E-Waste & the Circular Economy: An Irish SME Context

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Abstract. E-waste is a term given to waste generated by electrical and electronic equipment (WEEE). It is one the fastest growing waste streams in the EU, and it is expected to grow to more than 12 million tonnes by 2020. WEEE raises a dual problem for the environment; on the one hand, the composition of WEEE is highly toxic and represents a serious threat to the environment, and on the other, there are precious materials that can be recovered from WEEE; materials that can be used in the production of other goods. Reverse logistics is mainly the backward flow of used products from consumers to producers. Remanufacturing brings the benefits of availability, economics and security, energy savings, and reduction in the need for dirty processes. The estimated value for all manufactured products in the remanufacturing intensive sectors is €1.5 trillion.
The growing problem of E-waste is defined in this research, and the benefits of the services that 'Wisetek', (the company at the core of this research) offer for managing this E-waste issue are outlined. E-waste is a solution for data centres and Wisetek are leaders in the circular economy. Their services include remanufacturing IT equipment and then remarketing to approved buyers. This research study recommends that Wisetek adopt an innovative approach through their strategic decision making to transfer their competencies into the EU. The strong presence that Wisetek have in other key global regions must be enhanced into the European market.
Keywords: E-waste, Circular Economy, Reverse Logistics, Remanufacturing, Data Centres, GDPR.
Keywords: First Keyword, Second Keyword, Third Keyword.

CEUR-WS.org/Vol-2348/paper19.pdf

1 Introduction

Wisetek are IT asset disposal (ITAD), reuse and data destruction services providers. Leaders in the circular economy, their services to clients include global site audits of IT equipment and providing their clients tailored reports. Wisetek's TotalRMA™ web portal provides data centres with secure and easy to use online system, that allows data centre personnel to register redundant product details. Wisetek provide remanufacturing services of IT equipment. This involves dismantling IT equipment and any recovered components are tested. Components that are reusable are then re-marketed to approved buyers, defective or non-usable components are responsibly recycled to the R2 standard (Wisetek.net). This research study is an empirical investigation into the importance of reverse logistics, remanufacturing and electronic recycling in data centres, in particular a focus on the data centre hubs in Germany and The Netherlands. Western

Europe has established a number of technology hubs in major cities including Dublin, London, Amsterdam and Frankfurt, that are growing rapidly. The study examines a range of topical issues in cloud computing and data centres. The issues of remanufacturing and reverse logistics, along with recycling of electronic waste (E-waste) with regard to current legislation, cyber security, corporate social responsibility (CSR) and efficiencies in data centre infrastructure management are investigated. The next section presents the research context and research question.

1.1 1.1 Research Context

The circular economy is perhaps the biggest revolution for the global economy in the last 250 years and is gaining momentum (Timmermans, 2016); in 15 years from now, it could be worth $4.5 trillion. Geissdoerfer et al., (2017) define the Circular Economy as a regenerative system in which resource input, waste emission and energy leakage are minimised by slowing, closing and narrowing material and energy loops. A circular economy requires a transformation of both production and consumption systems; the standard approach for creation, fabrication and commerce of products is challenged (De los Rios and Charnley, 2016). The concept of the circular economy is, to an increasing extent, treated as a solution to a series of challenges, (Lieder and Rashid, 2016) such as waste generation, resource scarcity and sustaining economic benefits. Switching from the current linear model of economy to a circular one, has recently attracted increased attention from major global companies e.g., Google, Unilever, Renault, noted by Lewandowski, (2016) and policymakers attending the World Economic Forum. The reasons for this are very significant financial, social and environmental benefits (Lewandowski, 2016). Reverse logistics, indicating the process of this return flow highlighted by Olariu (2014) encompasses such activities as the movement of returned products, facilities to accommodate returned items and overall remedy process for returned items. The area of reverse logistics has recently received considerable attention, due to a combination of environmental, economic and social factors (Olariu, 2014). Reverse logistics refers to the series of operations as articulated by Alshamsi and Diabat (2015) that initiate at the consumer level with the collection of products and terminate with the re-processing of these products at remanufacturing facilities. Reverse logistics, which is mainly the backward flows of used products from consumers to producers, is an important stage while constructing a recovery system (Alshamsi and Diabat, 2015). A remanufactured component is, by definition, (Robinson, 2014) going to provide the same service as the original, so that the original component or system considerably extends its life, therefore, end-of-life scrapping is postponed. Remanufacturing and refurbishing activities also may be included in the definition of reverse logistics (Robinson, 2014). The development of remanufacturing highlighted by Xiong et al., (2016) in many industries where high-profile manufacturers like Boeing, Caterpillar, General Electric, IBM, Kodak, Volkswagen and Xerox initiate a business model in which remanufacturing is an integral part (Xiong et al., 2016). Remanufacturing makes up a small share of European manufacturing output, accounting for an estimated 1.9 % of total production value in these sectors. The four key regions estimated to account for some 70 % of remanufacturing value in Europe are, Germany, the UK,

Ireland, France and Italy. Germany undertakes most remanufacturing by a significant margin, making up almost a third of the European market (Remanufacturing.eu). E-waste is a term given to waste generated by electrical and electronic equipment (WEEE) (Heacock et al., 2016). This comprises of equipment such as televisions, mobile phones, computers, IT equipment and household appliances. E-waste is produced in staggering quantities, estimated globally to be 41.8 million tonnes in 2014 (Heacock et al., 2016). It is one the fastest growing waste streams in the EU, with some 9 million tonnes generated in 2005 and expected to grow to more than 12 million tonnes by 2020 (Ec.europa.eu). Baldé et al., (2014) note that in Europe, the total E-waste generation was 11.6 million metric tonnes in 2014. The European countries with the highest E-waste generation in absolute quantities are, Germany (1.8 million metric tonnes), The United Kingdom (1.5 million metric tonnes) and France (1.4 million metric tonnes) (Baldé et al., 2014). Recycling for E-waste will be a necessity, not only to address the shortage of mineral resources for the electronics industry, but also to decline the environmental pollution and human health risk (Zeng et al., 2017). The rapid consumption of new electronic devices has expanded the volume of E-waste, Gonul Kochan et al., (2016) and this has created a potential threat to the environment. Recycling of E-waste can help stem the proliferation of E-waste and its environmental threat (Gonul Kochan et al., 2016). In Europe, manual dismantling as a first treatment step has been gradually replaced by mechanical break up of appliances, (Salhofer et al., 2016) followed by sorting out of hazardous and valuable components (Salhofer et al., 2016). Recycling of electronics is good for the environment when done in an appropriate manner as it recovers materials for reuse and reduces waste in landfills (Ceballos and Dong, 2016). Cloud computing has become the next logical step for the IT industry. It's the new strategic weapon in enterprise computing and the new norm in every sector of society. Businesses, educational institutions, governments, community organizations and individuals are looking at cloud offerings to manage information, instead of infrastructure (Bojanova et al., 2013). The cloud computing paradigm has sustained its growth, which has led to increase an in size and the number of data centres. Data centres with thousands of computing devices are deployed as back end to provide cloud services (Shuja et al., 2016). Data centres are physical infrastructures that are used for housing and operating servers, routers, switches and networking systems, along with, storing and processing a large amount of data belong to an organisation (Sapdatacentre.com). These new data centres are the physical manifestation Katz (2009) of what Internet companies are calling cloud computing. The physical environment of data centres are strictly regulated and air conditioning is used to control both the temperature and humidity, Jones et al., (2013) and data centres also have water and smoke detection systems and sprinkler systems. Powerful cooling systems are required to offset the heat produced by the servers and more energy is needed for cooling, than for data storage and processing (Jones et al., 2013). Data centres must provide not only performance guarantees, but reliability ones as well (Wood, 2011). Disaster recovery services attempt to protect applications by continuously replicating to a secondary data centre, that can be switched to, in the event of catastrophic data centre failure (Wood, 2011). The aims of this research study are to provide an analysis of reverse logistics, remanufacturing and electronic recycling in the data centre hubs of Frankfurt and Amsterdam and how likely is

it that the service offerings of Wisetek will fit into these markets in the future. The next section presents the literature review for this research study.

2 Literature Review

2.1 Data Centres

A data centre (or datacentre) is a facility composed of networked computers and storage that businesses or other organizations use (Rouse, 2010). Data centres are described by Flucker and Tozer (2013) as mission critical facilities; they are essential for the business to carry out its mission and hence any interruption in service, downtime or unavailability usually has a significant cost impact (Flucker and Tozer, 2013). The concept of data centres has been around since the late 1950s, when American Airlines and IBM partnered to create a passenger reservations system, automating one of its key business areas (Woods, 2014). Server virtualization technologies first appeared in the 1960s to enable timesharing of expensive hardware between multiple users (Dasgupta et al., 2011). Carcary et al., (2013) note that by 2011, it had become the top technology priority for organizations worldwide to reach $241 billion by 2020. Hao et al., (2010) state that today's large data centres are the computational hubs of the next generation of IT services (Hao et al., 2010). This is disputed by Fulton III (2016) stating that the Internet of Things (IoT) would be a cleverer architecture than a colossal hub-and-spoke topology that testifies to its power to change the landscape of data centres. IoT could, if it continues to develop the way it has, draw more compute, storage and bandwidth power towards the edge away from centralized facilities and closer to where these various streams of data are being gathered (Fulton III, 2016). A data centre typically houses a large number of computing and storage nodes, interconnected by a specially designed network, namely, data centre network (DCN) (Xia et al., 2016). Data centres that house the cloud systems, revealed by Preimesberger (2015) that serve up the apps used on connected devices, are popping up all over the globe and often in cities away from the traditional core markets (Preimesberger, 2015). Yesilyurt and Yalman (2016) suggest that this model has become more desirable for all institutions, organizations and for personal use thanks to the storage of 'valuable information' at low costs, access to such information from anywhere in the world, as well as its ease of use and low cost (Yesilyurt and Yalman, 2016). The proprietary rating system begins with Tier 1 data centres, which are basically warehouses with power and ends with Tier 4 data centres, which offer 2N redundant power and cooling in addition to a 99.99% uptime guarantee (Colocationamerica.com). Arno et al., (2012) state that the Tier classifications provide guidelines and a gradient scale of data centre designs, that can be used in conjunction with reliability engineering to design or evaluate an existing critical facility (Arno et al., 2012).

2.2 Types of Data Centres

Data Centre Hosting is provided by a facility that stores and maintains servers and applications for clients and it can help companies reduce capital expenditures and accelerate the implementation of technology with on-demand services (Cyrusone.com). Guo et al., (2017) outline that colocation data centres who rent out spaces to multiple tenants to house their servers, are another important but under-explored type of data centre (Guo et al., 2017). Masoud et al., (2017) state that internet exchange points (IXPs) emerged to remedy the deficiency of peering connections among autonomous systems (ASes) and play an important role in reducing the cost of transit connections over the Internet (Masoud et al., 2017). It is outlined by Benson et al., (2010) that as data centres become increasingly central in Internet communications, both research and operations communities have begun to explore how to better design and manage them (Benson et al., 2010). Security and privacy of data are some of the most important issues of cloud data services (Tang et al., 2016). It is noted by Silverman (2016) that in November 2015, Target settled with the consumer class for $10 million plus $6.75 million in attorney's fees. In May 2016, it settled with the last third of the issuing banks for nearly $60 million, with just under $20 million in fees and expenses for plaintiffs' counsel following their data breach. Silverman (2016) further notes that Home Depot settled its consumer claims at $19.5 million for damages and prevention plus around $8.5 million in fees and costs (Silverman, 2016).

2.3 E-Waste

As of 2010, the Environmental Protection Agency, according to Dewey (2013) reported that of the 2,440,000 tons of disposed of technology waste which included computers, monitors, hard copy devices, keyboards and mice, televisions, mobile devices and TV peripherals, 1,790,000 tons were sent to landfill and only 649,000 tons, or 27%, was recycled (Dewey, 2013). Rosenfeld and Feng (2011) convey that electronic waste is responsible for 70% of the heavy metals (including mercury and chromium) found in landfills (Rosenfeld and Feng, 2011). In January 2003, the EU issued a directive on E-waste to deal with increasing quantities and the included hazardous components (Favot and Marini, 2013). It is claimed by Peagam et al., (2013) that very little business to business WEEE is reported as collected in the EU in compliance with the WEEE Directive, which uses the policy principle of extended producer responsibility (EPR) to ensure that WEEE is managed correctly (Peagam et al., 2013). A series of reports revealed that such major E-waste flows reach China, India, Pakistan, Ghana and Nigeria, outlined by Kuper and Hojsik (2008) that in these countries, refurbishment and recycling activities are mostly carried out by the informal E-waste sector, which is characterized by poor working conditions with insufficient management of hazardous substances leading to adverse impacts on human health and the environment (Kuper and Hojsik, 2008). As the world’s largest dumping ground for E-waste, much of the population in Guiyu, China is exposed to heavy metals due to informal E-waste recycling processes (Song and Li, 2015). Vick (2016) notes that data centre decommissioning has recently become an evolving function that is more than just IT Asset. Remanufacturing,

by taking back used products, can help firms meet environmental regulations and improve economic benefits (Han et al., 2016). Ruth (2009) concludes that significant new regulations for IT equipment disposal to stringent energy-efficiency specifications for PCs and monitors to national standards for data centre power savings, Green IT is an "in" topic (Ruth, 2009).

2.4 E-Waste Legislation

Abu Bakar and Rahimifard (2008) explain that in Europe, 7.3 million tonnes of WEEE were created in 2002 and the growth rate of WEEE is 3 to 5% per annum, with a significant amount of this waste used to be dumped into landfills without any pre-treatment, has resulted in the introduction of a European WEEE directive (Abu Bakar and Rahimifard, 2008). Manhart (2011) records that in the last decade, electrical and electronic equipment (EEE) such as computers, mobile phones and DVD players, increasingly became mass products in emerging economies and even developing countries (Manhart, 2011).

2.5 IT Asset Disposition (ITAD)

Disposal or Excess Inventory Management (including Remarketing and Consignment), is about closing or merging a data centre without a huge loss to your company's revenue (Vick, 2016). IT asset disposal is getting rid of personal computers, servers and other obsolete or unneeded devices in a secure and environmentally sound manner (Carr, 2007). Haas et al., (2015) outline that the circular economy is a simple, but convincing, strategy, which aims at reducing both input of virgin materials and output of wastes by closing economic and ecological loops of resource flows (Haas et al., 2015). There is a window of opportunity to escape the "dump regime", dumps are being challenged by the circular economy, which has established instability in the "dump regime", (Johansson et al., 2012). Diabat et al., (2013) outline that remanufacturing is the basis of profit-oriented reverse logistics in which recovered products are restored to a marketable condition in order to be resold to the primary or secondary market (Diabat et al., 2013). Paterson et al., (2017) state that remanufacturing is a product recovery strategy resulting in end of life products being returned to as new condition or better and receiving a warranty at least equivalent to the original (Paterson et al., 2017). It is stated by McKeen and Smith (2010) that Total Cost of Ownership (TCO) advocates for a holistic view of IT costs across the enterprise over time, grouped into a series of direct and indirect cost. Knowing the full costs allows organizations to make optimal decisions regarding the enhancement, retirement, renewal and/or replacement of critical IT assets (McKeen and Smith, 2010). Shin et al., (2013) state that conventional data centres, based on wired networks, entail high wiring costs, suffer from performance bottlenecks and have low resilience to network failures (Shin et al., 2013). Saran (2013) outlines that tackling energy efficiency in a datacentre's operations is the main way to limit its carbon footprint and the cooling system is the biggest culprit in terms of inefficiency (Saran, 2013). Hou et al., (2013) conclude that many IT service providers are

in dire need of new servers that can support their applications/services efficiently while keeping the cost of their data centres under control (Hou et al., 2013).

2.6 Frankfurt and Amsterdam Data Centres

The combined material weight of the servers, networks and storage systems in the German data centres is 37,500 tonnes, whereas the total product weight of all terminals comes to 134,300 tonnes (Fichter and Hintemann, 2014). Frankfurt data centres are among the world's most carrier-dense with DE-CIX Frankfurt, the largest Internet exchange point in the world (Equinix.com). DE-CIX Frankfurt, the flagship in a family that includes facilities in New York, Istanbul and Dubai is the No.1 Internet traffic hub on the continent, during peak traffic times, the exchange can move data at a rate equivalent to processing 4 billion emails per second (Hackett, 2015). Telecomworldwire.com claim that Amsterdam is a digital gateway, allowing businesses to reach 80% of Europe within 50 milliseconds (Telecomworldwire.com). Hackett (2015) concludes that geographically situated, between several important digital destinations, Frankfurt, London and Paris, the Amsterdam Internet Exchange serves as one of the biggest traffic routers in the world, channelling roughly 700,000 terabytes a month (Hackett, 2015).

2.7 General Data Protection Regulations (GDPR)

Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data (the "Data Protection Directive" or the "Directive") was adopted as a legislative measure in October 1995 (Carey, 2010). The Federal Data Protection Commissioners (2017) notes that the current European Data Protection Directive will be replaced in May 2018 (Ec.europa.eu). Zhang and Dong (2016) remark that to ensure the security of the outsourced data, data users need to periodically check data integrity (Zhang and Dong, 2016). It is explained by Rasheed (2014) that for many companies the remaining barriers to adopting cloud computing services are related to security and one of these security issues is the lack of auditability for various aspects of security in the cloud computing environment (Rasheed, 2014). That concludes the Literature Review and the next section presents the Methodology for this research study.

3 Methodology

3.1 Case Study Research

Yin (2009: 18) defines a case study as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident", (Yin, 2009: 18). There is a need to clarify and unify the understanding of what is meant by a case study pointed out by Runeson et al., (2012) and how a good case study is conducted and reported (Runeson et al., 2012).

3.2 The Methodology and Strategy for this Research Study

This study was exploratory in nature and after an extensive review of the existing work in the area, in was believed that a post-positivistic approach was the best method that would afford the most integral range of new data to develop new findings for this research study. A qualitative research approach was considered as the best way to accomplish the research objectives outlined earlier in this paper. Given the research objectives and the research question that needed to be addressed, the researchers believed however, that a quantitative approach would not generate the rich quality of data required for this research study, hence, the qualitative path. A thorough review of secondary research through peer review academic journals, books, newspaper articles, industry specific magazines, official government statistics, doctorate dissertations, conference publications and internet websites were undertaken. From this, to create a process of gathering information from the primary sources, semi structure interviews were undertaken. First, five semi structured face to face interviews were undertaken with the board of management of the company at the core of this study – Wisetek, and then, twelve semi-structured face to face interviews with senior executives in data centres who had significant experience in the filed were completed. A pilot interview was conducted first to check for any research issues and to illuminate biased and ensure reliability and validity.

3.3 The Data Collection Process

A list of interviewees was developed that would best provide the primary data results needed to achieve the objectives of this research study. The sample of the interviewees was purposely selected and directed at senior management in relation to their academic qualifications and business experience within data centres specifically. The interviewees were geographically located in the data centre hubs of Frankfurt and Amsterdam and in Boston, Massachauttes in the USA. An interview guide consisting of four questions was prepared for the management of Wisetek to obtain a macroenvironmental overview of the services of Wisetek for data centres and microenvironmental overview of Wisetek. The questions were discussed in detail and then pilot tested with a business advisor in the field. From the results of the pilot test, there was obvious ambiguity in one of the questions that was asked. The questions were then adjusted to allow the participants a clear understanding of how to answer. These researchers then proceeded to carry out the interviews with the management of Wisetek. The same process was followed for the twelve other participants from the data centres. A test was undertaken with an expert in the field to gains insights and to improve the guide. A concluding interview guide of 10 questions was finalised after the pilot process. The researchers believed that these questions were clear and easy to understand and would provide valuable primary data for this research study.

3.4 Data Analysis

There are seven key methods of analysis, four of which are the pattern-based methods of thematic analysis, interpretative phenomenological analysis, grounded theory and pattern-based discourse analysis (Braun, 2013). Coding and categorising are ways of analysing that can be applied to all sorts of data and are not focused on a specific method of data collection as pointed out by (Flick, 2007a). This is not the only way of analysing data, but it is the most prominent one, if the data result comes from interviews, focus groups or observations. The main activities are to search for relevant parts of the data and to analyse them by comparing them with other data and by naming and classifying them (Flick, 2007a). Thematic analysis focuses on the data at hand (Rosenblatt, 2015) rather than demanding a process of repeated analysis, repeated grounds of data gathering and multiple stages of theory development. Flick (2007b) notes that for the design of case study triangulation, similar questions arise as for designs in qualitative research in general. Triangulation can be used in the context of one of the basic designs in qualitative research. You can plan a case study using a variety of data sorts or different methods or theoretical approaches.

4 Main Findings and Discussion

4.1 Competitive Edge

Supporting (Han et al., 2016; Paterson et al., 2017), this current research has found that Wiseteks' services provide a competitive edge for data centres from their quality, efficiency, innovation and customer responsiveness in services of data sanitisation and remanufacturing. This current research has found that 83% of respondents determine that the circular economy and remanufacturing provide a competitive edge to data centres through providing end of life value to the IT assets, converting end of life assets into revenue and decreasing the cost of replacement assets. Similar to Jayaram and Xu (2016) who found that firms that have a closer alignment between external and internal knowledge appear to excel in both quality and efficiency (Jayaram and Xu, 2016).

4.2 Influencers of Change

In support of (Favot and Marini, 2013; Peagam et al., 2013) this current research study has found that the key core influencers of change for data centres are from the changes in technology and legislation. There exists an environment of responsible recycling and of green IT and green computing in companies. This current research has found that 66% of respondents determine that legislation is the key core influencer of change while 33% of respondents believe that with the growth of data centres, scaling, cost reduction and getting value is the key core influencer of change. Seeberger et al., (2016) previously found that the USA is a major producer of E-waste, although its management practice and policy regulation are not sufficient to meet the challenge.

4.3 Exporting of Competency

In line with (Clegg, 2011; Eicher, 2016; Joardar et al., 2014), this current research study has found that the exporting of competency as assessed in Wisetek is through auditing the standards set by Wisetek and the consistency in the facilities in geographic regions. This current research has found that 66% of respondents believe that auditing of facilities is how the exporting of competency is viewed. Hillier (2016) previously outlined that the acquisition of one firm by another is, of course, an investment made under uncertainty and the basic principles of valuation apply. One firm should acquire another only if doing so generates a positive net present value for the acquiring firm (Hillier, 2016).

4.4 Competency Assessment

In line with (Cadle et al., 2014; Gander, 2017; Gębczyńska, 2016), this current research study has found that competency is assessed in Wisetek internally and externally through their critical success factors (CSF's), key performance indicators (KPI's), Lean manufacturing and certification programmes. This research found that 60% of participants believe that Wisetek's competency is assessed through their certification and manufacturing. It has been previously highlighted by Zhang et al., (2016) that Lean Manufacturing has a higher implementation rate than Six Sigma in the logistics industry. This is because process variations, what Six Sigma tackles, are often not a main concern in logistics processes due to the absence of physical transformation (Zhang et al., 2016).

4.5 Understanding of IT Asset Disposition

Supporting (Carr, 2007; Haas et al., 2015; Johansson et al., 2012) this current research has found that IT Asset Disposition is understood as the disposal of switches and servers other unwanted IT equipment from data centres. This current research has found that 100% of respondents in Germany and The Netherlands determine that the IT Assets need to have their data shredded before disposal to eliminate the risk of data breaches. It has been outlined by Lowe (2011) that a critically important part of data lifecycle management is destroying data at the end of a medium's useful life. If this step is overlooked, it can lead to disastrous results. Recommended methods for destroying data on magnetic media are shredding, degaussing, department of defence level data overwrite, smelting and encryption from the beginning (Lowe, 2011).

4.6 The Services Expected from an IT Asset Disposition Services Company

In support of (Tang et al., 2016; Silverman, 2016;) this current research found that services expected from an IT Asset Disposition Services Company are a full service of in house certified data destruction of sensitive equipment containing private and protected data. This current research found that 100% of respondents from Germany and 50% of respondents from The Netherlands believe that destruction of data and handling

of private and protected data is the top priority. It is stated by Salisch and Mayfield (2017) that the financial, operational and reputational damage from a data breach can be enormous and can imperil the very existence of a breached organisation (Salisch and Mayfield, 2017).

4.7 Capital expenditure v running cost expenditure

In support of (Hou et al., 2013; McKeen and Smith, 2010; Saran, 2010), another finding of this current research is the importance of capital expenditure v running cost expenditure in decision making, when evaluating IT Asset purchase provides variable information. This current research has found that 40% of respondents in Germany and 100% of respondents in The Netherlands believe that OPEX and total cost of ownership (TCO) is becoming more important in evaluating IT Assets. According to Gendron (2014) when IT infrastructure are acquired, they are traditionally treated as CAPEX. They are recorded as an asset on the balance sheet and depreciated over time. Buying infrastructure for in-house installation is CAPEX and buying services from a cloud vendor is OPEX. There is a trade-off between CAPEX and OPEX that occurs when moving applications to an external cloud (Gendron, 2014).

4.8 Corporate Social Responsibility

In support of (Dewey, 2013; Favot and Marini, 2013; Rosenfeld and Feng, 2011), this current research found that Green IT is what companies want to be part of. It is outlined by Dalvi-Esfahani et al., (2017) that some suggestions are made to foster and enhance psychological drivers in order to motivate managers to adopt Green IT in organisations, though there is a need to formulate proper strategies and educational methods to reinforce individual factors of decision-makers more towards environmental sustainability (Dalvi-Esfahani et al., 2017).

4.9 Benefits for the Data Centre Market

In support of (Carr, 2007; Johansson et al., 2012), this current research found that the benefits to the data centre market, from and ITAD services company are, that it generates value and provides a competitive advantage to data centres. Contrary to Shin et al., (2013) noting that data centres have performance bottlenecks and have low resilience to network failures. This current research has found that 40% of participants from Germany and 50% of participants from The Netherlands believe that income from the disposal of E-waste is a benefit for the data centre market. It was previously stated by Shuva et al., (2016) that E-waste can be viewed as a resource for metals, as it does not only contain the common metals like iron (Fe), aluminium (Al), lead (Pb) and copper (Cu) but also traces of precious and rare elements such as gold (Au), silver (Ag), tin (Sn), selenium (Se), tellurium (Te), platinum (Pt), palladium (Pd), tantalum (Ta), cobalt (Co) and indium (In). The recovery of these trace elements is vital, not just because it has high commercial values, but also for resource efficiency (Shuva et al., 2016).

4.10 Certification Programme

In line with Peagam et al., (2013) and Ruth (2009) another important finding of the current research is the value of a certification programme. It provides assurance that compliance with regulations is met. This current research has found that 100% of participants from Germany and The Netherlands believe that a certificate programme will motivate and help the industry as long as the certification has meaning and will add value. Renckens (2015) that non-state certification programmes can emerge as a result of both failed or absent governmental regulation and international cooperation, the case of E-waste recycling certification shows that even when an international agreement with widespread membership exists, non-state regulation covering problems dealt with under the agreement can still emerge. Established to be used globally, these programmes do add important elements to existing public E-waste legislation in countries that have ratified the Basel Convention or which have promulgated legislation dealing with collection and take-back of E-waste, hazardous content of electronic devices, or recycling practices (Renckens, 2015).

4.11 Services to build on WEEE

In support of Abu Bakar and Rahimifard (2008) and Manhart (2011), this current research found that 100% of participants from Germany and 50% of participants from The Netherlands believe that services who build on the existing WEEE requirements are to provide transparency and a clearer framework of the regulations along with integrating the certificates with ISO standards. “It has been previously highlighted by Khan et al., (2014) that key players particularly the developing countries, should have a voice in the decision of WEEE management. It is important to have a neutral arena where the solution for WEEE management can be achieved by mutual consultation (Khan et al., 2014).

4.12 Changes and trends in collection targets

Contrary to (Favot and Marini, 2013; Peagam et al., 2013; Ruth, 2009), this current research has found that 60% of participants from Germany and 25% of participants from The Netherlands are aware of focus groups that are working on E-waste legislation and they are unaware of any lobby groups that are dedicated to collection targets. It has been previously stated by Atasu et al., (2016) that the issue of the disposal of waste electrical and electronic equipment (WEEE), firms are frequently unaware of the threats posed by such legislation, poor at anticipating its provisions and effects, and generally not very skilful at representing their interests in the political process (Atasu et al., 2016).

4.13 Data protection for end of life equipment

In support of (Carey, 2010; Ec.europa.eu; Rasheed, 2014; Zhang and Dong, 2016), another important finding of this current research is the stringent controls and rigorous audits of returned material to protect against data breaches. This current research found

that 60% of participants from Germany and 75% of participants from The Netherlands have procedures in place to prevent data breaches of end of life equipment. It is stated by Martin et al., (2017) that transparency and control in a firms' data management practices can suppress the negative effects of customer data vulnerability. Mere access to personal data inflates feelings of violation and reduces trust. The negative effects, as well as spillover vulnerabilities from rival firms' breaches, on firm performance. The severity of the breach hurts the local firm but helps the rival firm (Martin et al., 2017).

4.14 Remanufacturing as a Key Business Driver

In support of (Han et al., 2016; Paterson et al., 2017; Robinson, 2014; Xiong et al., 2016), another important finding of this current research is that remanufacturing is a key business driver. This current research found that 60% of participants from Germany and 25% of participants from The Netherlands believe that remanufacturing is a cost driver that facilitates pricing models. It is stated by Kwak and Kim (2017) that the potential of generating green profits through remanufacturing needs to be supported by optimal pricing and production planning. Potential concerns and barriers to OEM remanufacturing, which include unproven economic profitability and the environmental sustainability of remanufacturing, imbalance between the supply of end-of-life products and demand for remanufactured products and the risk of cannibalizing new product sales (Kwak and Kim, 2017). This concludes the discussion of the main findings. The next section presents the recommendations and final comments.

5 Conclusion

This research study has evaluated Wisetek as an international organisation operating in different key geographic regions. The operational excellence has been the most distinct value associated with the success of the company to date, however, as an international organisation, there are many challenges for Wisetek operating in a global market, with significant competition from other large players. This research study has determined that it is imperative for the future success of Wisetek to expand and enhance its shareholder value. There is an immense opportunity to develop innovative strategies that will enhance the ability for Wisetek to grow in Europe and Wisetek should commence a plan to transfer their competencies into Germany and The Netherlands. The marketing of Wisetek needs to focus on becoming more visual in these geographic regions and not, however, just during times when organisations require their services. The marketing expertise and budgets that larger competitors of Wisetek possess suggests that these competitors will continue to be a visual presence in the target markets and on a global stage. Wisetek cannot underestimate the influence that high profile organisations can have on the market of the country that they are operating in.

6 References

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