives set became stricter and more SMART goals were created, the goals have supposed to be achieved between 2007 and 2016. (Ribeiro, Castro, Macedo, & Carvalho, 2011)

The second strategic plan includes priorities and targets for multi-municipal, inter-municipal and municipal action plans. Soon after the approval of PERSU II, the Urban Waste Prevention Programme (PPRU) was established in 2010, setting national goals on waste prevention for 2009-2016. (European Environment Agency, 2010) Also PEAASAR is a strategic plan based on water and wastewater services, whereas PEAASAR II focuses on the organization and management of waste and wastewater services for the period 2007-2013. (The Water and Waste Services Regulation Authority, 2010)

The responsibility on waste management is divided in bulk- and retail services. The State is responsible for the multi-municipal services as in bulk and the municipalities (SGRSU's) are responsible for the retail services. (The Water and Waste Services Regulation Authority, 2010)

From 2000 on, Portugal has made some major efforts to revise environmental directives. Next to the funds of the EU, local investments are required to be able to achieve the environmental infrastructure goals that have been set. Unfortunately, citizens are hardly involved in the decision-making process on environmental issues, because of a weak non-governmental organization (NGO).

In the area of waste management, Portugal has made great progress and all municipalities perform well because of effective waste collection systems. In some municipalities, tariffs have been introduced; however, they do provide too little incentives for waste reduction. (OECD, 2011) Major improvements are necessary in terms of capacity building, qualified human resources, tradition and efficiency and effectiveness. (The Water and Waste Services Regulation Authority, 2010)

Smart Cities

According to EUROCITIES (2013) Lisbon, Matosinhos, Oporto and Sintra are the cities in Portugal which are striving to become a Smart City. Moreover, as an initiative of Cisco, Microsoft, Philips and

other partners, the Smart City PlanIt Valley is built near Oporto. The city is aimed to adapt completely to the needs and wishes of its inhabitants, by means of sensors. The sensors will optimize energy efficiency and reduce urban congestion. (Sustainable Mobility, 2012)

4.1.4 Russia

General information on waste & social awareness

In Russian cities, million tons of municipal solid waste are produced every year. Currently, the annual waste is about 150 million cubic meters and this amount is expected to increase in the next ten years by 1.5/2 times.

The management of waste is a real problem also because of the lack of the MSW processing industry. The MSW management differs per region and per city and depends on the development of the city. The average MSW per year per capita is about 250 kg. (Green Pack, 2005)

Current waste management system

In Russia, the current waste management is very poor and the process of waste collection and further processing has been changed completely. There is need for investors and innovative technologies to change the systems. (Frost & Sullivan, 2011)

In total, only 3% of the total MSW is processed and little disposals are reused; almost all are land filled. This poor waste management is because of the lack of infrastructure for MSW processing and reuse.

Almost all waste is collected in public containers and there are either no, or only poor possibilities to separate waste. (Green Pack, 2005)

In 1998, a public federal law 'On production and consumption waste' was introduced. The main objectives of the law are to prevent adverse impact of waste on the environment and public health, reduction of waste and using waste as a resource. Based on the federal law, many regions created their own waste legislation to contribute to environmental improvement. However, the legislations on recycling perform very poorly and there are too little means to actually improve the situation and to meet the policy objectives.

Investments, a review of the Federal Waste Programme, and cooperation between federal and regional authorities are needed. (Green Pack, 2005) (OECD, 2013) Improvements in technology and the management of waste service companies should be improved as well (Frost & Sullivan, 2011). Moreover, the infrastructure needs to be developed, and awareness should be created on the importance of recycling (Bachiri & Pivovarsky, 2012).

At the moment, only 30% of waste management companies are private. This number needs to be increased and incentives have to be given to encourage private investment. (International Finance Corporation, 2012)

Smart Cities

In Russia, the idea of building a complete new, smart and innovative city was introduced in 2009. The city that is currently built is called Skolkovo and is located near Moscow. The city will be a high technology business area, encouraging the development of new technologies. (Skolkovo Foundation, 2011).

4.1.5 Mexico

General information on waste & social awareness

The amount of trash produced per day in Mexico City is about 12,500 tons (Armijo de Vega C. , 2006). Almost none of the garbage in Mexico-City is recycled; everything is dumped into one single huge land fill, called 'Bordo Poniente' outside the city. Daily 700 trucks bring unsorted garbage to the 'Bordo Poniente' dump. Since 2003, the city has required their citizens to separate waste; however there is no infrastructure to digest it. 90% of the trucks cannot separate organic from inorganic waste. (Armijo de Vega, Ojeda-Benítez, & Luz Quintanilla Montoya, 2006)

Socially, changing the policies on waste management is a challenge as well. The garbage unions need to be involved in the implementation of new policies and the means need to be created to be able to actually implement new systems. Furthermore, the current unsorted garbage, dumped at the enormous land fill is used by many poor people who are searching for 'valuable' material between the enormous mountains of waste. The current landfills enable them to gather some money to live, by selling the things they found on the waste mountains. (NBC News, 2009) (Finpro, 2010) (Armijo de Vega C. , 2006)

Municipalities, consortiums, deputations

Mexico consists out of 32 states which are divided into 2,456 municipalities. The municipalities have tax authority but they get also financial support from the state. The municipalities manage and organize several public services like water management, trash collection and disposal, street lightning and public transport. (Rhoda & Burton, 2010)

Current waste management system

There has been estimated that in large cities the total waste collected is 75%; the remaining 25% is lying in public areas (Armijo de Vega, Ojeda-Benítez, & Luz Quintanilla Montoya, 2006).

In 2009, the plan has been made to create four new processing centers, requiring \$14 million per centre. One centre has been financed by public funds, the other have to be paid by investors. By 2012, the centers are supposed to recycle 20%, compost 20% and burn 45% of the waste for energy.

In 2009, the Bio Sistemas Sustentables center has been open as a private initiative. The plant is able to recycle waste. The organic soil that comes out as a result can be sold.

In total, three out of the city's 16 waste authority firms have decided to pick up recyclable and non-recyclable goods on different days. This allows them to use their trucks for different kinds of waste.

Smart Cities

In 2011, the City of Guadalajara received a grant from IBM for their efforts to create a 'smarter planet'. The city received the grant because of their development of data availability within its City departments and between customers and governmental offices. (IBM, 2011)

Furthermore, there are plans to build an intelligent city, called 'Cuidad Maderas'. It will be located in the municipality of El Marqués. The city will include everything a city usually contains of hotels, a university, hospitals, houses and so on. The aim of the project is to build a city focused on continuous technological developments. (Rosas, 2012)

4.1.6 Turkey

General information on waste & social awareness

The country is split up into 81 provinces and exists out of 3,215 different municipalities, of which 16 are metropolitan areas. According to data from 2008, in Turkey 24.4 million tons of MSW is collected, of which 12.7 million tons go directly to dumpsites, about 11 million tons go to controlled landfills and 0.3 million tons is sent to composting plants. Only 39% of the Turkish population has access to recycling facilities and services. The average waste produced per year is estimated at 400 kg per capita in 2009 (Eurostat, 2011).

The last few years, the country has been unable to meet the directives of the European Commission. In 2011, the United Nations Environment Program (UNEP) has forced Turkey together with other emerging countries to make more efforts to improve its waste disposal systems. Some municipalities are attempting to implement a landfill gas collection system, so the waste is used to produce electricity (Schrader, 2013).

According to a poll held in 2008 under the Turkish population, it seemed that 80% was willing to separate waste. Another social issue is that there exist many individual collectors, as in scavengers,

for which the collection of usable waste is a “unregistered” economic activity (Metin, Erozturk, & Neyim, 2003).

Municipalities, consortiums, deputations

As already mentioned, Turkey consists of 3,215 municipalities, which are divided into three types: metropolitan municipalities, district municipalities (in metropolitan areas) and other municipalities. The governance in Turkey is mainly centralized and therefore, all the municipalities lean heavily upon the grants issued by the central government. The municipalities are not allowed to change their local tax administration to increase revenue and because of this they experience a shortage in resources to improve their municipal services. Service Unions have been established to encourage inter-municipal cooperation to provide better public services as waste management. (Bahloul & Ozcan, 2006)

Current waste management system

Waste in Turkey is often collected on a weekly base and in most cases public containers are situated across the cities (Metin, Erozturk, & Neyim, 2003). The municipality’s only deal with the collection of waste, the shipment and other services are outsourced, which complicates the control of waste. There is a lack of cooperation between different institutions and therefore controlling, monitoring and coordinating waste is very complicated and this makes the current waste management system very inefficient and ineffective. (Köse, Ayaz, & Köroğlu, 2007).

There is a huge lack of reuse, recycling and sanitary disposal. The regulatory bodies pay too little attention to waste management and are not able to supervise properly, there are little financial resources, and there is a lack of information and a lack of technical capabilities. (Tarhan & Unlu, 2004)

Smart Cities

In 2010, the city Gaziantep in Turkey was visited by eight IBM volunteers, because the city aimed to be changed into a Smart City. Several strategic recommendations have been made regarding IT infrastructure and IT services. (UNDP, 2010) According to data of EURO CITIES (2012), Gaziantep, Istanbul, Konya and Nilufer are cities that pay special attention to the environment.

4.1.7 Outcome country analysis

When considering the philosophy behind the smart products Wellness Telecom provides, the aim is to target Smart Cities. Considering the social conscious on the environment and the awareness of people about the existence and growing efforts on Smart Cities, not all countries mentioned above will be suitable for the implementation for the eGarbage system.

Although the system could contribute greatly to several different cities, it is important that the basics for the infrastructure are well developed, that there is a basic awareness of the environment and that some efforts are made to contribute the effort of becoming a Smart City.

Mexico, Russia and Turkey require too many efforts in the short-term to have the ability to implement the eGarbage system. The infrastructure is very poor, the social awareness of the environment is still in the initial phase and there is a lack of integration between governments and society.

The situation is different in most European countries. Since the European Union has set several environmental directives that have to be met by all member countries. Due to the general environmental awareness within the zone, the accomplishments to install the system throughout cities will be far less.

After having consulted the literature, websites of cities and having discussed the results with respondents A and B, the countries Italy and Portugal have been chosen. In Italy and Portugal, there is great interest in sustainable city management and there is increasing consciousness that efforts have to be made to improve the living environment and to meet the European directives.

Moreover, in many cities garbage is collected by means of mobile public containers. After having checked the different potential Smart Cities in both countries, the present competition and the current waste management, the cities **Turin** (Italy) and **Oporto** (Portugal) have been selected to elaborate the further research on. Turin and Oporto are members of EUROCITIES and participate in the NiCE project (Networking intelligent Cities for Energy Efficiency), a project focused on innovative technologies. Furthermore, mobile public containers are still the most commonly used means to collect waste.

4.2 Internal analysis Wellness Telecom

4.2.1 *Mission, vision & values*

The mission statement of Wellness Telecom clarifies that the company aims to offer an excellent service to its customers by means of the design, implementation and maintenance of Telecommunication, Networks and IT systems. Wellness Telecom also attempts to improve the efficiency of cities through the implementation of intelligent and sustainable systems. Moreover, the company's technical solutions should improve communication between people.

As described in Wellness Telecom's vision statement; *the company strives to help to build a more efficient and better connected world by means of their innovative technology solutions.* (Wellness Telecom, 2013)

Wellness Telecom is a very young company, consisting of a team of young, dynamic and multidisciplinary people. The major part of the employees owns high degrees in Engineering and Telecommunications and has international experience. Employees are seen as the greatest assets of the company and therefore individual develop is encouraged to a great extent.

The mentality of the company is based on lifelong learning, a standard that is followed to be able to continuously compete in the global economy and to support the knowledge of its employees. Wellness Telecom endeavors to deliver high quality products and a great service, all provide by experts. (Wellness Telecom, 2012)

The key elements within the values of Wellness Telecom are empathy, excellence and implication. The company strives to show empathy for its customers, partners, collaborators and peers. It demonstrates excellence in its services, continuous improvement and permanent focus on good results. Finally, implication applies to being proactive, finding solutions to problems, being conscious about their business and the external environment and the employee's motivation and passion for work. (Wellness Telecom , 2012)

4.2.2 Organizational structure

Wellness Telecom was founded in 2008 and existed back then out of four employees. During the last five years, the company has been expanding rapidly and currently the company has over 60 employees, spread over the offices in Spain; in Seville, Malaga, Badajoz and Valladolid and the oversees delegations in Mexico-City, Panamá and Costa Rica. (GiraldaTV, 2011) The president of the company is Fernando Ibañez Contreras, and the CEO is David Garcia Kalf. (einforma, 2013)

4.2.3 eGarbage objectives

Wellness Telecom endeavors to expand and introduce the eGarbage system in Smart Cities outside Spain and to become the number one smart technology provider for waste management braches. (Respondents A and C) The objective is to:

- Create brand awareness in Italy and Portugal
- To collaborate with Smart Cities associations and organizations
- To have implemented the eGarbage system in one Smart City outside Spain within three years
 - First year: negotiations and the creation of a plan

- Second year: adjustment of the current technology's used, integrating the ERP system of the clients with the eGarbage system and the creation of the hardware and additional required features.
- Third year: test phase and final implementation. (Respondent A)

4.3 Business Model Canvas

The Business Model Canvas connects the infrastructure of the company with the customer. It includes all down-stream activities and management to execution and distribution and after sales relationships. The model consists out of nine building blocks: key partners, key activities, key resources, customer relationships, customer segments, channels, value proposition, cost structure and revenue stream. Within the Business Model Canvas, the value proposition is at the core and links all remaining eight building blocks. (Nielsen & Lund, 2012) This model functions like a guide for finding the right strategy. It focuses on both internal as well as external factors, containing both primary and secondary activities.

The model is a combination of information from literature, internal experts and external experts. The Business Model Canvas has already been used by Wellness Telecom for the implementation of the eGarbage system in Seville, Spain.

Due to some limitations of the model, some important elements are considered along with the model. For example, the vision, mission and values of a company are not considered in this model. Another very important element in this research is the presence of a competitive analysis.

This section will discuss the nine building blocks of the Business Model Canvas related to Wellness Telecom in general. Within the model, three different core elements can be distinguished: the **infrastructure**, consisting of; key partners, key activities and key resources. Followed by the **customers**, consisting of; customer relationships, customer segments and channels. **Offering** consisting of; value propositions and the final element is **finances**, including; the cost structure and revenue stream.

4.3.1 Infrastructure

Key Partners

The key partners of Wellness Telecom are required to help leverage the business model. The key partners of Wellness Telecom in the implementation of the eGarbage system are several companies in the engineering sector as well as public authorities, waste companies and container

manufacturers. The engineering partners who supply the hardware and M2M equipment to WT are Movisat, Tecnogral, Distromel and Abertis (Respondent C). All these companies are situated in Spain and provide technologies and hardware solutions. The potential partners in Turin and Oporto are mentioned in table 1 (Respondents D and E).

Both external experts (Respondents D and E) were not willing to share detailed information. Nevertheless, both confirmed many of the findings and expectations and gave some additional evidence in the research and justified the choice for both cities. Both cities have great interest in becoming a Smart City and many different efforts are made by the local government.

Respondent D clarified that Amiat is in charge of most tasks related to waste management. The person provided some additional information on the partners of the company by sending a report. Besides, the person explained that Amiat is partner of 'Torino Smart City'. The company is collaborating with many projects that have been established for the 'Smart City Days' event.

Respondent E explained about the increasing importance of the ecopoints. The ecopoints encourage recycling and good results have been obtained already. Furthermore, there has been confirmed that already a similar garbage system exist, applied by the waste management company Lipor.

City	Potential Partners/Clients/Channels	Core business
Turin	Gruppo Gariglio (Gruppo Gariglio, 2012)	Container company
	Amiat (Amait, 2012)	Public Waste management company
	Città di Torino (Respondent D)	Local government
	Microtech System (Respondent D)	Technology company, for installation and maintenance of security systems
	Sublitech (Respondent D)	Container company
Oporto	Lipor	Waste management company
	Câmara Municipal do Porto (Câmara Municipal Porto, 2006)	Local government & Waste management company
	Omeu Ecoponto (GEOTA, 2012)	Ecopoint project in Portugal, also in Oporto
	Ecolinha (Respondent E)	Waste management department government of Oporto (Câmara Municipal do Porto)

Table 1. Key partners, clients, channels of Wellness Telecom in Turin and Oporto

Key Activities

To be able to let the eGarbage system perform well, Wellness Telecom executes the following activities (Respondent C):

- Network with the customer
- Consultancy: develop plan of approach - where to locate the sensors/WIFI

- Integrate the eGarbage system within the current ERP system of the client
- Manage and adjust the infrastructure
- Installation of sensors and field tests
- Monitor the garbage level in containers
- Route optimization
- Maintenance

Key Resources

The key resources are the infrastructure that creates, delivers and captures value. The assets of the infrastructure are an essential part to let the project succeed. For the implementation the eGarbage system, several external resources are of great importance. The hardware needs to be provided by an external company, a M2M supplier has to be involved and a license for installation has to be obtained. The main service provided by Wellness Telecom itself is the eGarbage software. One of the biggest elements of the project is to change the infrastructure according to the eGarbage system. Also human resources are of great importance, not only for the development of the customized eGarbage system, but also for the installation and maintenance. (Respondent C)

4.3.2 Customers

Customer Relationships

Wellness Telecom continuously needs to monitor the waste level and maintain and improve the system. The company always remains involved in the garbage system of the customer; therefore, preserving a good relationship is a necessity (Respondent C). This kind of relationship can be referred to as 'dedicated personal assistance' as well 'co-creation'. The first kind of relationship contains sufficient contact hours and meetings with the customer by some predetermined representatives, this to facilitate the customer with all necessary help and guidance. The second kind of relationship relates to a personal relationship and a direct input of the customer's needs and wishes. Co-creation enables a customized product and improves the connection between Wellness Telecom and the customers. (Coralic, 2011) (Businessmodeltv, 2011)

Clients

The customer segments of Wellness Telecom contain all the people for which the company creates value. Since the system demands integration of several organizations and institutions, many parties are involved in the implementation and so the client cannot be appointed to as one organization. Also councils and associations spread throughout the city are assigned to as clients. (Respondent C) Table 1 shows the potential clients WT can provide its service to (Respondents D and E).

Channels

WT uses several business channels to interact with its customers and to deliver its products. The business channels involved are commercial as well technical and the partners of containers and the engineering companies. Enternational is an intermediary that belongs to the commercial channel, the suppliers of hardware and M2M as mentioned on the previous page are the technical partners and city councils, container companies and other local parties involved belong to local channels.

(Respondent C) The channels mentioned in table 1 display the local stakeholders in Turin and Oporto (Respondents D and E).

4.3.3 Offering

Value Proposition

Several aspects of the eGarbage system make the product very attractive and multiple characteristics of the product contribute to a high value. First of all, the eGarbage system offers several environmental and social benefits. The product reduces the emissions of garbage trucks, thanks to the real-time information available that calculates the most efficient collection routes. Besides, it improves the living environment due to the fact that no longer containers will be overloaded and waste will not have to be placed outside the containers anymore. Both benefits improve the environment of a particular area and contribute to the environmental directives set by national and international governments.

Moreover, the system facilitates a more smooth and transparent process. The system of the waste management company will be integrated with the eGarbage system and information will be available for all stakeholders.

Another feature of the system is an economical advantage. The operational costs will be reduced by the usage of innovative IT systems, since less people will be involved in waste management and less gas will be required. As previously described in the introductory chapter, sensors measure the amount of waste in containers and based on that information, the information is send to a central system and then automatically the most efficient collection route is calculated, subsequently the route is send to the truck driver. (Respondent C) (Wellness Telecom, 2013)

4.3.4 Finances

Cost structure

Once the infrastructure is understandable, it is easier to come up with a cost structure for the eGarbage system. The costs of the system will depend per customer; city size, the condition of the

current infrastructure, the overall waste management and the cooperation between citizens and local companies and public authorities.

The current costs of implementing the system are estimated at €100.000 for a single city district including about 50.000 citizens. At present, due to the small size of customers, WT cannot make use of economies of scale, and so the production costs are relatively high.

The eGarbage system is value driven. It is a product that is entirely adjusted to the needs and wishes of the client. The hardware is fixed, but all the remaining elements (e.g. the software and infrastructure) are completely tailor made, due to different infrastructures, divergent city sizes and diverse IT and ERP systems used. (Respondent C)

Revenue Stream

During the establishment of the system, there has been determined that eGarbage is a product that is provided with an ongoing service. WT will always be involved to maintain the system and to make necessary adjustments. Due to the high costs concerning the implementation of the system, especially the adjustments required to change the infrastructure which take about 30-50% of the total costs, external investors would be very welcome. Customers are supposed to pay a subscription fee as well a monthly/yearly usage fee, receiving a continuous service as in after-sales services and maintenance of the product. (Respondent C)

4.4 Competitive analysis

The competitors of Wellness Telecom are companies that offer RFID and other IT solutions for waste management. Worldwide, there are many different companies that offer RFID and other technological solutions to improve infrastructures of diverse business areas. Nevertheless, not all companies apply their technologies to waste management solutions. This section provides a list of the largest competitors that operate in Italy and Portugal.

CAEN RFID

CAEN RFID is an Italian-based company and offers RFID applications and works together with the important associations such as EPCglobal and ETSI. CAEN provides RFID to waste management companies. The product delivers a similar solution as the eGarbage system. It tracks data, improves the route plan and distinguishes who produces the largest amount of garbage. (CAEN RFID, 2011)

SOFTWARE

SOFTWARE is an Italian company offering RFID solutions to different industries. The company also

focuses on Smart Cities and uses RFID as a solution for waste management. The company is located in Concesio, Italy. Regarding waste management, SOFTWORK is collaborating with the Austrian company IDENTEC Solutions AG which is specialized in identification, tracking and searching containers. (SOFTWORK, 2012) (IDENTEC Solutions, 2013)

RFID NFC

The Italian company RFID NFC uses RFID tags for the collection of waste. By means of a Nokia or Samsung mobile phone, the tags can be read and all the parties involved know the amount of waste produced per household. NFC is a technology that functions together with RFID and enables communication between two different tools which are close to each other. (RFID NFC, 2013)

Alien trusted performance

Alien Technology is a Canadian company providing RFID solutions (Alien, 2013). The Portuguese waste management company Lipor implemented the technology in their waste management practices in Oporto. The RFID enables the company to identify the waste that is entering trucks and is brought to the final disposal centers. (O'Connor, 2009)

4.5 SWOT analysis

The SWOT analysis is attached in appendix C and gives an overview of the company's internal strengths and weaknesses and external opportunities and threats having considered the eGarbage system. The SWOT analysis has been created based on secondary literature and on the information given by the internal experts (Respondents A, B, C, F). This analysis can be applied to come up with an adequate positioning strategy.

The most prevailing strength of Wellness Telecom is their well-established R&D department. The company continuously strives for innovation and endeavors to develop new technologies to respond to the current global needs. Cloud computing is one of their newest and major established technologies.

The Smart City department is very innovative and offers many different technological solutions for various Smart City topics. Another beneficial factor is their optimal service and well-practiced CRM. The company aims for good relationships with its customers and invests greatly in delivering high quality products and services, perfectly adjusted to the customer's needs and wishes. (Respondent C) Furthermore, Wellness Telecom obtained an award for the eGarbage system, as being the best R&D project in Andalucía in 2010. (Wellness Telecom S.L., 2012)

The major weakness of the company regarding the eGarbage system is the fact that the company has no international experience with the eGarbage system. Besides, there are little references on the performance of the system and the company has little brand awareness abroad. Another main weakness is the fact that due to the lack of demand for the eGarbage system, the company is not able to make use of economies of scale and thus the manufacturing costs are relatively high. Furthermore, the company has a lack of financial resources and therefore, collaboration with other companies or seeking funding is a necessity. (Respondent C)

One of the opportunities that WT is facing is the increasing social environmental awareness in European countries. Both Italy and Portugal are conscious about the concept of 'Smart Cities' and are members of EUROCITIES and the NiCE project. (EUROCITIES, 2013) The NiCE project aims to support cities in creating tools to monitor and report the ICT carbon footprint, developing green ICT tools, learning activities, organizing networking and visibility events. (Green Digital Charter, 2013) In Portugal, cities are improving and creating ecopoints, which are points throughout the cities where containers for all different kinds of waste are placed. These ecopoints encourage people to recycle and improve the living environment. (GEOTA, 2012)

One of the most important threats that Wellness Telecom is facing is the expanding door-to-door collection method in both Portugal and Italy (Comune Rufina, 2009) (Porto Câmara Municipal, 2013) (SUMA, 2009). The eGarbage is developed for large mobile containers, not for individual household collection. Another threat are the already used RFID technologies in waste management that enable companies to have the same kind of waste control (Arebey, Hannan, Basri, Begum, & Abdullah, 2010). Also vandalism is a threat that has to be considered. The sensors and hardware boxes are susceptible to theft and therefore, there should be carefully looked at the most convenient way and location to place them. (Respondent B)

4.6 Confrontation Matrix

The confrontation matrix can be found in appendix E. The table combines the most important internal and external factors of the SWOT analysis and aims to visualize strategic challenges. The capital letters in the table suggest that there is a strategic challenge for Wellness Telecom. The following strategy themes exist:

Adjust strategy: opportunities against weaknesses: conquer weaknesses to pursue opportunities.

Defensive strategy: weaknesses against threats: develop a defensive plan to prevent the company's weaknesses from making it highly vulnerable to external threats.

Offensive strategy: opportunities against strengths: pursue opportunities that fit the company's strengths.

Reactive strategy: threats against strengths: recognize how WT can use its strengths to reduce its susceptibility to external events. (Rustenburg & Gouw de, 2011)

The strategies that arose from the confrontation matrix have been established with the help of Respondents A, B and E. The confrontation matrix in appendix E mentions 17 different capital letters, which all represent a strategy. The researcher discussed together with respondents A, B and E the SWOT analysis and by means of a brainstorm meeting, the following strategies have been invented:

Adjust strategies

- A** Acquire references from partners in Seville, e.g. Lipasam, citizens, town hall.
- C** Collaborate with EUROCITIES and participate in their Smart City projects.
- E** Try to collect money by means of Crowd Funding online; promoting the eGarbage system and its benefits online.
- G** Approach Smart Cities that invest in new ecopoints.
- H** Try to promote the eGarbage system to EUROCITIES and the Green Digital Charter and the NiCE project and apply for funding.

Defensive strategies

- I** Find partners (e.g. RFID companies) to integrate the system in their current system.
- J** Sell the eGarbage system to competitors or RFID companies.

Reactive strategy

- K** Develop new technologies/products for different kinds of waste management.
- L** Sell new technologies to competitors or RFID companies.
- M** Become the external R&D department of competitors or RFID companies.
- N** Become a Smart City consultant for town halls or competitors; consult in making decisions about the right garbage systems and most optimal technologies.
- J&L** Collaborate with international companies from Seville that operate in Italy and Portugal.
- K** Attend 'Smart City' trade shows and fairs in Italy and Portugal to introduce the eGarbage system.

Combined strategies: Adjust & Offensive strategies

- B** Collaborate with Smart City, apply for participation in smart projects, participate trade shows in Italy and Portugal and take part in smart technology contests in Europe.
- D** Create a magazine and release it every month/every quarter; with research facts, new products, to involve people and to promote the smart technologies of Wellness Telecom.

Additional strategies

- O** Create a chip that measures the garbage produced per citizen.

4.7 Marketing Mix

The marketing mix, known as the four P's, consists of four different variables: Product, Price, Place (distribution) and Promotion. The marketing mix is based on the internal analysis of Wellness Telecom and the strategies that originated from the confrontation matrix. The Marketing Mix should serve as a solid foundation for the positioning strategy.

Product

The actual product delivered by Wellness Telecom is the eGarbage system. As already described in chapter 1, the eGarbage system is a very complex product and includes a tangible product, an intangible product and services. The core product delivered by Wellness Telecom is the intangible part of the final product, the software. The tangible part, the hardware, is provided by external suppliers. The hardware and software together form the actual product that creates the added value for the final customers. (Kotler & Armstrong, 2008) (Respondent C)

Considering the strategic challenges derived from the confrontation matrix, Wellness Telecom has different options. The eGarbage system is an innovative product, however, similar systems exist and there are many companies that offer RFID solutions. There are several opportunities when it comes to the expansion of the eGarbage system.

Wellness Telecom could diversify to be able to compete and acquire a position in the global market of smart technologies. Instead of only focusing on Smart Cities with public containers, the company could expand the eGarbage system by including different kinds of waste management. Currently, door-to-door collection is increasing and many public, mobile containers are replaced by underground containers. Considering the well-established R&D department of Wellness Telecom, various technologies could be developed for different kinds of waste collection.

Another option is launching a consultancy department for Smart Cities. The idea is to become a consultant in Smart City technologies and to consult local governments and/or town halls which measures could be taken to make a city more sustainable. WT could for example consult a city about which kind of waste collection would be the best option and which systems would be most favorable.

An additional alternative is to develop a system that can measure the garbage produced per citizen. This could work using a RFID chip in containers and a card that is provided to all citizens. The card is provided with a chip with the data of the citizen on it. When the citizen wants to leave its garbage in a container, the person first has to scan the card, and then the container will open. In this way the 'polluter pays principle' can be applied. People will become more aware of how much waste they produce and will be encouraged to recognize which products and packages are reducing their garbage production. This eventually will change the industry and improve the environment.

(Respondents A, B, F)

Price

The price of the eGarbage system depends on several factors. Investing in the infrastructure is the biggest expense, the amount spend on adjusting the infrastructure is estimated on 30-50% of the total costs. Other elements that belong to the total costs are; manufacturing, testing, installing, consulting and teaching. The testing, installing, consulting and teaching activities require a lot of human resources. Next to the initial investment, the customer will have to pay usage fee to WT for the ongoing service for maintenance, adjustments and improvements. The table below displays a rough estimation of the initial investment, focused on a small part of a city. (Respondent C)

Citizens	50.000 citizens
Containers	100-150 containers
Activities included	Infrastructure, manufacturing, testing, installing, consulting, teaching
Initial investment	€100.000

Table 2. Cost estimation of the initial investment of eGarbage.

Depending on the economic situation in the targeted cities, the initial investment could be done in several ways. The local government or the largest waste management company could make the investment. Citizens could be charged with higher garbage taxes or the 'polluter pays principle' could be introduced. Another way to acquire the system is requesting funds from Smart City associations like EUROCITIES or environmental organizations. (Respondents A, B, F)

Distribution

The distribution of the eGarbage system is completely adjusted to the client. The system is entirely tailor made and therefore the distribution channels will differ per client. eGarbage depends on the size of the neighborhood(s), the current containers used and the current ERP system that is used. Once the product requirements for the clients are known, the software can be prepared according to the needs and wishes of the client and the hardware can be ordered.

The hardware is provided by a supplier of Wellness Telecom. Once the hardware and software are ready, they will be sent to the clients, where the partners (container company and technical companies) will take care of the installation. Depending on the location of the client, the eGarbage system will be send by air, ship or truck.

Even when the system is installed and performing well, Wellness Telecom is continuously involved to ensure high quality and to intervene whenever necessary. (Respondent C)

Bearing in mind the lack of brand awareness and experience, entering agreements with local partners could be considered. The local partner (waste management company, container company, town hall, and so on) could take over the entire process of implementing and testing the system. (Respondents A, B, F)

Promotion

Promotion is all about marketing communication. There are several ways in which Wellness Telecom could promote its eGarbage system and its additional Smart City technologies. Currently, the company is in the cognitive stage when it comes to the eGarbage system. The cognitive stage represents the stage in which brand awareness has to be created. The brand awareness can be achieved by attending fairs and trade shows in the target markets. By expanding the brand awareness, and approaching clients directly, the company can create interest in the product. (Kotler & Armstrong, 2008)

The best way to achieve brand awareness in Italy and Portugal is to attend international fairs about Smart Cities and smart technologies. During these trade shows, WT could demonstrate the eGarbage system and promote its benefits.

Another way in which WT could increase its brand awareness in Italy and Portugal is by approaching EUROCITIES and becoming a member of other European Smart City associations. Furthermore, WT could advertise in environmental magazines in the relevant cities and areas and this could also be done in collaboration with EUROCITIES and the EUROCITIES website. A video that explains and demonstrates the product could be published online. (Respondents A, B, C, F)

5. Conclusion and discussion

This chapter interprets the most important findings from the previous chapter. The conclusion will give an overview of the observations and findings and concludes the answers to the sub question and the research question.

5.1 Conclusion

Smart Cities

The concern for the environment is increasing and the interest in sustainable management in cities is rising. Europeans are aware of the impact their daily activities have on the environment and they are conscious about the call for a change. Many European cities aim to become entitled as a Smart City, since it provokes a good image.

Smart Cities are defined as cities that endeavor to invest in economical, technological and environmental development. The purpose is to improve the living environment and to make a city more transparent by involving all its stakeholders in the process by means of IT systems.

There is an increasing need for new technologies that enable cities to become more transparent and involve citizens. Waste management is one of the main concerns in many cities and is required to improve. Although RFID technologies are used in several cities as a tool to measure, track and or manage waste, the system is not optimal.

Target market

The objective of Wellness Telecom is to target Smart Cities outside Spain. During a meeting with the client Wellness Telecom, the company decided to investigate the countries Italy, France, Portugal, Mexico, Russia and Turkey. The aim was to find out per country, how well-developed the social environmental consciousness is, if the countries know the concept of Smart Cities and if they make any efforts to create Smart Cities, how the current waste management is organized, which competitors and partners there are and which Smart Cities already exist.

There has been concluded from the country analysis that the idea of Smart Cities is well-established in western countries, but that the concept is not well developed yet in Mexico, Russia and Turkey. Implementing the eGarbage system in these countries would require too much investment, due to the lack of social and environmental awareness and underdeveloped infrastructures.

Based on the extensive country analysis and having discussed the topic with the internal experts (Respondents A and B), Italy and Portugal seem to be the most interesting countries to target. In

many places, garbage is still collected by means of large public containers and people are not used to door-to-door collection, although this last method of waste collection is slowly entering both countries. After having decided on Italy and Portugal, having researched the cities and investigated the current waste management systems, Turin and Oporto have been chosen as target cities.

Both cities show a great interest in sustainability and aim to provide its citizens with the best possible waste management. Turin and Oporto are both members of EUROCITIES and participate in the NiCE project. Furthermore, the cities and waste management stakeholders are interested in new technologies and strive for a reduction of gas emissions. During the research process, there has been encountered that in Oporto, a similar system as the eGarbage system is used. This brought along some limitations, since a RFID system is used to track and trace waste. However, the system is only used with the objective to follow waste to the final disposal.

Internal analysis

The objective of the eGarbage system is to improve the living environment in cities, to stimulate recycling, to reduce the cost of waste collection and to develop more points for bins to meet the needs of citizens.

Wellness Telecom strives to expand the system and to target Smart Cities outside Spain. To be able to fund the expansion and to implement the system, the company aims to collaborate with associations and organizations that are focused on the development of sustainable (smart) cities. The aim is to have the system operating in two Smart Cities within three years. Three years will be needed for various purposes. First of all, negotiations will be made with clients, partners, distribution channels and investors. Subsequently, research will have to be conducted regarding the current waste management system, the infrastructure in the city and the most suitable system that should be implemented. The final phase is that of the implementation and testing.

Customer

Taking into account the Business Model Canvas, Wellness Telecom has several options when it comes to offering the eGarbage system. Partners, clients and competitors are very closely related to each other and can even overlap.

The initial investment of the eGarbage system in Oporto and Turin could be done by waste management companies, the local government or external investors. WT could also enter a partnership with container manufacturers. The sensors could be installed in new containers and the container companies could sell the containers together with the system.

An additional alternative is to collaborate with RFID companies which do not yet offer RFID solutions for waste management, the eGarbage concept could be sold to them, or WT could become their supplier. A different option is to sell the eGarbage concept to competitors, companies that already use RFID solutions for waste management. Although the product is similar, the eGarbage is more innovative due to the use of WIFI and 3G.

The ultimate alternative for Wellness Telecom is to become a consultant. WT could offer consulting services regarding waste management to local governments, waste management companies, competitors or container manufacturers. The company could investigate the current waste management, the infrastructure, the environmental and social awareness of citizens and eventually advice which waste management system(s) would be most favorable. Due to the powerful R&D department of the company and the Smart City aptitude, Wellness Telecom has good insight in the Smart City market and has knowledge about various technologies that could suit a city.

Competition

The competitors of Wellness Telecom are companies that offer RFID solutions for waste management as well. There are many companies that offer RFID solutions for many different purposes, nevertheless, only a small amount of the companies created RFID solutions for waste management.

The largest competitors of Wellness Telecom in Italy and Portugal are CAEN RFID, SOFTWORK, RFID NFC and Alien Trusted Performance. All four companies are specialized in RFID. Although these four companies did develop a similar garbage system using RFID, the eGarbage is innovative, due to the usage of WIFI and 3G to send the data. WT could take advantage of its competition by selling the eGarbage system to them or consult them. In Oporto, there is already one company active with RFID solutions for the waste management. The company collaborated with Lipor, a large waste management company.

SWOT analysis

Based on the strengths, weaknesses, opportunities and threats mentioned in the SWOT, it is important to notice that there are important opportunities in Europe. The environmental awareness is increasing and the interest Smart Cities is augmenting. On the other hand, there is much competition, offering similar systems with a more outdated technology. Besides, in many cities, including Turin and Oporto, the waste collection with public containers is slowly replaced by door-to-

door collection or containers are built underground while the eGarbage system focuses on public, mobile containers at central points throughout a city.

Wellness Telecom does not have many references and experience regarding the eGarbage system and has a lack of brand awareness abroad. Nonetheless, WT has a successful R&D department and owns one department specifically dedicated to Smart City technologies.

Confrontation matrix & marketing mix

By combining the strengths, weaknesses, opportunities and threats, several strategic challenges have been created. Most strategic challenges are covered by the adjust strategy, meaning that weaknesses can be conquered by focusing on the opportunities. This means that WT should focus on the increasing interest in Smart Cities, the augmenting social and environmental awareness and the Smart City associations and projects that currently exist. A reactive strategy, which focuses at a company's strengths to reduce the vulnerability to external threats, could be possible for Wellness Telecom as well. The company could expand its R&D department and focus on different waste systems, promote its Smart City technologies and enter a partnership with competitors and RFID companies.

Marketing mix

The marketing mix consists of information of the current eGarbage product, the price, the distribution channels and promotion activities and the strategies that have been deducted from the confrontation matrix. The marketing mix shows different ways how Wellness Telecom could position itself in order to market the eGarbage system in Turin and Oporto.

The eGarbage product consists of hardware, software and WIFI and/or 3G. The final product that is offered depends on the client. Relying on the client, WT could sell the entire system including after sales services and maintenance, sell the concept to competitors or RFID companies, or consult companies about the most effective waste management system to implement.

The price depends heavily on the current infrastructure of a city. Since the initial investment is relatively high, WT and the client should seek investors that will fund the investment. Smart Cities associations might be willing to invest in a sustainable system or a city could introduce the 'polluter pays principle' which motivates citizens to recycle and measures and charges the person that produces the most. An additional monthly/yearly fee is required to finance the after sales service and maintenance.

The distribution of the product will be most convenient when entering agreements with local partners. Collaborating with local partners enables WT to acquire more easily a foothold in the Italian and Portuguese market and will facilitate brand awareness.

The SWOT analysis also showed that WT needs brand awareness and references. This could be achieved by participating in European and/or International fairs about Smart Cities, sustainable development and/or smart technologies. An additional promotion alternative would be to create a magazine and publish it via EUROCITIES and other Smart City organizations in the relevant countries.

Additional research

Currently, waste management in Turin and Oporto consist of public mobile containers, underground containers and private containers per building or household. For this case it can be concluded from the research project that the eGarbage is not the optimal system. It can have great potential in some parts of cities, but a combination of different garbage systems throughout a city or district would be more favorable. Additional research should find out what kind of waste management systems would be most favorable for Turin and Oporto or what combination of waste management systems would be the best.

An investigation about the costs and benefits per city district should be performed. Districts with family houses have different needs than districts where mainly flats determine the view. The costs for implementing new waste systems is high and therefore, there should be carefully considered which systems at which locations are most beneficial, economically as well as environmentally.

5.2 Discussion

Although the research has initially been performed to advice Wellness Telecom about the expansion of the eGarbage system, the outcome of the project can certainly be utilized in a broader context.

The research gives Enternational and Wellness Telecom insight in the current waste management market. It enables Wellness Telecom to determine their internal strengths. The company can conclude that currently, their Smart City department is of great value and that there are many opportunities if they invest in R&D regarding smart technologies.

When considering the external environment, the report displays the environmental developments, awareness, trends and needs in several countries. The research provides insight in external needs and facilitates Wellness Telecom to conclude that only offering the eGarbage system would not be beneficial and successful when they do not consider the shifting waste management needs.

The country analysis provides a general overview of how environmental issues are handled in different countries. It shows where environmental consciousness is big and where recycling is a well-integrated factor in waste management and sustainable city management.

The interest in smart technologies and Smart Cities is an encouraging outcome for the Smart City department of Wellness Telecom. Also the competitive analysis facilitates Wellness Telecom with an overview of how they should use its internal strengths to conquer its competitors.

An additional supportive fact is that Wellness Telecom has several alternatives when it comes to expansion abroad. Many possibilities are feasible considering clients. The company could collaborate with local governments, container manufacturers, RFID companies, competitors and environmental organizations. All these stakeholders can benefit from an innovative technology that improves the living environment and helps to achieve the environmental directives set by the European Union.

6. Recommendations

This report has been conducted, based on the research question: “**What kind of strategic approach should Wellness Telecom use in order to enter Smart Cities with their eGarbage system?**” This chapter will provide Enternational and Wellness Telecom with a recommendation on how to strategically approach Turin and Oporto. The recommendations will give advice on how Wellness Telecom should approach both Smart Cities in the; short term, medium term and long turn. All three recommendations have been established during one of the meetings between the researcher and respondents A, B and E and are based on the strategic options that have been originated from the confrontation matrix.

In the short-term, Wellness Telecom should collaborate with local companies, environmental and Smart City organizations and (Spanish) companies that have interest in Turin and Oporto. Wellness Telecom should strive to have obtained satisfactory partnerships by the end of 2015. Having partners in Turin and Oporto enables Wellness Telecom to enter the markets more easily and to obtain brand awareness abroad. Another benefit of collaborating with stakeholders in the relevant cities is to provide the cities with the best suitable waste management solution due to reliable insight information that can be acquired.

In both cities, it is advisable to firstly approach the local government. The local government can help to provide a clear overview of the current situation and can present Wellness Telecom a clear overview of the most important parties involved. Wellness Telecom can decide, based on the current situation and the information about the parties involved, which companies would be most favorable to collaborate with. In case of Oporto, the company should approach the Smart City PlanIt Valley project that is been performed near Oporto. In this Smart City project, many important companies are involved which could provide market access.

Attending European or local Smart City fairs is also recommendable. At these fairs, companies and organizations participate which have interest in Smart Cities. These fairs are a great opportunity to demonstrate the eGarbage system and to meet potential partners. Moreover, cooperating with environmental and Smart City organizations in Europe will provide Wellness Telecom to more easily promote itself and to raise funds. EURO CITIES is a Smart City organization that has great interest in companies that develop innovative, sustainable technologies for cities.

Furthermore, partnering with Spanish companies that do business with waste management companies and/or companies involved in environmental issues in Italy and Portugal will help Wellness Telecom to position itself in the Italian and Portuguese market.

Turin and Oporto have multiple waste management systems. Next to waste collected in public mobile containers, both cities are slowly introducing door-to-door collection, besides, underground containers is an upcoming trend as well. Therefore, the second and foremost important advice is therefore to diversify in the medium term.

Wellness Telecom should not only position itself in the Italian and Portuguese market as a company providing the eGarbage system. The company should market itself as a company, developing smart technologies and offering diverse solutions for waste management. It is highly recommendable for Wellness Telecom to expand its portfolio in the next six years. Next to establishing partnerships in the short-term, they should focus on different waste management systems. The partnerships that will be established in the short-run will facilitate the process of diversification, due to the information that can be obtained by local partners.

The company should develop various solutions for different needs; mobile containers, underground containers and door-to-door. Using the knowledge and intelligence about R&D and innovative, smart technologies could be offered as a consultancy service, that advises cities and its stakeholder how best to improve the living environment regarding waste management. In this way, the company is able to avoid fierce competition and is capable of obtaining a foothold in the European market.

In the long-term, within eight to ten years, the company should aim to establish a Smart City consultancy department. The environmental awareness is rising and the interest in smart technologies is increasing. Therefore, offering specific Smart City consultancy services will have great prospective. The company already owns all the required knowledge about smart technologies and is aware of the latest developments. Wellness Telecom should combine its R&D knowledge, its smart technology intelligence and by that time, international experience to advice cities about the most effective and sustainable way of city management.

This long-term strategy can gradually be implemented over the years. The company is already offering diverse smart technologies for Smart Cities and by acquiring international experience the company is able to recognize what cities need. Besides, having partners in different countries will give insight information and support the creation of city-specific consultancy services.

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Appendix A

Country analysis; Potential partners per country

Italy

- E.S.P.E.R. (ESPER, 2012)
- HarnekInfo: Information and Telecommunication company, garbage-web-system (HarnekInfo, 2012).
- Raccolta dei Rifiuti – Caronte: (Il portale dei rifiuti, 2013).
- AMSA: Waste collection company (Amsa S.p.a., 2012).
- Azienda Ambiente S.r.L: responsible for entire MSW in Trento (Azienda Ambiente srl, 2003).
- Group Hera: MSW company (Gruppo Hera, 2012).
- Gruppo Waste Italia: waste management company (Gruppo Waste Italia, 2012).
- Arpa Emilia-Romagna: environmental protection agency in the region Emilia-Romagna (Arpa, 2011).
- ATO: Ambiti Territoriali Ottimali: Territorially optimized consortia (ISPRA, 2012).

France

- Sita: waste division of Suez France - waste specialist (Suez - SITA, 2012)
- Veolia: waste company, environmental services (VEOLIA, 2010).
- Groupe Nicollin: waste collection services, traditional techniques (Groupe Nicollin, 2012).

Portugal

- ERSAR: Water and Waste Services Regulation Authority, regulating among others municipal waste management services. (ERSAR, 2012)
- Resulima: Waste Management Company: offering services to a large part of Portugal (Resulima, 2012).
- Ponto Verde: NGO focused on separating waste, collect and recycle it and improve the current waste circumstances (Ponto Verde, 2012).

Russia

- Remondis: energy & environmental services (Remondis AG & Co. KG, 2013)
- ASA: waste solutions in central and south-eastern Europe (A.S.A., 2013)
- Arhvtorresursy JSC.: waste collection company (NorTech Oulu, 2012)

Murmanpolimer: production of containers, recycling plastic.

Mexico

- Centro Ecológico Akumal: environmental education (Nah, 1993).
- Corte Internacional de Arbitraje y Conciliación Ambiental: International Court for disputes and conflicts regarding environmental, natural and legal issues (Gloobal, 2012).
- Red Girasol: organization to stimulate integrated waste management (Giresol, 2013).
- Basura Cero: company that develops sustainable strategies for companies regarding waste and recycling (BasuraCero, 2012).
- UK: Defra: Department for Environment, Food and Rural Affairs (Defra, 2012).
- SIMEPRODE: Integrated Ecological Management and Waste Processing company (Nuevo León Unido, 2012).

PASA: Waste collection company (Promotora Ambiental, 2012).

Turkey

- Lahore: Waste Management Company (LWMC, 2011)

Largest Waste Collection Companies in Northern Europe

Country	Company	Locations
Germany	Remondis	Throughout Europe
	Sulo	Eastern Europe
	Alba	Germany, Bosnia, Poland
	AGR	Germany, Finland, Poland, UK
	Becker	Eastern Europe
	Lobbe	Eastern Europe, Greece and Spain
Netherlands	Van Gansewinkel	The Netherlands, Belgium, Czech Republic, France, Poland, Portugal
	AVR	Netherlands, Belgium, Ireland
	Essent	Netherlands, Belgium, Czech Republic, France, Germany, Poland, Portugal
UK	Biffa	United Kingdom, Belgium
	Shanks	United Kingdom, Belgium, Netherlands
Belgium	Indaver	Eastern Europe, Italy, Portugal, Netherlands, Belgium
Austria	Rumpold	Austria, Czech Republic, Croatia, Slovenia, Hungary
	ASA	Eastern Europe
Sweden	Ragn-Sells	Sweden, Denmark, Estonia, Norway, Poland
Finland	Lassila & Tikanoja	Finland, Estonia, Latvia, Russia

Table 3 appendix. Waste Management Companies Northern Europe (Hall, 2006).

Appendix B

Business Model Canvas

 Key Partners Container Manufacturers • Gruppo Gariglio (Turin) • Sublitech (Turin) Engineering sector • Movisat (Murcia) • Tecnigral (Málaga) • Distromel (Madrid) • Abertis (Sevilla) • Microtech System (Turin) Ecopoints Portugal • Omeu Ecoponto	 Key Activities • Networking • Consultancy • Plan of Approach • Integrate eGarbage • Installing sensors • Field test • Monitor garbage • Route optimization • Maintenance	Value Proposition  Social and environmental Benefits: • Real-time information • Reduction of emissions • Improvement of living environment • Reduction of operational costs • Monitoring garbage level in containers • Integrating the system in the ERP system of the client • Route optimization	Customer Relationships  • Visit clients • Regular phone/e-mail contact with clients • Contact with suppliers and partners • Fairs	Customer Segments  Public companies: • Ecolinha • Câmara Municipal do Porto • Amiat • Città di Torino Private companies: • Lipor
Key Resources  • Hardware provider • M2M supplier • Cloud infrastructure • Licenses for installation • Human Resources		Channels  Commercial, Technical & local: • International • Local partners • Container companies • Engineering companies		• Cooperatives • Associations • Councils • Private clients
Cost Structure  Infrastructure (30-50% of total costs): • City size • Amount of containers		Revenue Streams  • Initial investment • Monthly/Yearly fee • External investors		

Appendix C

Qualitative data collection

All the questions/topics mentioned in Appendix C have been used as guidance during the interviews/questionnaires. The interviews conducted have been semi-structured and the answers have been obtained based on meetings, phone conversations and e-mail contact.

Internal experts

Interview questions, Wellness Telecom

Date: 12th of March 2013

Location: Head Office Wellness Telecom, Seville

Respondent: Francesco Bernard, *Business Development Manager*

Interviewer: Grace Janssen

1. What are the company objectives regarding the eGarbage system?
2. Which countries would be most interesting for Wellness Telecom to enter?
3. Where was the current 'eGarbage product' developed and who were involved? (also partners)?
4. Which resources are required in order to implement the system?
5. Which resources are most expensive? Which activities are most expensive?
6. What are the suppliers of Wellness Telecom regarding this system?
7. Once the system is implemented and integrated in a city: what will be the role of Wellness Telecom?
8. Who are involved in the key activities when using the system?
9. How did the first trial in Seville work out?
10. How is the maintenance managed?

Interview questions, Enternational

Date: 29th of May 2013

Location: Enternational

Respondent: Antonio J. Peinado, Co-founder Enternational

Interviewer: Grace Janssen

1. What are the best models to use to create a strategy?
2. How can the Marketing Mix add value to the formation of a strategy?
3. How should the SWOT analysis be used and what is the best way to use the confrontation matrix to come up with possible strategies?

Interview questions, Enternational

Date: 5th of June 2013

Location: Enternational

Respondent: Pablo Delgado, Company Supervisor and Co-founder Enternational

Interviewer: Grace Janssen

1. How can the objectives of Wellness Telecom regarding the eGarbage system best be formulized?
2. What is the most effective way to create strategies out of the confrontation matrix?
3. How can the strategies that aroused from the confrontation matrix be used in the Marketing Mix?

Brainstorm session, Enternational

Date: 12th of June 2013

Location: Enternational

Respondent: Pablo Delgado, Company Supervisor and Co-founder Enternational; Antonio J. Peinado, Co-founder Enternational; Aurore Michelin; Export & Sales Consultant

Interviewer: Grace Janssen

The brainstorm session was about a draft of the confrontation matrix. The strengths, weaknesses, opportunities and threats have been discussed and potential strategies have been created.

External experts

Interview questions, Amiat

Date: 3rd of June 2013

Location: Phone conversation & e-mail contact

Respondent: Anonymous, *External communication employee Amiat*

Interviewer: Grace Janssen

1. Amiat fa tutte le attività di gestioni dei rifiuti? O collabora con altre aziende/partners?
Does Amiat does all the waste management related tasks itself or does it collaborate with other companies and/or partners?

2. La maggioranza della raccolta è stata fatta porta-a-porta o stradale? *Is the majority of the waste collection done door-to-door or are mainly public containers used?*

3. Amiat usa una tecnologia come RFID per misurare quali contenitori devono essere svuotati, o per misurare la quantità di rifiuti prodotti per persona?

Does Amiat use RFID to measure which containers should be emptied or to measure the amount of garbage produced per household?

Interview questions, Câmara Municipal do Porto

Date: 5th of June 2013

Location: E-mail contact

Respondent: Anonymous, Administration Câmara Municipal do Porto

Interviewer: Grace Janssen

1. Which companies and/or public authorities are involved regarding waste collection in Oporto?

2. Is waste collected door-to-door or by means of public containers located at central points in the city? And are the public containers mobile or are they built in the ground?

3. Are RFID sensors or other technologies used to measure the amount of waste per person?

4. How is measured which containers need to be emptied? Is there any technology used, or are all containers emptied on fixed waste collection days?

5. Are there any sensors/RFID used in the door-to-door collection, to measure the amount of waste?

6. In case innovative technologies are used (RFID, WIFI, sensors, GPS, etc), which companies supply these technologies to waste management companies in Oporto?

7. Which companies supply Oporto with (public) containers?

8. Which companies supply Oporto with waste collection trucks?

Appendix D

SWOT Analysis

Strengths	Weaknesses
R&D department well developed	Lack of experience and references eGarbage
Organizational culture; young and dynamic	No brand awareness abroad
Team with international experience	No economy of scale, due to low demand
CRM; good relationships with customers	Lack of financial resources
Award winning product	
Cloud computing department well developed	
Smart Cities department, entirely dedicated to develop products and services for Smart Cities	
Opportunities	Threats
Increasing interest in Smart Cities in Europe	Expanding door-to-door waste collection method
Turin and Oporto are members of EUROCITIES	Increasing competition; development new technologies
Turin and Oporto are participants in the NiCE project	Already existing RFID in waste management, sometimes same usage as eGarbage
Social environmental awareness	Sensitive to vandalism; people can steal the sensors or hardware
Free movement of dual-use items in EU	
Many Ecopoints in Oporto; new public containers for diverse kinds of waste.	

Appendix E

Confrontation Matrix

	Weaknesses				Strengths			
	W1: Lack of experience and references	W2: No brand awareness abroad	W3: No economy of scale	W4: Lack of financial resources	S1: R&D department	S2: Award winning product	S3: Usage of cloud computing	S4: Smart Cities Department
Opportunities	A							
	O1: Increasing interest in Smart Cities							
	O2: Social environmental Awareness	D		E				D
	O3: Ecopoints	Adjust			Offensive			
	O4: Italy and Portugal member EUROCITIES	C						B
Threats	O5: Participant NiCE project	B		H				
	T1: Expanding door-to-door collection method				K			
	T2: Competition	Defensive			Reactive			
	T3: Already existing RFID technology							
	T4: Vandalism							