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The circular economy in public purchasing: a qualitative research

Nowadays, organisations, especially public organisations, are expected to act in an environmentally friendly way. The circular economy model is a model to do so and that is upcoming. Research about this topic is increasing, the literature about using the circular economy model in purchasing departments has increased a lot the last years. However, until now no research has developed a model to see which purchasing categories are or are not suitable to use in a circular economy model. This study focused on the use of a circular economy model in the public purchasing sector. The goal of this research was to develop a model on how to introduce a circular economy model in public organisations and develop a model in which organisations can find which purchasing categories are and are not suitable for use in a circular economy model. The research question that was answered is:

What are the steps to introduce a circular economy model in public purchasing departments and do public purchasing categories differ in their suitability for use in a circular economy model?

A combination between a literary research and semi-structured in-depth interviews with open questions were performed to find an answer to this research question. Seven different interviews have taken place with seven purchasers experienced with introducing a circular economy model in public organisations. The results show that there are differences between the use of a circular economy model. Public purchasing has to adhere to extra demands which can make the introduction of circular purchasing more difficult. Subsequently, the interviewees named seven steps to implement a circular economy model in public purchasing based on their experience, these steps are compared to change management models and a model was developed which names the steps on how to introduce a circular economy in public purchasing. Furthermore, the analyses of the interviews shows that there are differences between product categories which can make a category suitable for use in a circular economy model or not. The lifespan and market development of a product category can influence the suitability for use in a circular economy model. Products with a short lifespan and well-developed market in this area are most suitable for use in a circular economy model at this moment. A recommendation for further research is made because for this research only seven interviewees were needed. Furthermore, an evaluation of the steps named by the interviewees on how to introduce a model would be recommended to ensure that these really work.

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1. Introducing a circular economy model requires policy changes, this will affect three areas: contract management, purchasing categories and the employees

1.1. This study will focus on the relationship between the introduction of a circular economy model and purchasing categories of public organisations

When a circular economy is introduced in an organisation, a change in policy is needed. The institutional theory focuses on management practices as a product of social pressure, it helps to explain organisational behaviour. This theory has been used to explain why managerial innovations become adopted by organisations or not. According to the institutional theory, social pressure has more influence on the adoption and retention of organisational practices than technical pressure¹. One of these social pressures is the expectation for organisations to change their environmental policies. Environmental issues are seen as more and more important, organisations are expected to act in an environmentally friendly way to reduce the effect of the greenhouse effect. The new 2018 Dutch climate agreement states that in the year 2030 the CO² emissions should be decreased by 49%². The Dutch government is a big supporter of sustainable economic growth, they support this green growth through stimulation of sustainable innovation, this approach is called the Green Deal approach³. This stimulation is realised by removing bottlenecks in legislation and regulations, creating new markets, provide good information and make sure that companies work together the best way possible. By elaborating their sustainable ideas, companies get the possibility to profit from this situation in different ways. They could profit from a better competitive position and bigger export opportunities⁴. To get the most effective implementation of the circular economy it would be necessary change policies. Activities which are desired by society should be promoted and those that do not should be discouraged⁵. If companies redesign their business model to sustainable purchasing, this has different effects^{6,7}: (1) Technological (converge waste into value, buy more renewable and natural products and maximise material and energy efficiency); (2) Social (promote sufficiency, replace ownership for functionality and adopt a stewardship role); (3) Organisational (create more responsibility for society and the environment and develop solutions). Activities which are related to the business model also change in case of a redesign. If a circular economy is introduced into a public organisation, change would also be

¹ See Suddaby, (2013), p. 379

² See Raad, (2018), p. 19

³ See Rijksoverheid, (2015), p. 1

⁴ See Rijksoverheid, (2015), p. 1

⁵ See Stahel, (2016), p. 1

⁶ See Bocken, Short, Rana, & Evans, (2014), p. 48

⁷ See Witjes & Lozano, (2016), p. 40

necessary in the related activities. There are three main areas in a purchasing department that are affected (See Figure I). First is the contract management, these are the contracts that already exist in the current situation in the companies. A redesign of the business model into a circular economy would change the relationship between a supplier and procurer⁸. Some of the article groups are tendered at a European level, changes do need to take place in the contract management of the public organisations to implement a circular economy as efficiently as possible. The second area that is affected by the introduction of a circular economy are the employees. The introduction of the new way of purchasing means that the employees have to adapt to this. The employees thought has to make a shift from one issue to multiple-issue thinking (economic, environmental and social)⁹. Another part of this is the knowledge of the employees on this topic, employees want to be involved in the process and need to support organisational change in order for it to be a success¹⁰. To increase this knowledge, it would be useful to introduce trainings and education. This research however focusses on how a circular economy can be introduced the best and what effect the introduction has on the purchasing categories (See Figure I). Category management helps managing the purchasing spend of an organisation, therefore managers should develop a number of homogeneous purchasing categories¹¹. The effect of the introduction of a circular economy model will be different for different purchasing categories. A number of most common purchasing categories are analysed to find out which of them is suitable, semi-suitable or non-suitable to be purchased using a circular economy purchasing model.

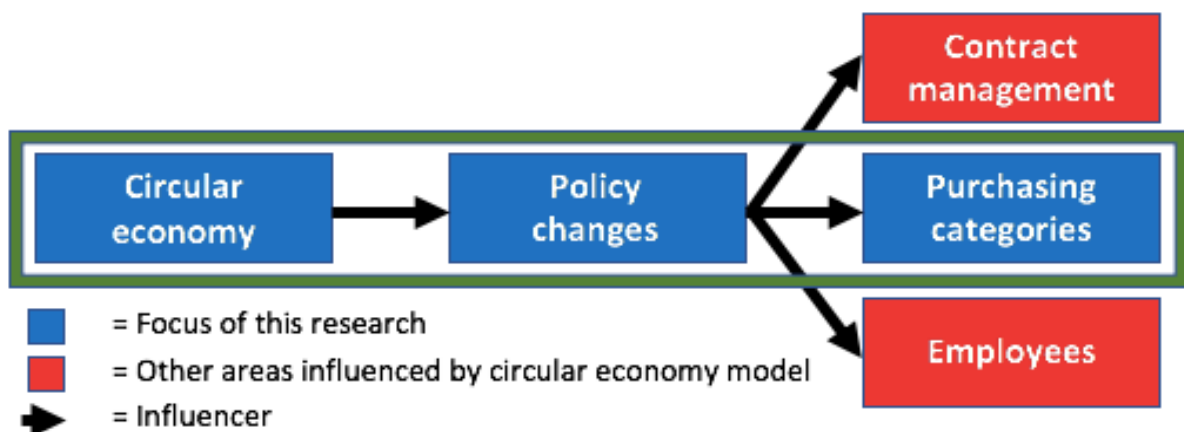


Figure I: Areas affected by the introduction of a circular economy and the scope of this research

⁸ See Witjes & Lozano, (2016), p. 40

⁹ See Witjes & Lozano, (2016), p. 40

¹⁰ See Choi, (2011), p. 480

¹¹ See Husted & Reinecke, (2009), p. 21

1.2. The research will develop an eleven-step circular economy implementation model for public organisations and a framework that guides public organisations on which purchasing categories are suitable or not for use in a circular economy model

Because of all the attention for the environmental problems worldwide and the political attention for this problem, the field of green procurement, sustainable procurement and circular economy is a field in which a lot of research has been performed. Research in the literature databases show that the field of circular economy is a popular research field. The topic has been studied in different ways in multiple countries^{12,13,14}. There are multiple case studies which can be found that study the effect of circular economy for one particular purchasing category, these study the effects of circular economy on building material^{15,16}, ICT^{17,18} and other product categories. There is however still a gap in this research field which has not been researched before. None of the studies in the field of circular economy have studied the different characteristics of product categories that can make a product category suitable, semi-suitable or non-suitable for use in a circular economy model. This research fills this gap by providing the characteristics of the different public purchasing categories which determine the suitability for use in a circular economy model. Furthermore, a new framework will be developed, this framework guides public institutions on which purchasing categories are best suitable for implementation in a circular economy model and which are not yet suitable to be purchased using a circular purchasing model. Next to this, this research will provide an eleven-step model that shows how public organisations can implement a circular economy model. These steps guide public organisations who are planning to introduce a circular economy model. Furthermore, this research will result in an advice to public organisations. This advice will explain how to and for which purchasing categories implementing a circular economy model would be best suitable.

Site visits will take place at organisations who have successfully implemented a circular economy model. The main research question that guides this study is:

1. *What are the steps to introduce a circular economy model in public purchasing departments and do public purchasing categories differ in their suitability for use in a circular economy model?*

¹² See Van Eygen, Laner, & Fellner, (2018), p. 10934

¹³ See Ormazabal, Prieto-Sandoval, Puga-Leal, & Jaca, (2018), p. 157

¹⁴ See Eberhardt, Birgisdóttir, & Birkved, (2018), p. 1

¹⁵ See Sparrevik, Wangen, Fet, & De Boer, (2018,) p. 879

¹⁶ See Lozano-Miralles, Hermoso-Orzáez, Martínez-García, & Rojas-Sola, (2018), p. 1

¹⁷ See Crafoord, Dalhammar, & Milios, (2018), p. 137

¹⁸ See Bovea & Pérez-Belis, (2018), p. 483

This research focusses on the field of public purchasing, that is why first the literature about public and private purchasing will be analysed to find out the differences between introducing a circular economy model in public organisations compared to private organisations. There are research papers about the differences between private purchasing and public purchasing¹⁹, multiple articles have been written about this, among them are Wang and Bunn²⁰ and Thai²¹. Little research however has been performed about the effect of the differences between private and public purchasing on the use of a circular economy model. This research will find out whether public organisations encounter limitations when using a circular economy model. The first research question that will be answered is:

1.1 What are the differences in the use of the circular economy model in the purchasing departments of public and private companies?

Next to this, this research also gives an advice to public organisations on how to introduce a circular economy model in public purchasing. Currently there are initiatives like workshops and consulting firms that can help organisations to introduce a circular economy model. However, there is no roadmap that for public organisations that gives them an overview of the steps they need to take to introduce a circular economy model, next to this the interviewees who are experienced with the introduction of a circular economy model are asked about the mistakes and problems they encountered. The roadmap developed in this research will guide public organisations who plan to introduce a circular economy model. Site visits to organisations who already use a circular economy will be performed to answer the question:

1.2 What are the steps for public organisations to introduce a circular economy in public procurement?

Most organisations do have different purchasing categories, with corresponding purchasing codes. Public organisations can manage their purchasing spend by introducing a spend overview. The information needed to create this overview can mostly not directly be taken out of the internal systems. Managers should therefore create a number of spending categories which are manageable and give a good overview²². These purchasing categories do all have different characteristics, the last sub-question that will be answered tries to find out what the effect of the different characteristics of public purchasing categories is on the suitability of these categories for use in a circular economy model. Since the resources for this research are limited, the most common purchasing categories in public organisations will be researched. These

¹⁹ See Telgen, Harland, & Knight, (2007), p. 16

²⁰ See Wang & Bunn, (2004) p.84

²¹ See Thai, (2001), p. 34

²² See Husted & Reinecke, (2009), p. 21

categories are: office furniture, catering, ICT, company clothing, telecommunication, buildings and transport. These product categories were found at the pianoo website, which provides a list with the general product categories²³. The question that will be answered is:

1.3 Which of the most common purchasing categories of public organisations are suitable, semi-suitable and non-suitable to integrate in a circular economy model?

The goal of this research is to create a matrix including the different characteristics that determine a product categories' suitability for use in a circular economy model. If public organisations decide to implement a circular economy model, this matrix will help them to decide which product categories are suitable, semi-suitable or non-suitable for this model. This matrix will be developed in such a way that all public organisations can use it. The first chapter of this thesis will first start with putting the concept of 'circular economy' in a theoretical framework. The theoretical framework will explain what a circular economy is, where a circular economy originates from and what the impact of implementing this model is. Following a setup of the method will be made, which explains how this research will be executed. Thereafter follows the results chapter, in which the different research questions are answered. This all is concluded in the conclusion and discussion chapter, which presents the final results and limitations of the results. Finally, an advice is written including possible options for further research.

2. A closer look on the circular economy model: the concept was described in 1981 and consists of two groups, promote reuse and extension of service life and turn old goods into as-new resources by recycling.

2.1. Circular economy: goods at their end of use are turned into resources, loops in industrial ecosystems are closed and waste is minimized.

The concept of circular economy grew out of the idea to substitute manpower for energy, this was described in 1981 by Stahel and Reday-Mulvey and has since then been developed to what it is now²⁴. A circular economy turns goods that are at the end of their use into resources for others, closing the loops in the industrial ecosystems and minimizing waste²⁵. In the report: towards the circular economy, by the Ellen MacArthur Foundation, the circular economy is defined as:

²³ See PIANOo, (2018), pp. 1-17

²⁴ See Stahel, (2016), p. 435

²⁵ See MacArthur, (2013), p. 59

*'A circular economy is an industrial system that is restorative by intention and design. In a circular economy, products are designed for ease of reuse, disassembly and refurbishment, or recycling, with the understanding that it is the reuse of vast amounts of material reclaimed from end-of-life products rather than the extraction of resources, that is the foundation of economic growth'.*²⁶

In a circular economy, unlimited resources play a more central role and limited resources play a more supporting role. Minimising the input has to be combined with an innovation in the way people work with the output to increase the effect of introducing a circular economy, e.g. from consuming and discarding to using and reusing products. Owning products is still important for consumers in developing countries, there is however a turn in this trend as consumers are getting more aware about the downside of ownership²⁷. For example, buying products that are used only a few minutes per year or paying insurance for a car that stands still most of its time. New business models, like a 'product-as-a-service' model, allow access instead of ownership, this increases the utilisation of the capacity and efficiency of resource use²⁸.

There are two groups in circular economy: the first promotes reuse and the extension of service life through repairing, remanufacturing, upgrades and retrofits. The second group turns old goods into as-new resources by recycling materials. For both of the groups, people are crucial for the model to work, consumers become users and creators. The circular economy idea is not used a lot yet, because of a lack of familiarity and fear of the unknown. The concept is also new to economists, creating wealth by making things last is the opposite of what they learned in school²⁹. Knowledge about the circular economy is concentrated in big industries and dispersed across small-medium enterprises (SMEs). In order to get more companies to use the concept, it must be brought into academic training. This will make sure that SMEs can hire graduates that have the economic and technical knowledge how to change business models and implement the circular economy to put a change into motion³⁰. A circular economy model arises out of an open-ended system if the relation between resource use and waste residuals is considered. The traditional open-ended model transforming in a circular economy model can be visualised as follows where (P: production, C: consumption, K: capital goods, U: utility, R: natural resources, r: recycling and W: waste)³¹:

²⁶ MacArthur, (2013), p. 14

²⁷ See Planing, (2015), p. 3

²⁸ See Planing, (2015), p. 3

²⁹ See Stahel, (2016), pp. 435-436

³⁰ See Stahel, (2016), p. 436

³¹ See Andersen, (2007), p. 13

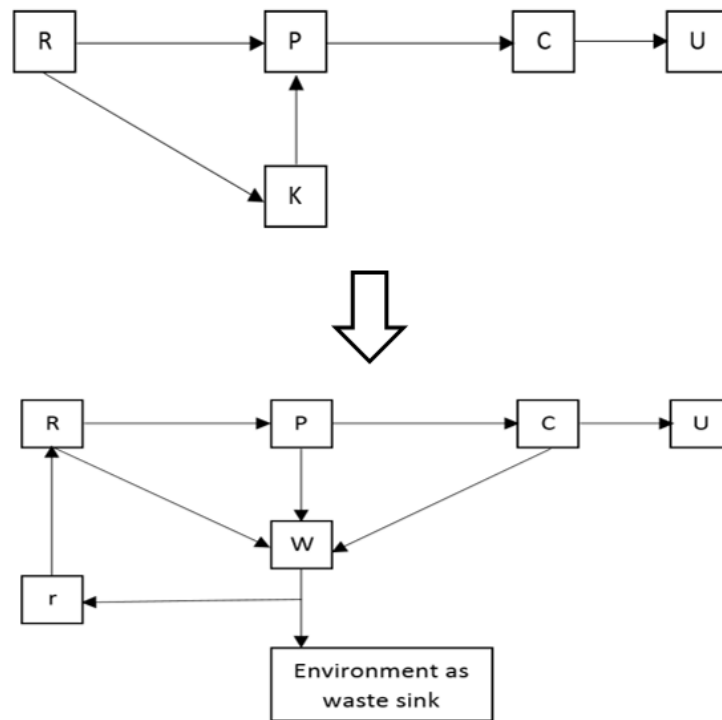


Figure II: The transition from a Conventional open-ended economy into a circular economy

The box ‘r’ in Figure II represents recycling, Figure II shows that waste is partly recycled and is converted back into resources³². If introduced in the business world now, it would change the economic logic. It replaces production with sufficiency: if possible, first reuse, what cannot be reused should be recycled, repair what is broken and remanufacture what cannot be repaired³³. Applying a circular economy model requires careful management of materials flows. There are two types of material flows, on the one hand are the biological nutrients, designed to build natural capital and re-enter the biosphere safely, such as food or wood³⁴. On the other hand, are the technical nutrients, which are designed to circulate at high quality without entering the biosphere, such as a mobile phone³⁵. A clear visualisation of the circular economy and the biological and technical nutrients can be found in Figure III:

³² See Andersen, (2007), p. 134

³³ See Stahel, (2016), p. 435

³⁴ See MacArthur, (2013), pp. 51-52

³⁵ See MacArthur, (2013), pp. 39-40

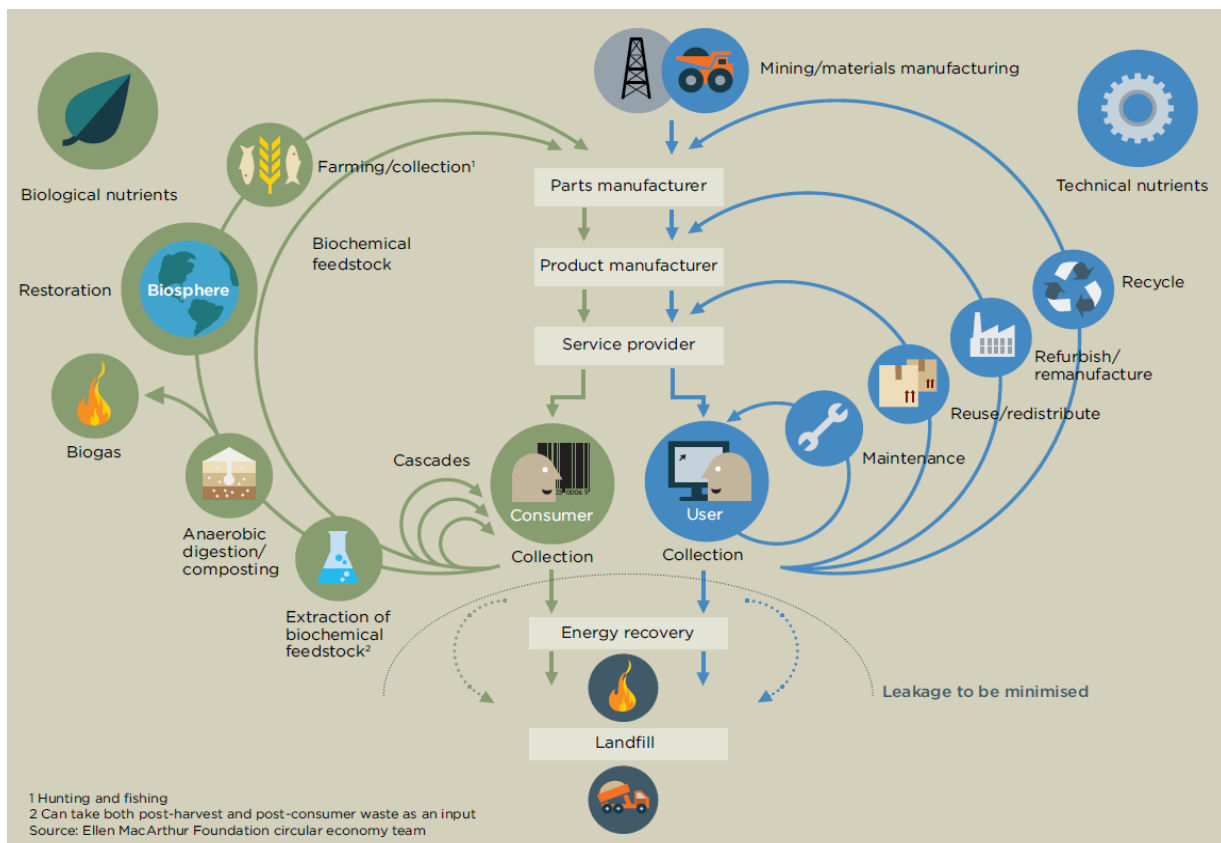


Figure III: The circular economy model described by the Ellen MacArthur foundation

Next to reusing as much resources as possible and creating value out of waste, there also is another form of circular economy. In this form of a circular economy, the focus shifts from selling a product in which the buyer becomes the owner of a product into selling a service, in which the customer only pays for the usage time³⁶. In this case, the provider of the product has the ownership during its whole lifecycle. This makes it possible for the provider to manage the product through design, reuse, maintenance etc. ending with recycling the product. This way the product is sold as a service, leading to this business model called ‘products as a service’. This business model could lead to closer relations with customers, enhanced product development through closer feedback loops and provide both parties with greater business and can contribute in an improved customer satisfaction³⁷.

³⁶ See Tukker, (2004), p. 1

³⁷ See Tukker, (2004), p. 1

To help and support public organisations with introducing sustainable measures like introducing a circular economy, the European Commission (EC) has developed a guideline for organisations on how to incorporate environmental criteria in the public procurement process³⁸. The EU Public Procurement Directive tells procurers to award a contract to the economically most advantageous tender³⁹. If the awarding is based on the most value for money (price-quality wise), quality criteria could also include non-financial criteria like environmental or social oriented criteria⁴⁰. By incorporating socio-cultural specifications such as sustainability criteria in a tender, the concept of sustainable public procurement arises. Closer collaboration between suppliers and procurers is needed shifting the moment of collaboration from the sourcing stage to the preparation stage (beginning of the tender) if socio cultural specifications need to be included.⁴¹ Witjes and Lozano propose an alternative new framework to the linear one, focussing on reducing waste and closing loops trough recovery:

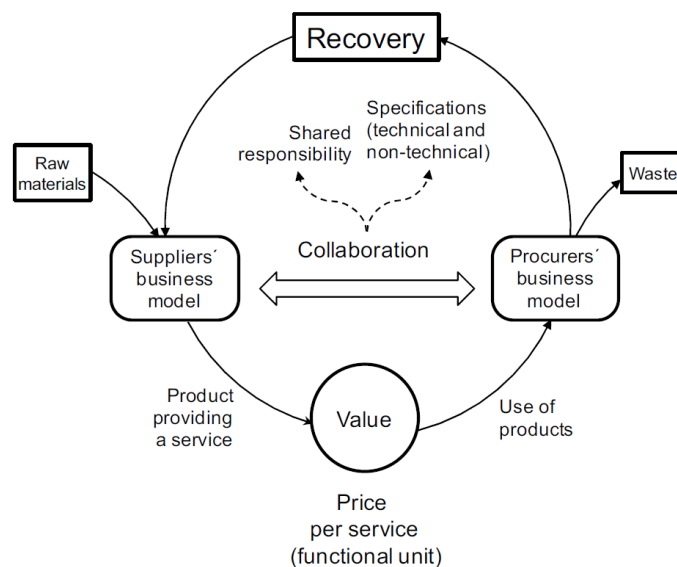


Figure IV: Public circular economy purchasing framework

To ensure a successful implementation of this circular economy framework in public purchasing, the procurer and supplier need to collaborate in establishing the (non-)technical specifications and creating a shared feeling of ownership⁴².

³⁸ See UNEP, UNOPS, ILO, & ILO, (2011), pp. 26-29

³⁹ See Parliament, (2014), p. 1

⁴⁰ See Witjes & Lozano, (2016), p. 39

⁴¹ See Witjes & Lozano, (2016), p. 41

⁴² See Witjes & Lozano, (2016), p. 42

2.2. The loss of resources through a linear resource use model and rise of resource prices by the linear model lead to an increased use of the circular economy model.

During the past decades, Low Carbon Procurement (LCP) has emerged as an important agenda topic for private as well as public companies. The declining resource prices have supported economic growth in advanced economies. The relatively low-price level of resources compared to labour costs has created the wasteful resource system that exists now. The ease of obtaining new materials and the cheap disposal of finished goods led to reusing not being a priority⁴³. This existing system in which companies extract materials, apply energy to them to manufacture a product and sell it to a customer who then discards it in the end, is characterised as a ‘take-make-dispose’ or ‘linear’ model. According to MacArthur, the linear model leads to resource losses via:

1. Waste in the production chain
2. End-of-life waste
3. Energy use
4. Erosion of ecosystem services

These losses of resources led to rising prices of natural resources and volatility of resource prices and this trend is not expected to come to a stop soon⁴⁴. To stop this trend of value loss and negative effects, business leaders are in search of an industrial model that decouples revenue from the material input, this model is called: ‘the circular economy’. There are companies who have already taken the initiative to counter the negative effects of a linear model and the number of companies who do is increasing⁴⁵. However, the implementation of a circular economy still seems to be in the early stages, the focus is still mainly on recycling instead of reusing⁴⁶. As a result of the evolution of climate change and policy changes, companies focus more on reducing their Carbon Footprint⁴⁷. The traditional ‘take-make-dispose’ consumption patterns are facing the constraints on the availability of resources. The circular economy is an important tool to decrease a company’s carbon footprint.

The concept ‘Circular Economy’ origins from different schools of thought. The roots of circular economy are however mainly in ecological and environmental economics and industrial ecology⁴⁸. The first that was mentioned about the predecessor of the circular economy was: ‘a closed system with practically no exchanges of matter with the outside environment’ by

⁴³ See MacArthur, (2013), p. 14

⁴⁴ See MacArthur, (2013), p. 18

⁴⁵ See MacArthur, (2013), p. 20

⁴⁶ See Ghisellini, Cialani, & Ulgiati, (2016), p. 11

⁴⁷ See Correia, Howard, Hawkins, Pye, & Lamming, (2013), p. 62

⁴⁸ See Ghisellini et al., (2016), p. 11

economist Kenneth Boulding in 1966⁴⁹. The concept of circular economy was first introduced by the environmental economists Pearce and Turner⁵⁰, based on previous studies of Boulding. They explained the shift from the traditional open-ended economic system to the circular economic system as a consequence of the law of thermodynamics. A different perspective was introduced with the concept industrial ecology, the industrial system and its environment were analysed as a joint ecosystem⁵¹. In the 1990s scientists spoke about this industrial ecology, which promotes the transition from open to closed cycles of materials^{52,53}. In the 2000s Finkbeiner wrote about the threats and opportunities of carbon foot printing and life cycle impact⁵⁴ and Iung and Levrat note that the circular economy builds on industrial ecologies concepts for the analysis of industrial systems operation and optimization⁵⁵. In order to maximize the value of resources with the ambition to decouple economic growth and resource use, a redesign of products and processes takes place⁵⁶. A circular economy can best be implemented in a mature economy because these are capable of decoupling economy from environment⁵⁷. Lately, the Ellen MacArthur Foundation contributed importantly to the further refinement and development of the concept circular economy to what it is now⁵⁸.

2.2.1. The circular economy is based on five principles: design out waste, build resilience trough diversity, relay on energy from renewable sources, think in ‘systems’ and waste is food. The impact of a circular economy model can be measured using the four levers of the Ellen MacArthur foundation or the 10R model by Cramer.

The Ellen MacArthur Foundation is a foundation established in 2010, their mission is to accelerate the transition towards a circular economy⁵⁹. They state that there are five principles on which a circular economy is based⁶⁰:

- Design out waste: by designing the biological and technical nutrients of a product to fit within a biological or technical material cycle and by designing them for disassembly and refurbishment, waste does not exist.

⁴⁹ See Boulding, (1966), p. 5

⁵⁰ See Pearce & Turner, (1990), p. 66

⁵¹ See Erkman, (1997), p. 1

⁵² See Erkman, (1997), p. 5

⁵³ See Frosch, (1992), p. 801

⁵⁴ See Finkbeiner, (2009), p. 92

⁵⁵ See Iung & Levrat, (2014), p. 16

⁵⁶ See Sidney, (2015), p. 1

⁵⁷ See Zhu & Wu, (2007), p. 5

⁵⁸ See Ghisellini et al., (2016), p. 15

⁵⁹ See MacArthur, (2018) p. 1

⁶⁰ See MacArthur, (2013), pp. 22-25

- Build resilience through diversity: in an uncertain and fast evolving world, features as modularity, versatility, and adaptivity need to be prioritised. Systems which are diverse and have many connections and scales are more resilient in case of external shocks.
- Rely on energy from renewable sources: in a circular system, the aim should be to run on renewable resources. Starting a circular model should start by looking into the energy involved in the production process.
- Think in 'systems': it is crucial to understand how parts influence one another and how the relationship is of the whole to the parts. These parts are considered in their relationship with the infrastructure, environment, and social context.
- Waste is food: products and materials are reintroduced into the biosphere through non-toxic, restorative loops on the biological nutrient side. On the technical nutrient side, upcycling makes it possible to improve quality.

When a company wants to introduce a circular economy model, they should keep these five principles in mind. By applying these five principles in the organisation a circular economy model can be created. If a company applies a circular economy model, value is created in four different ways. According to the MacArthur foundation, applying a circular economy leads to the following levers for value creation⁶¹:

- Power of the inner circle: in general, tighter circles lead to larger savings. Inefficiencies along the linear supply chain lead to tighter circles benefiting from a comparatively higher material substitution effect.
- Power of circling longer: in a circular economy, products, components, and materials are kept in use for a longer period. This prolongation can be achieved by going through more consecutive cycles or spending more time within a cycle. It will substitute virgin material inflows to counter dissipation of material out of the economy.
- Power of cascaded use and inbound material/product substitution: another opportunity is the cascading of products, components or materials across different product categories. The potential for value creation comes from the lower marginal costs of reusing the cascading material as a substitute for virgin material.
- Power of pure, non-toxic, or at least easier-to-separate inputs and designs: improvements in the original design of products can lead to scale economies and efficiency gains in the reverse cycle. These improvements translate into further reductions of the comparative costs of the reserve cycle while maintaining nutrients at higher quality throughout the cycles.

⁶¹ See MacArthur, (2013), pp. 30-31

In order to get another view of the term ‘circular economy’ and its impact, Prof. dr. Jacqueline Cramer from the university of Utrecht has developed a model which consists of 10 different levels of circularity⁶². This 10R model (Figure V) has different steps, of which the highest steps have the biggest impact and are most desirable from a resource saving view.

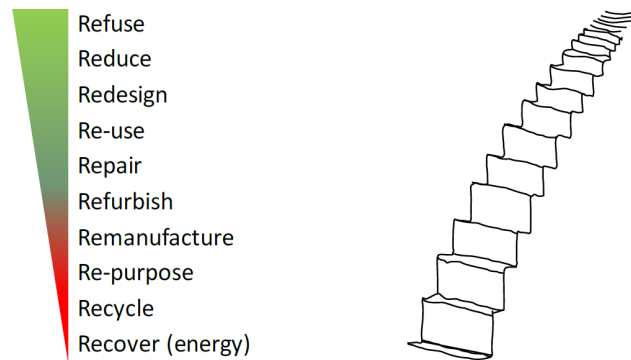


Figure V: Model 10 R's of circular economy from high (refuse) to low (recover) impact

The first steps are to economically use resources (refuse and reduce), the next step is to redesign and reuse (redesign, reuse, repair, refurbish, remanufacture, repurpose), thereafter is the recycling (recycle) and the last step is to recover energy from burning the waste (recover). In order to move the economy to the circular economy and to gain the societal benefits, policy measures are required. An important point will be the way people see a circular economy, it should not be seen as an environmental issue alone, but as an integral part of jobs and competitiveness strategies. Another point is that most strategies now are focused on energy use. The general level of resource use is seldom considered, in spite of the fact that using products longer and from enhanced rates of recycling and reuse leads to benefits for the climate⁶³. In addition to the reframing of the understanding of circular economy, a change in policy is also necessary for better adoption. Support systems for renewable energy, energy efficiency standards, targets for recycling of materials, etc. do already exist, but need to be strengthened. The public procurement needs to be more proactive, favouring investments which are more efficient in resource use. Awarding more ‘green’ public contracts can be realised through setting and including green requirements^{64, 65}. Taxation is another way to promote a circular economy, taxes on work should be lowered and taxes on the consumption of non-renewable resources should be increased⁶⁶. This tax shift would accelerate the transition to a circular

⁶² See Cramer, (2017), p. 8

⁶³ See Wijkman & Skånberg, (2017), pp. 8-9

⁶⁴ See Ghisellini et al., (2016), p. 19

⁶⁵ See Union, (2010), pp. 3-4

⁶⁶ See Wijkman & Skånberg, (2017), p. 9

economy because a circular economy is by definition more labour-intensive than a disposal economy. Consumption of non-renewable resources should be taxed more, and consumption of renewable resources should not⁶⁷. Maintain, upgrade and remanufacturing what already has been produced is more labour intensive than mining and manufacturing.

2.3. Propositions were drawn up based on literature research of differences between private and public purchasing, change management models and product category literature.

2.3.1. External demands, internal demands, contextual demands, processual demands and a different role are the extra demands which can make implementing a circular economy in public purchasing more complicated.

It is known and accepted that public procurement is different from private procurement, even though there are similarities between them⁶⁸. There are good reasons to strive for the best deal in obtaining goods and services in both public and private sector procurement⁶⁹. To get an answer to the question about the differences between the use of a circular purchasing model in the public and private sector, first a literature review was performed.

Economic, social and other objectives can be achieved by using public procurement as an important tool^{70,71}. These public-sector buyers are however more forced by regulation to use public tenders and open auctions to procure goods⁷². These auctions have free entry which invites all kind of suppliers, resulting in a fair market price. The open structure in public procurement is also known for its transparency, resulting in easier corruption prevention⁷³. On top of that, the EU has set thresholds for public purchasers, if they exceed the amount of the threshold, they are obliged to use electronic commerce technologies for the tender process⁷⁴. In the paper: 'public procurement in perspective', Telgen, Harland and Knight have combined the existing literature about the differences between private and public purchasing to find out the additional demands that public procurement has compared to private purchasing⁷⁵. According to Telgen et al., there are five groups of extra demands which public procurement has to meet. These groups are: external demands, internal demands, contextual demands, the processual demands and the demand that public purchasing has multiple roles. All these extra demands

⁶⁷ See Stahel, (2016), p. 1

⁶⁸ See Thai, (2001), p. 34

⁶⁹ See Telgen et al., (2007), p. 16

⁷⁰ See Arrowsmith, Linarelli, & Wallace, (2000), p. 310

⁷¹ See Thai, (2001), p. 25

⁷² See Rijksoverheid, (2016), p. 1

⁷³ See Tadelis, (2012), p. 297

⁷⁴ See Cousins & Lamming, (2008), pp. 232-233

⁷⁵ See Telgen et al., (2007), pp. 17-19

come on top the demands that are already present for private procurement, this makes that it can be said that public procurement is more complicated to carry out⁷⁶. Table I shows the five forms of extra demands that public procurement has to adhere to and which can make public purchasing more complex.

External demand	Effect
Transparency	In public purchasing, organisations who want to do a tender have to be transparent, all participants should be able to understand the means and processes and should have equal opportunities.
Integrity	The public sector should do what they promise, avoiding corruption and fraudulent practices.
Accountability	Public procurement and their officers must be accountable for the way they conduct procurement.
Exemplary behaviour	Public procurement is expected to set an example, not only ethical but also in efficiency and effectiveness.
Internal demand	Effect
Many goals	Instead of making profit, public organisations have to serve many goals at the same time. Next to internal economic goals public organisations are also supposed to fulfil the general public good with other goals
Political goals	In public purchasing, political goals have to be considered. Political goals can be broad and have many possible explanations. Political goals can also change during the years
Many stakeholders	Public procurement has to consider that they have many stakeholders, these stakeholders can all have different objectives
Contextual demand	Effect
Budget driven	Public procurers have to consider that they are budget driven. Changing the budget or overspending this budget requires major changes within the organisation.
Open budget	The buyer-supplier relationship changes because the budgets of public organisations are open. General public and also supplier usually have access to the budgets

⁷⁶ See Telgen et al., (2007), p. 16

Mutually dependent budgets	Employees in the public sector have to consider that departments or layers of government have to work with mutually dependent budgets.
Public interests	Employees of public organisations are often concerned with public interests which causes a more risk adverse cultural setting and decision-making to take longer.
Processual demand	Effect
Rules and regulations	Public purchasing departments have to adhere to the rules and regulations of the European tender law. These rules and regulations can also be cumulative or mutually contradictory or elusive.
Long-term relationship	Because of these rules and regulations in public procurement, it is difficult to create a long-term relationship with suppliers.
Cooperation	Cooperation with other public entities is allowed. Anti-trust laws need to be respected, but if this requirement is fulfilled, there are no legal or commercial reasons against cooperation.
Role	Effect
Large buyer	Most of public organisations are large buyers, they buy for their own organisation but also for the citizens they serve.
Reciprocity	The goods and services are bought from suppliers that are citizens/taxpayers/electorate as well. This buying from a supplier that is buying from you is close to the concept of reciprocity. Additional demands on the buyer-supplier interaction are needed in this complicated relationship.
Determines rules and regulations	To some extent, the public sector determines the rules and regulations it has to adhere to. The control and auditing of these rules is also done by a part of the public sector, meaning that the public sector is a player, decision maker on the rules and also referee.

Table I: Additional demands for public purchasing according to Telgen et al. explained

The extra requirements and demands in public procurement, like the obligation to use an electronic tender process, could make it more difficult for public organisations to implement a circular economy model. As companies are told to award contracts to the most economically advantageous tender, they do not have the free choice to choose a company that scores the best

on environmental or circular economy criteria. This problem could partly be solved by incorporating socio-cultural criteria into the awarding criteria. However, public companies are still not allowed to base their choice of supplier on these non-financial criteria only, which could mean that implementing a circular economy could be restricted. As purchasers in a public organisation are not allowed to just choose their preferred (most circular) supplier, this could mean more effort has to be put in to getting a supplier that uses a circular economy model. The difference between using a circular economy model in public and private purchasing, therefore leads to the following proposition:

Proposition 1. Public purchasing has to adhere to multiple extra demands compared to private purchasing, which means that implementing a circular economy model in a public organisation is more complicated than in a private organisation.

2.3.2. The steps of introducing a circular economy model are probably the same as the steps in three leading change management models, also purchasing categories differ in their suitability for use in a circular economy model.

Introducing a circular economy model into your organisation means that a new innovation is being implemented. If a company wants to introduce this innovation within the organisation, it should take several steps to make sure this process goes as smooth and efficient as possible. Change management models have been developed as a guidance for managers to perform organisational change processes⁷⁷. There are three models that are well known in change management literature that support organisations which undergo changes⁷⁸. The first model is Kotter's eight-step model for transforming organisations, in which the key phases in the change process are named⁷⁹. According to Kotter, there are eight steps that play a key role in producing useful change, these are⁸⁰:

- | | |
|---|---------------------------------------|
| 1. Create a sense of urgency | 5. Enable action by removing barriers |
| 2. Build a guiding coalition | 6. Generate short-term wins |
| 3. Form strategic visions and initiatives | 7. Sustain acceleration |
| 4. Enlist a volunteer army | 8. Institute change |

The second change model is the 10-step model by Jick⁸¹, in this model a blueprint is given to organisations who are planning to perform a change, the following steps are named:⁸²

⁷⁷ See Mento, Jones, & Dirndorfer, (2002), p. 45

⁷⁸ See Mento et al., (2002), p. 45

⁷⁹ See Kotter, (1995), p. 61

⁸⁰ See Kotter, (1995), p. 61

⁸¹ See Jick & Peiperl, (1993), p. 195

⁸² See Mento et al., (2002), p. 46

- | | |
|---|---|
| 1. Analyse the organisation and the need for change | 6. Line up political sponsorship |
| 2. Create a shared vision and common direction | 7. Craft an implementation plan |
| 3. Separate from the past | 8. Develop enabling structures |
| 4. Create a sense of urgency | 9. Communicate, involve people, and be honest |
| 5. Support a strong leader role | 10. Reinforce and institutionalise the change |

The third and last model in change management is the 7-step change acceleration process model by Garvin⁸³. The model helps leaders to create urgency for the change, and how to measure the progress of the change, the following steps are named:⁸⁴

- | | |
|---------------------------|-----------------------------------|
| 1. Leading change | 5. Making change last |
| 2. Creating a shared need | 6. Monitoring progress |
| 3. Shaping a vision | 7. Changing systems and structure |
| 4. Mobilizing commitment | |

These models show different steps that organisations should take to implement a change, implementing a circular economy model also requires a change in policy and change management steps. Because these models are leading in change management literature, the steps needed to implement the change of introducing a circular economy model can probably be based on these change management models. Not every change process however is the same, there are probably some steps in introducing a circular economy model which are specifically applicable to this particular change process. Subsequently, following proposition can be made: **Proposition 2:** The steps for implementing a circular economy model can partly be based on the steps used in the most used change management models, some steps however are only applicable to introducing a circular economy model.

Professional public purchasing does have category management and different purchasing categories. Public organisations can manage their purchasing spend by introducing a spend overview. The information needed to create this overview can mostly not directly be taken out of the internal systems⁸⁵. Managers should therefore create a number of spending categories which are manageable and give a good overview⁸⁶. In public purchasing, each category of spend requires its own sourcing and bidding strategy⁸⁷. Purchasing departments should design

⁸³ See Garvin, (2003), p. 131

⁸⁴ See Mento et al., (2002), p. 46

⁸⁵ See Husted & Reinecke, (2009), p. 21

⁸⁶ See Husted & Reinecke, (2009), p. 21

⁸⁷ See Husted & Reinecke, (2009), p. 22

strategies per category and take elements into account that are specifically applicable for these categories⁸⁸. To make sure this research is applicable to as much public organisations as possible, six of the most used product categories in public purchasing were chosen, these categories are applicable for almost all public organisations. The first category is office furniture, this category consists of the desks, office chairs and cabinets. The second category is catering, this category consist of food and drinks, also coffee cups is a big part in the catering category. Third is the category ICT, all ICT like computers, laptops and printers are part of this category. Company clothing is the fourth category, all clothing that is needed for public companies is part of this category. Fifth is the category telecommunication, this category consists of mobile phones and other telecommunication devices. Lastly is the category building, new buildings but also renovations are part of this category. These categories are some of the most applicable for public organisations. These product categories do have different characteristics. One of these characteristics can be complexity, products that are complex and important for organisations require a different strategy than products which are non-complex, and which are not important for the organisation⁸⁹. Also, competitiveness of the market can differ the way how products are purchased, products which have a very competitive market are purchased in a different way compared to products which can be found in a monopoly market⁹⁰. The differences in how they are bought can also lead to differences in how these products are bought on a circular basis. Based on the fact that product categories do have characteristics which can differ from each other and that these characteristics can influence the way how products are purchased, this last proposition was made:

Proposition 3. There is a difference in the suitability of implementing a circular economy in different purchasing categories, because of their characteristics.

3. This research was executed for Saxion school for applied sciences and was executed by performing a literature analysis and by performing seven different site visits performing in-depth semi structured interviews.

3.1. Saxion school of applied sciences: a public organisation which has spoken out the ambition to implement a circular economy model in their purchasing department.

To get an answer to the research question, this qualitative research was executed. The study did take place at the purchasing department of Saxion (location Enschede/Deventer), this is a school of applied sciences in the Netherlands. This organisation is specifically suitable for this study

⁸⁸ See Husted & Reinecke, (2009), p. 22

⁸⁹ See Kraljic, (1983), p. 112

⁹⁰ See Kraljic, (1983), p. 112

because it is a public organisation which does not use a circular economy model yet. Next to this is that the head of the purchasing department spoke out the ambition to create a total circular economy at the purchasing department of the location in Deventer. The main ambition is to create a total circular economy at all Saxion's locations. Saxion spoke out this ambition because they have noticed that circular economy and sustainability get more and more important in the public sector. To make sure students chose Saxion as their future school, Saxion's wants to show how they are working on sustainability and circular economy. Next to this Saxion feels like they have to work on introducing this model because they have a public role and as a public institution, they should give a good example to the society. To get closer to this ambition, the head of purchasing would like to know how his department can introduce the circular economy and for which product categories the introduction is suitable and for which not. Currently there are 26.000 students who follow their education at Saxion, national as well as international students. The total number of employees is 2812 (2149 FTE), of which 1701 (1308 FTE) are teaching staff and 1111 (841 FTE) are supporting staff⁹¹. There are 173 employees who can do orders, divided over three locations in the cities of Enschede, Deventer and Apeldoorn. The total number of orders is 12.263 per year, the main purchasing takes place in the non-critical part of the Kraljic Model. The Kraljic Model classifies supply items in four different stages based on two characteristics, profit impact and supply risk⁹². Kraljic defines profit impact as: 'the volume purchased, percentage of total purchase cost, or impact on product quality or business growth'⁹³. The supply risk can be defined in terms of: 'availability, number of suppliers, competitive demand, make-or-buy opportunities, and storage risk and substitution possibilities'⁹⁴. The categories in which the supply items can be found are: strategic items (high profit impact, high supply risk), bottleneck items (low profit impact, high supply risk), leverage items (high profit impact, low supply risk) and noncritical items (low profit impact, low supply risk)⁹⁵. 90% of the orders at Saxion have a value less than €5000, -⁹⁶, which is a logic consequence, as Saxion's biggest part of purchasing takes place in the routine quadrant of the Kraljic model. It is also known that this division of orders is often seen in public companies.

⁹¹ See Saxion, (2017), p. 1

⁹² See Kraljic, (1983), p. 112

⁹³ Kraljic, (1983), p. 112

⁹⁴ Kraljic, (1983), p. 112

⁹⁵ See Kraljic, (1983), p. 112

⁹⁶ See Grashof, (2017), p. 8

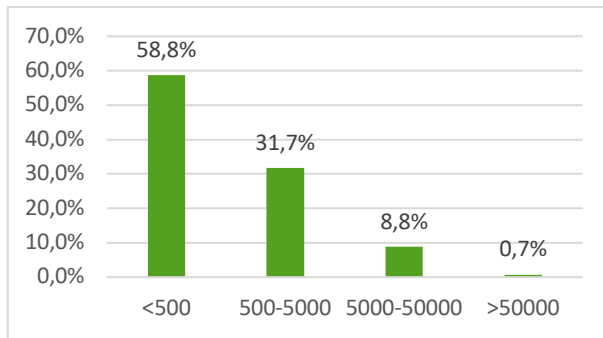


Figure VI: Order division in (€) at Saxion school for applied sciences

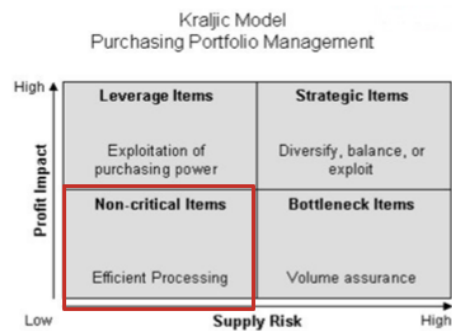


Figure VII: Public purchasing: biggest purchasing category

3.1.1. The current purchasing department at Saxion has three different sub-departments: contract management, operational purchasing and tactical purchasing each performing their own tasks

Currently, the purchasing department has a spend of €65,5 million and consists of 10 employees managed by the head of purchasing⁹⁷. The department is divided in three different sub-departments: team contract management (4 employees, of which one also does tactical purchasing), team operational purchasing (4 employees) and team tactical purchasing (3 employees). They are managed by the head of purchasing, who also is a member of the management team. The head of purchasing is also responsible for incoming goods and logistics and printing and post services. The purchasing department has drawn up the following mission: ‘As an expert in the area of purchasing and contract management we facilitate in an unburdening and efficient way the purchasing needs of and for our customers (students and employees), with the goal to secure the legality and increase the efficiency’⁹⁸. They work according to four core values: unburdening, professional, trustworthy and innovative.

Saxion has introduced their ‘contract management 2.0’ one year ago. Currently Saxion has four contract managers who all have different suppliers for whom they are the responsible contract manager. At Saxion, suppliers are divided into A, B and C suppliers. A-suppliers are the key suppliers and most important, B suppliers are less important than A, but still need attention and C suppliers are the less important and are managed by the order desk under supervision of the contract managers. The contract management is still in a basic phase, and in development. There are three focus points on which the focus is on: creating structure, creating focus and being in an expert role.

⁹⁷ See Grashof, (2017), p. 5

⁹⁸ Inkoop-en beleidsplan Saxion P 21

The order desk of Saxion is a supporting service to all the 180 employees who can make an order at Saxion. During working days, they are constantly available for buyers to answer questions via phone or email. For some widely used suppliers, the order desk has created catalogues in consultation with the supplier. In these catalogues, all products that can be bought at that specific supplier are available and have a fixed price. These orders directly go to the supplier without intervention of the order desk. The order does go by the order desk in case of a new supplier that is requested by one of the buyers. The order desk does a check to make sure there is no supplier in the current system that can deliver the requested service/product. If there is no suitable supplier in the current system, the request for a new supplier will be checked and accepted or not. If a product or service has been delivered, the buyer has to book the order to make sure the invoice goes to the financial administration, where the order is matched to the invoice. If this match is correct, the invoice can be paid. By supporting the buyers in their decision on where to buy products/services, the order desk hopes to decrease the number of unique suppliers. If more orders are made at the same supplier, better agreements on price, delivery etc. can be made, eventually leading to savings.

The tactical purchasing at Saxion is responsible for all European tenders at Saxion school for applied science. All big tenders with a value above € 30,000, - are performed by the tactical purchasers. This team consists of 3 tactical purchasers and the head of purchasing. The tenders are performed using a tender calendar. In this calendar, the planning of the coming tenders is displayed. The order of this calendar is used to perform the different tenders. The tactical purchasers are also responsible for the negotiated contracting or limited tendering.

3.2. Participants in the research are experienced with circular tenders and have a position at a purchasing department.

This research has been executed for the purchasing department of Saxion school for applied sciences. The head of purchasing, and employees of each sub-department of the purchasing department were interviewed to get an overview of the purchasing processes at Saxion. Other organisations were visited to find out what the steps of introducing a circular economy in the public purchasing sector is. These organisations were selected based on their use of a circular economy model in their purchasing process. Subsequently, the employees who are responsible for introducing a circular economy model of these companies were questioned in order to find out what steps they took to introduce a circular economy in procurement and what these organisations gain from using a circular economy model. Before the interview took place, the interviewee has to sign an informed consent. With the informed consent the interviewee gave his/her permission to record the interview and use the results for this research. If an interviewee

had not given permission for the recording, the interview would be typed down in word to get the information needed.

The first inclusion criterion was that participants in this study had to be experienced with circular tenders, they had to be a part of at least one circular tender. Another inclusion criterion was that the participant had a position in purchasing or was closely connected with this department and were responsible for the circular purchasing at their company. The interviewee also still had to be active in the company that uses the circular economy model. A last criterion was that the interviewee should at least have reached the adult age of 18 years old. Participants were excluded from the sample if they had a plan for circular purchasing but did not start yet or when they did work in the world of circular economy but not in the field of purchasing. Furthermore, for the third sub question, purchasing categories that can be seen as a service, like consulting companies and hiring of external personnel were excluded as they cannot be bought circular, they can only be bought from organisations that have a more circular business model.

3.3. Data was collected via in depth semi-structured interviews to get as much information as needed, a method of theoretical saturation was used to make sure enough information was collected.

The first part of this research answers the question about the differences between using the circular economy model in public purchasing departments and private purchasing departments. To answer this question, a literature review of the relevant articles on this topic was performed. This literature review took place in the first weeks of the research, because, the steps to take to introduce a circular economy model in public companies was also partly be based on this literature review. The other part was based on site visits of companies who did already start implementing a circular economy. These site visits took place at other organisations and companies in the Netherlands. A number of site visits were performed. During this site visits, interviews were executed with the persons responsible for circular tenders at those organisations. A method with interviews was preferred in this research because it gives as much data as possible. Interviews were preferred above the other qualitative research methods because of the limited resources of this research. Focus groups require a number of participants to discuss a topic, for this research this method however was no possibility because of the limited time and number of available participants. The other qualitative research methods of participating observations and ethnographic research are not applicable for this research

because these require observation and interviews during the process⁹⁹. The introduction of the circular economy model at the visited companies did already take place in the past, so this cannot be observed anymore. With these methods the current way of working can be researched which is not needed in this research. In the Delphi method a researcher defines a problem which is send to the participants who then answer with their view on the topic. For this research however, this would not lead to the results required because the topic will not be questioned deep enough, and this research has too little participants¹⁰⁰. Furthermore, the limited number of participants in this research make in-depth interviews the most suitable research method because it will lead to the most information.

Researchers can learn about the world of others via interviews, while the real understanding may be elusive¹⁰¹. A well-planned interview however can result in a rich set of data. To ensure the collected data is useful for the research, the interviewer must develop as much expertise in the topic as possible, this makes sure the interviewer can ask well informed questions¹⁰². Rubin and Rubin name that interviewing requires: *'a respect for and curiosity about what people say, and a systematic effort to really hear and understand what people tell you'*.¹⁰³ In other methods like a survey, questions are more closed, and the researcher gets less information about the perspective of the respondent. Interviews give an interviewee the possibility to share a lot of information and tell a lot about their opinion or experiences about the topic of the interview. The most common qualitative research method is the semi-structured interview¹⁰⁴. This type of interviews has prepared questioning guided by themes. It is structured in a consistent and systematic way, interposed with silences to elicit more elaborate answers¹⁰⁵. This interview method is popular because of its flexibility, accessibility, intelligibility and most important its capability of disclosing important and hidden information¹⁰⁶. To get as much as information needed from these interviews, they were semi-structured in-depth with open questions. This method was chosen because it is the most effective and convenient for information gathering¹⁰⁷, the basis which lies in human conversation allows the interviewer to modify the style, pace and ordering of questions to receive the most elaborate answers. Also, it allows the interviewee to answer in their own words and language¹⁰⁸. It is important that both

⁹⁹ See LeCompte & Schensul, (1999) p.2

¹⁰⁰ See Linstone & Turoff, (1975) pp. 5-6

¹⁰¹ See Qu & Dumay, (2011), p. 239

¹⁰² See Qu & Dumay, (2011), p. 239

¹⁰³ Rubin & Rubin, (1995), p. 17

¹⁰⁴ See Alvesson & Deetz, (2000), p. 194

¹⁰⁵ See Qu & Dumay, (2011), p. 246

¹⁰⁶ See Qu & Dumay, (2011), p. 246

¹⁰⁷ See Kvale & Brinkmann, (2009), p. 124

¹⁰⁸ See Qu & Dumay, (2011), p. 246

the interviewer and interviewee participate in the interview, both producing questions while talking¹⁰⁹.

The interview-questions can be found in appendix A8.1 and are the same for all interviewees. The interview questions were created in such a way that by asking them, the research questions could be answered. The literature and the propositions that followed out of the literature were the basis on which the interview questions were based. Using these interview questions the researcher made sure that the research questions could be answered. To make sure that enough information was collected, and the research question could be answered, the method of theoretical saturation is used. Glaser and Strauss quote it as: *"The criterion for judging when to stop sampling the different groups pertinent to a category is the category's theoretical saturation. Saturation means that no additional data are being found whereby the sociologist can develop properties of the category"*¹¹⁰.

This method means that interviews are taken until no more new information about the research question is found.

Some of the interviewees were approached via the network of Saxion, others were found via articles about circular economy on the internet and approached via email or found in the network of the other interviewees.

The models that have been composed are based on the interviews and the literature review. The parameters that determine whether a purchasing category is suitable, semi-suitable or non-suitable for circular purchasing will be based on this data. In this research a first step on how to implement a circular economy was performed, this is an analysis of the spend analysis of Saxion. (The analysis of the different product categories was performed using the theoretical matrix, to find out which of the present purchasing categories at the purchasing department of Saxion the circular economy could be implemented the best and where it would be the most profitable.

3.4. Seven site visits and interviews took place, interviews were coded using atlas.ti, after the interviews were coded, this data was used to answer the research questions.

During this research, seven interviews have taken place at seven different organisations and institutions. Interviews were performed during the research period in June and July 2018. The following seven participants were interviewed:

¹⁰⁹ See Qu & Dumay, (2011), p. 247

¹¹⁰ See Glaser & Strauss, (1967), p. 67

Interviewee	Organisation and position
1. Interviewee 1	Interviewee 1 is a program manager socially responsible purchasing at company X. Here his responsibility was to make sure that durability and circularity become as common in the purchasing process as price and quality, he has been part of multiple circular tenders
2. Interviewee 2	Interviewee 2 has prepared and performed different circular tenders for the municipality X, he has done a tender about office furniture, catering and hot drinks.
3. Interviewee 3	Interviewee 3 is a category manager at organisation X and responsible for the purchasing of work clothing, currently he tries to purchase these clothes as circular as possible.
4. Interviewee 4	Interviewee 4 is procurement advisor at company X, she has been a part of different circular tenders and has done research about this topic.
5. Interviewee 5	Interviewee 5 is a category manager office furniture. She is responsible for all the office furniture at organisation X.
6. Interviewee 6	Interviewee 6 is purchaser at the municipality X, he is the lead buyer facilities. He has been part of multiple circular tenders at the municipality, for example a tender for circular hot drinks and circular office furniture.
7. Interviewee 7	Interviewee 7 has her own consultancy firm in circular economy and her main focus is the circular economy in construction works. She has been a part of multiple circular tenders for municipalities as well as contractors. She gives advice about circular economy and how this can be implemented in circular building and purchasing.

Table II: Participants in this research

The interviews were transcribed and coded using coding software (atlas.ti) to filter the information needed out of these interviews. The first step was the open coding of the interviews, then the different categories were connected using axial coding and the last step was selective coding. Coding in-depth semi structured interviews requires that the codes are defined clearly

and mutually exclusive¹¹¹. For semi structured interviews it is necessary that the interviewer is knowledgeable, because coding this data requires interpreting what respondents mean in their answers¹¹². After the selective coding has taken place, the most important categories were put in a table with their sub-categories. The different codes are explained and defined below Table III. The interviews are numbered in the report from 1 tot 7 following the order of interviewees as named in this chapter.

The steps to implement this circular economy model the best way possible were found in the data of the interviews. A step-by-step plan has been created on how to introduce a circular economy model at the current best way possible according to the interviewees. The theoretical matrix is based on the information out of the interviews and the literature review. This information was analysed and combined to find out the parameters that determine whether a purchasing category is suitable for circular purchasing or not. Afterwards a matrix was created using the different parameters that have been found. In this matrix six of the most common purchasing categories were tested for their suitability for use in a circular economy model. The analysis of the spend analysis was performed at Saxion to find out which purchasing categories do exist at Saxion and what the size (in €) is. Based on this analysis the purchasing categories can be evaluated on their suitability for use in a circular economy using the matrix that has been composed before. The value of the parameters of the different purchasing categories of Saxion should be determined to find out how suitable the category is for use in a circular economy model.

4. There are nine extra demands public organisations have to adhere to , an eleven-step implementation model can help to introduce a circular economy model and products categories suitability for use in a circular economy model can be assessed using the model developed in this study.

4.1. Four main topics result from interviews: product categories and circular economy, start circular economy, development circular economy and difference private and public circular purchasing.

After the interviews had taken place and the coding was finished, several main topics concerning public circular purchasing came forward. During this research the point of theoretical saturation was reached after conducting 7 interviews at 7 different

¹¹¹ See Campbell, Pedersen, Quincy, & Osserman, (2013), p. 296

¹¹² See Campbell et al., (2013), p. 297

companies/institutions. The following topics came forward most frequently and are seen as most important, they are used to answer the research questions. These are the following topics:

Topic	Sub-Topics
1. Product categories and circular economy	
2. Start circular economy	<ul style="list-style-type: none"> - Steps to get to circular purchasing - Mistakes introduction - Problems introduction circular purchasing
3. Development circular purchasing	
4. Difference private and public circular purchasing	

Table III: Main topics about circular economy resulting from the interviews

As can be seen, one of the topics consist of sub-topics. These sub-topics were created because they had affection with and were part of the main topic that came of out of the interviews. The first main topic that came out of the interviews was the topic: ‘product categories and circular economy’. This topic gives an answer to the question: ‘Which product categories are, according to you, suitable/semi-suitable/non-suitable for circular purchasing? What makes a product suitable/non-suitable?’. Parts of the interviews that belong to this topic describe which product categories, according to the interviewees, are suitable for circular purchasing or not. Another part in this chapter is about the possible factors that might determine whether a product category is suitable for circular purchasing at this moment or not. The second main topic is named as: ‘the start of circular economy’, this topic consists out of multiple sub-topics. In this part of the interviews, the interviewees explained how they have started with circular purchasing within the organisation they work for and what actions were needed to implement a circular purchasing model. This process is described via different sub topics. The first sub-topic is called: ‘steps to get to circular purchasing’, in this part the interviewees explained what steps they had to take to make implementation of circular purchasing possible in the organisation they work for. The second sub-topic is called: ‘mistakes introduction’, in this topic, the interviewees explain what kind of mistakes they made while introducing a circular purchasing model. ‘Problems introduction circular purchasing’ is the last sub-topic, here the interviewees have explained the problems they encountered while introducing circular

purchasing and how to prevent them. The third main topic the interviewees mentioned is: 'development circular purchasing'. In this topic the interviewees explain how they think circular purchasing has developed in their organisation, but also in a wider context, like how the concept itself has developed to what it is now. 'Difference private and public circular purchasing' is what the last main topic is called. In this part of the interview, the interviewees speak about what they think are the differences between circular purchasing in public and private companies and what the influence of the European tender laws could be on the ease of implementing a circular economy.

4.2. Introducing a circular economy in public organisations can be more complicated than introducing the model in private organisations because of the extra demands public purchasing has to adhere to.

4.2.1. Introduction of a circular economy model in public purchasing is not inhibited by the extra demands public purchasing has to adhere to, the societal role of public organisations can even accelerate introduction.

When asked whether these extra demands would inhibit the introduction of a circular purchasing model in public companies most interviewees answered they thought it didn't. Different reasoning was given by the interviewees. Interviewee one mentioned that it is possible to get to a supplier who is performing a circular economy model:

*'You can show your preference for a supplier who is performing well on circular economy in an objective, transparent and non-discriminatory way, but this is depending on the contract authority's courage to ask the right questions'.*¹¹³

In his opinion people often say that it is hard to put circularity in an objective context, but this is a problem that can also be solved by making it multiple subjective:

*'People often say that it is not possible to make circularity objective, I don't know if this is true, but if you think it is not possible to make circularity objective, why don't you make it multiple subjective?'.*¹¹⁴

He said that a successful implementation of circular purchasing can also be made possible by being creative with the different parts of the European tender laws and that it is a sign of inability when purchasers say that the tender laws block the circular economy:

¹¹³ Interview 1, (2018), p. 16

¹¹⁴ Interview 1, (2018), p. 16

'You need to be creative with the pillars on which the tender law is based, the excuse that the tender laws block the circular economy is actually a sign of inability of purchasers in the public sector'.¹¹⁵

Other interviewees also didn't agree with the proposition that introducing a circular economy model in public purchasing could be inhibited by the extra demands that public purchasing has to adhere to. Interviewee 3 was for example was resolute when asked whether public institutions were inhibited by the tender laws, his answer was: 'No'. The reason for this answer was that he thinks it has all to do with planning:

'Everyone will claim the opposite, especially people from municipalities and provinces, but this has all to do with planning and a lack of a reliable definition, this gets them into time pressure and makes them blame the procedures for their mistakes'.¹¹⁶

Interviewee 3 stated that purchases are always at the end of a trajectory, when they have to publish, they blame the procedure for their lack of planning, he thinks they do this to give themselves a cover for their bad planning. Interviewee 5 mentions that until this point, she did not notice that the introduction of the circular economy was inhibited by the tender laws. In her opinion, public organisations can come far in introducing a circular economy, but they need to be smart to get it done. She for example mentions that small public organisations who find it hard to have an influence on the market they purchase from should just take advantage on what is already done by bigger organisations, the large buyers in public purchasing can influence the market to develop circular solutions:

'If you are a small organisation, I would say you should just take advantage on what has already been done, office furniture for example is a category in which a lot has been done already'.¹¹⁷

Interviewee 6 also mentioned that he thinks that within the tender laws and regulations it is possible to introduce a circular economy:

'Within the European tender laws, it is also possible to introduce a circular purchasing model, you just need to adapt your weightings in the selection and awarding criteria, and really appreciate circularity in these criteria'.¹¹⁸

Some of the interviewees however did even want to go further than public purchasing not being inhibited by European tender laws, they think that public purchasing has an advantage in circular purchasing compared to private purchasing:

¹¹⁵ Interview 1, (2018), p. 16

¹¹⁶ Interview 3, (2018), p. 51

¹¹⁷ Interview 5, (2018), p. 86

¹¹⁸ Interview 6, (2018), p.106

Interviewee 1 mentioned that it could be possible that circular purchasing is easier for public organisations compared to private organisations. He thinks that because of this social role, public institutions can easier explain that they use community money to create societal value next to only using the best price-quality ratio. Public institutions have a societal task and part of this is to keep the society durable and sustainable¹¹⁹. He quoted:

*'I think that for public organisations it could even be easier to purchase circular than for commercial organisations, because public organisations don't only have a functional task, but they also have a societal role'.*¹²⁰

The fourth interviewee also agreed on the proposition that public organisations do have an advantage compared to private companies in introducing a circular economy model:

*'I think that public organisations have an advantage compared to private organisations, because they get their targets more from the government, which makes it easier to say: 'we have a problem as a company, and we are looking for companies to help us with that'.*¹²¹

She mentioned that public companies just say they want an X percentage of circularity or a circular solution for a problem. Next to this, market consultations are organised to let the market know what the problem is and give them the possibility to already think about a solution¹²². She stated that public companies have a big advantage because when a public company puts a tender on the market, the market knew this tender was coming and they had the possibility to prepare themselves before the tender was put on the market¹²³. Public companies have this advantage because private companies don't always have a goal in circularity and if they have, they don't know which goals they should set. Interviewee 6 does also think that public organisations have an advantage in introducing a circular economy because they also have a social responsibility and are supported by the politics, they are even pushed by the politics to be as circular as possible. He thinks this can make the introduction easier because they are allowed to spend just a bit more to make it possible¹²⁴. Table IV provides an overview of why introducing a circular economy model in public purchasing is not inhibited by extra demands compared to private purchasing.

Public organisations are not inhibited in introducing a circular economy model if:
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¹¹⁹ See Interview 1, (2018), p. 17-18

¹²⁰ Interview 1, (2018), p. 16

¹²¹ Interview 4, (2018), p. 67

¹²² See Interview 4, (2018), p. 67

¹²³ See Interview 4, (2018), p. 67

¹²⁴ See Interview 6, (2018), p. 107

- The contract authority has the courage to show preference for a circular supplier in an objective, transparent and non-discriminatory way.
- They are creative with the pillars on which the tender law is based.
- They have a good planning.
- They are smart, for example through the use of examples of other (big) organisations.

Public purchasing can have an advantage in circular purchasing because:

- They have a societal role, in which introducing a circular economy can support them.
- They can organise market consultations to let the market know what the problem is and give them the opportunity to think about solutions.

Table IV: summarizing chapter 4.2.1.: public organisations are not inhibited in introducing a circular economy by extra demands, they can even have an advantage compared to private purchasing

4.2.2. Arguments were given that introducing a circular economy model in public purchasing is inhibited by the extra demands it has to adhere to. The European tender laws need to be applied, people tend to be risk-averse and budgets can cause not getting the most circular supplier.

In chapter 4.2.1, the statements that public purchasing organisations do not get inhibited in introducing a circular economy model or even have advantages in introducing this model compared to private purchasing are summed up. There are however also interviewees that do think that public purchasing is inhibited in introducing a circular purchasing model because of the extra demands that public purchasing has to adhere to compared to private purchasing. The first interviewee mentioned that it was not possible for public organisations to just choose the preferred supplier because of the external demands¹²⁵, he also agreed on the proposition that the tender laws can make it difficult to purchase what you would like to purchase¹²⁶. This means that he thinks that public purchasing does have to put in extra effort to get introduce a circular purchasing model. Interviewee three named another factor that, in his opinion, has effect on the ease of introducing a circular economy in public purchasing, and that is the change in policies. People who work for public institutions, like the government, have to adhere to the policy that is made by the current cabinet. If a cabinet changes its strategy about circular purchasing this also has effect on the public institutions that buy for the government:

¹²⁵ See Interview 1, (2018), p. 16

¹²⁶ See Interview 1, (2018), p. 17

*'I represent the cabinet's objectives, I don't have anything to choose here, with an ambitious cabinet and sharp goals, I am ought to give a good example on their behalf.'*¹²⁷

At this moment, with an ambitious cabinet, he is really supported to increase circular purchasing more and more, however this can change if the new cabinet changes the policies and does not support the circular economy that much anymore. The fifth interviewee does have the idea that it is easier to introduce a circular economy without the tender law, but with the note that she has not performed a circular tender in the private world before:

*'Of course, I think it is easier if you are not obliged to use the tender laws, but this is easily said from my position.'*¹²⁸

She mentions that it is probably different for private than governmental organisations, because they have a lot more possibilities. Public organisations cannot just say they would like to work with a certain agency they like because they have nice ideas, this makes it more complicated.¹²⁹ Interviewee 5 mentioned however in her opinion, the laws are not biggest thing that inhibit the introduction of a circular economy in a public organisation, but people do:

*'In my view, there are a lot of possibilities, also within these laws and regulations, but the thing that comes forward is that people just don't like to change things.'*¹³⁰

The most resistance that interviewee 5 experiences comes from the people who find it hard to change and take risks. Especially within governmental organisations, who do have multiple goals, and which are quite large, people tend to protect their own job and work. She mentions that it is important to look for the opportunities that exist in starting with a circular economy. You need to be able to see through and convince all the people that find it too risky and people who see a lot of legal obstructions¹³¹. The introduction of a circular economy model in public purchasing is also more complicated according to interviewee six. He notices that as a public tender obliged organisation you are never sure that you have the most circular or sustainable supplier:

*'This guarantee can just not be given because the awarding procedure needs to be as transparent as possible, and because the factor price does always have a weight in the awarding. It can be that a cheaper supplier that is less circular or less sustainable wins the tender because it has a best overall score.'*¹³²

This can make it hard to get a supplier that is good enough for you, but that this is the system that public organisations have to work with. He states that public organisations do also have

¹²⁷ Interview 3, (2018), p. 48

¹²⁸ Interview 5, (2018), p. 86

¹²⁹ See Interview 5, (2018), p. 86

¹³⁰ Interview 5 p. 85

¹³¹ See Interview 5, (2018), p. 85

¹³² Interview 6, (2018), p. 106

budgets and that in some markets, price can be an important criterion¹³³. In his opinion it is good possible to get circular suppliers, but that the level of circularity can be different for different tenders, because of the difference in importance of the price:

'In some trajectories, we have the idea that we found the best circular supplier in the field, but sometimes we also think that it could have been better'.¹³⁴

The last point that interviewee six mentions is that organisations who are not obliged to adhere to the European tender laws can easier make a switch between suppliers. This means that private organisations can implement the new model quicker and easier compared to organisations who are obliged to adhere to the tender laws¹³⁵. The last interviewee fully agreed on the proposition that it is more complicated to introduce this new model in public purchasing than in private purchasing. She notices that private organisations also use a price/quality ratio to select a supplier and that circularity is one of the quality criteria, so they also have to do effort to find the best supplier. However, in her opinion for public organisations it can take a lot more time to put a good tender on the market:

'For public organisations who are obliged to adhere to the European tender laws, I think it just takes more time to put a good tender on the market. Public organisations need to do this in the right way, if they do not do this, they can get objections and complaints that the tender is not all right'.¹³⁶

Because of this she thinks that public organisations need to have more expertise on this than private organisations, the tender needs to be of higher quality than the tender of private companies to prevent legal problems. In her view this could inhibit the introduction of a circular economy. Another thing she thinks that could inhibit the introduction of a circular economy is the fact that circularity is an extra selection criterion that comes on top of the many that already exist and could be a reason for a tender to go wrong¹³⁷. Also, the suppliers are obliged to get more expertise in yet again another field, which they didn't have to before if they want to get selected¹³⁸. Table V provides an overview of why introducing a circular economy model in public purchasing is inhibited by extra demands compared to private purchasing.

Public organisations are inhibited in introducing a circular economy model because:

¹³³ See Interview 6, (2018), p. 107

¹³⁴ Interview 6, (2018), p. 107

¹³⁵ Interview 6 (2018) p. 103

¹³⁶ Interview 7, (2018), p.124

¹³⁷ See Interview 7, (2018), p. 124

¹³⁸ See Interview 7, (2018), p. 124-125

- European tender laws make it impossible for public organisations to choose the most circular supplier.
- People in public organisations tend to be risk-averse and are hesitant to change.
- Budgets play a role, which can cause that organisations cannot get the most circular supplier.
- Organisations who are not obliged to the tender laws can easier switch between suppliers.
- Public organisations need to make sure they put a good tender on the market, which can cause the process of implementation to take longer.
- Circular economy is yet another extra selection criterion which can cause a tender to go wrong.

Table V: summarizing chapter 4.2.2.: public organisations are inhibited in introducing a circular economy by extra demands.

4.2.3. Putting the relation between the extra demands and circular economy in a model: four demands have an inhibiting effect on the introduction of a circular economy, four demands have an accelerating effect and one demand can have an inhibiting or accelerating effect, depending on the context.

Figure VIII gives an overview of the extra demands public organisations have according to the article written by Telgen et al compared to private purchasing, these demands are put into the context of circular economy to find out what the effect of these extra demands could be on circular purchasing in public organisations. In the interviews that have taken place with purchasers who are experienced with circular purchasing, the interviewees answered to the question:

‘In your opinion, are public organisations inhibited in performing circular purchasing by the extra demands they have to adhere to compared to private purchasing? If yes, why? If no, why not?’

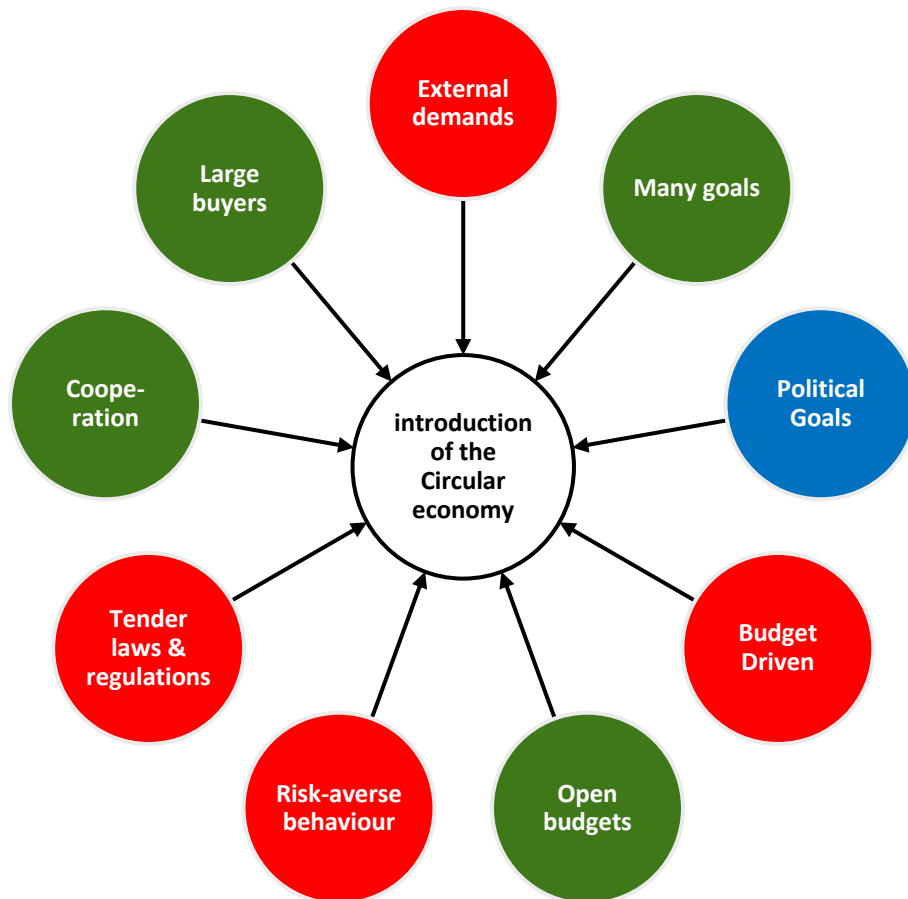


Figure VIII: Extra demands to public purchasing according to Telgen et al. and the effect of these demands on public circular purchasing according to the interviewees

In this model, the green colour means that the extra demand has an accelerating effect on the introduction of a circular economy model in public purchasing according to the interviewees. There are four demands that have this accelerating positive effect:

1. Public organisations have many goals compared to private organisations, they are supposed to fulfil the general good. The implementation of a circular economy model for public organisations can be easier because of their social responsibility^{139,140}.
2. Public organisations have open budgets, because of the open character of public purchasing, public organisations can already let the market know a tender is coming, giving them the opportunity to prepare themselves before the tender comes on the market. This can lead to better and easier implementation of a circular economy model for public organisations¹⁴¹.

¹³⁹ See Interview 1, (2018), p. 16

¹⁴⁰ See Interview 6, (2018), p. 107

¹⁴¹ See Interview 4, (2018), p. 67

3. Cooperation is allowed in public purchasing, this cooperative nature of public purchasing let small public organisations take advantage of the things that bigger organisations have already done. Together these organisations have more influence on the market and can pressure them to develop more circular products¹⁴².
4. Most public organisations are large buyers. Because some public organisations are really large buyers, they can together really influence the market and pressure them to develop circular solutions¹⁴³.

Furthermore, the red colour in the figure means that the demand has an inhibiting effect on the introduction of a circular economy model in public purchasing. According to the interviewees, four of the demands have this negative influence:

1. Public organisations have external demands they have to adhere to, including transparency, integrity and accountability. Public organisations cannot just choose their preferred supplier to purchase what they like, which can result in not getting the most circular supplier¹⁴⁴.
2. Public organisations are budget driven. Sometimes it is hard to get the most circular supplier because of the budgets public organisations have to deal with, price can play a big role in the awarding of the supplier¹⁴⁵.
3. Public interests cause risk-averse behaviour, people find it hard to try new things, like circular purchasing, because they are afraid of the risks and legal obstructions. People within governmental organisations, who do have multiple goals, and which are quite large, tend to protect their own job and work¹⁴⁶.
4. Public organisations have to adhere to the public tender laws and regulations, this can make it harder for public companies to purchase circular products, they cannot just choose the most circular supplier. It could also take more time to put a tender on the market compared to private companies because the tender needs to be of higher quality^{147,148}.

The last of the extra demands is political goals, a change in cabinet and political ambitions or goals can influence the success of implementing the circular purchasing model. Implementation

¹⁴² See Interview 5, (2018), p. 86

¹⁴³ See Interview 5, (2018), p. 86

¹⁴⁴ See Interview 1, (2018), p. 16

¹⁴⁵ See Interview 6, (2018), p. 107

¹⁴⁶ See Interview 5, (2018), p. 85

¹⁴⁷ See Interview 5, (2018), p. 86

¹⁴⁸ See Interview 7, (2018), p.124

of the circular purchasing model can be inhibited with a cabinet that does not support circular economy or accelerated by an ambitious and supportive cabinet¹⁴⁹.

4.3. The seven steps of introducing a circular economy in public purchasing departments according to the interviewees, starting with a good vision and strategy and ending with sharing knowledge and successes.

All interviewees agree on the proposition that before implementing a circular economy model into an organisation, quite some steps need to be taken. They however state that there is no certain sequence of steps or golden standard in introducing a circular economy. They do mention certain steps that could be useful to implement the circular economy model into the purchasing department as efficient as possible. Not all the interviewees mention the same steps, this chapter shows the steps they think an organisation can take for a successful implementation of the new purchasing model. The last part of this chapter will compare the steps named to introduce this new innovation to the introduction of other innovations and what differentiates here. In total eight steps were named for a successful implementation of the circular economy model:

The first and most important step that is needed to make sure a circular purchasing model is implemented the best way, is a clear and well described vision and strategy. There is a huge variety of definitions about circular economy, so an organisation should have a clear definition of what they see as circular economy and a clear strategy of how they are going to introduce a circular purchasing model. This vision and strategy can help with the introduction of a circular economy model because people can always fall back on it, they know what the organisations wants and how they want to do it. Multiple interviewees named this first step in the interviews:

- *'Decrease the gap between what people do now and what people should do, by finding a philosophy in which everyone in your organisation can find something that touches them and on which they could have influence'.¹⁵⁰*
- *'You need to have a clear vision about what you want to do'.¹⁵¹*
- *'You first need a vision, you need to know where you want to contribute'.¹⁵²*
- *'You need a strategy and a policy and then you just need to start'.¹⁵³*

¹⁴⁹ See Interview 3, (2018), p. 48

¹⁵⁰ Interview 1, (2018), p. 14-15

¹⁵¹ Interview 2, (2018), p. 37

¹⁵² Interview 3, (2018), p. 50

¹⁵³ Interview 4, (2018), p. 66

- *'There are 114 definitions of circularity, we decided to sit together to determine our own definition of circularity and how we were going to apply it'.¹⁵⁴*
- *'Of course, it starts with a strategy and vision'.¹⁵⁵*
- *'You need to carefully describe your tender, based on your vision'.¹⁵⁶*

As a second step, the interviewees state that it is important to create support from the management and employees of an organisation to make sure everything goes in the same direction. In the strategy the ownership of different parts in circular economy should also be named, it should be determined who is responsible, and who can be asked questions, for what part of the circular economy model. Interviewee 1 says that steps one and two need to be combined. You can have a good philosophy in how you see circular purchasing in your organisation, but if there is no support from the management and the employees, this can never be realised. The other way around, if the management and employees are really willing to use a circular purchasing model in the organisation but there is no grounded theory or philosophy on this topic, an efficient and good implementation will be difficult. It is also important that there is consensus with the client and customers, this gives you the full mandate.

The following quotes show how the interviewees mentioned this step in the interviews:

- *'Find ambassadors within your organisation, who are the people that really support circularity, and what is their position in the organisation'?¹⁵⁷*
- *'Make sure you have support from the management'.¹⁵⁸*
- *'We had to convince the whole purchasing department, their first reaction was that circular economy was no form of tendering'.¹⁵⁹*
- *'It is important to find out what is possible and to create support within the organisation'.¹⁶⁰*
- *'Then there are aspects that have influence on the rate of success, these are environmental factors like culture, expertise, managerial commitment and communication with employees'.¹⁶¹*

¹⁵⁴ Interview 5, (2018), p. 83

¹⁵⁵ Interview 7, (2018), p. 122

¹⁵⁶ Interview 2, (2018), p. 37

¹⁵⁷ Interview 1, (2018), p. 14

¹⁵⁸ Interview 1, (2018), p. 14

¹⁵⁹ Interview 2, (2018), p. 36

¹⁶⁰ Interview 5, (2018), p. 84

¹⁶¹ Interview 7, (2018), p. 123

The third step in implementing a circular economy model named by the interviewees was the importance of defining the ownership. Organisations need to make sure that their employees know for which part of the circular economy they are responsible, and they need to know who can be asked which questions. By making the concept of circular economy more tangible, the employees and management know what they have to do, which helps in the success of implementing this new model. Also, interviewee five mentioned that It is important to let your employees come with ideas and let them help you. The interviewees named this step as follows:

- *‘Don’t pull on people, instead try to enthuse the people and explain why circular purchasing can change something and how they can help with that’.*¹⁶²
- *‘You need to have a clear planning about who does what and share this with the suppliers again’.*¹⁶³
- *‘I think it is important to start with a kick-off meeting to tell people what you are going to do and why, to involve as many people as possible’.*¹⁶⁴

Step number four was also considered to be important, organisations need to share their vision and strategy with the suppliers and market. Sharing the definition and strategy with suppliers gives the market a better understanding of what your organisation wants and how they can help with that. Most of the time, suppliers are the people who have the knowledge in their particular field, involving them early on in the purchasing process could help in finding new circular solutions. Interviewee 2 emphasizes that sharing a clear vision is important, organisations need to have a clear story and communicate this with the partners they work with. This way you inform your partners about your vision and ask them how they can help you with that. The importance they see in this step can be seen in the following quotes:

- *‘Look for publicity when you start to purchase circular, it helps you to inform the market and to enthuse them’.*¹⁶⁵
- *‘Contact your chain partners, we organised a seminar with all the partners in the purchasing chain’.*¹⁶⁶

¹⁶² Interview 2, (2018), p. 33

¹⁶³ Interview 3, (2018), p. 51

¹⁶⁴ Interview 4, (2018), p. 73

¹⁶⁵ Interview 2, (2018), p. 36

¹⁶⁶ Interview 2, (2018), p. 37

- *'You need to keep feeling with the market, you need to look at the technical possibilities, because the market decides'.*¹⁶⁷
- *'Share your vision and your purchasing agenda with the suppliers'.*¹⁶⁸
- *'We organised sessions with suppliers to see what we could do for each other'.*¹⁶⁹
- *'The first thing we did is informing the market and suppliers that we were going to introduce a circular purchasing model'.*¹⁷⁰
- *'We organised sessions with all kind of stakeholders, showed them our vision and asked them what possibilities they saw'.*¹⁷¹
- *'It is very important to give the initiative to the market and tell them you would like to purchase things circular and ask them how they can help you with that'.*¹⁷²
- *'You need to do market research and challenge the suppliers'.*¹⁷³
- *'It is important to have your suppliers involved early on, to find out what they can do and what the market can do and then create a good business case together'.*¹⁷⁴

In the fifth step in introducing a circular economy model, the interviewees named the importance of educating the organisations about circular economy. Support can be created by sending employees to courses about circular economy, to increase their knowledge and understanding of the subject. If the topic gets better known to the employees, this will help with the implementation of the circular economy model. Increasing the knowledge of the employees can be accomplished in multiple ways, for example through workshops or by hiring consultancy firms. Hiring expertise in the form of a consultancy firm can also help to convince the client because they have the expertise and can show the opportunities well. The following quotes show how the interviewees mentioned this in the interviews:

- *'I did send two of the purchasers to a circular economy workshop at pianoo'.*¹⁷⁵
- *'We hired a consultancy firm to find out where the best opportunities were and increase our knowledge'.*¹⁷⁶

¹⁶⁷ Interview 3, (2018), p. 49

¹⁶⁸ Interview 3, (2018), p. 51

¹⁶⁹ Interview 4, (2018), p. 65

¹⁷⁰ Interview 5, (2018), p. 82

¹⁷¹ Interview 5, (2018), p. 83-84

¹⁷² Interview 6, (2018), p. 99

¹⁷³ Interview 6, (2018), p. 102

¹⁷⁴ Interview 7, (2018), p. 123

¹⁷⁵ Interview 2, (2018), p. 36

¹⁷⁶ Interview 5, (2018), p. 82

- *'We hired a consultancy office because we needed juridical advice to make sure we complied with the tender laws'.¹⁷⁷*
- *'In the first trajectory we decided to hire a consultancy firm to get some extra expertise, this can also help to convince the clients'.¹⁷⁸*

Then, as step number six, a good pilot or starting project should be found, it is important to take small steps instead of one big unrealisable step. As a first circular trajectory it would be wise to look for a project which has been done before by other companies and in which the market has developed itself quite well. This helps to perform a good first circular tender as support can be asked from people who are experienced with circular tenders and the market is developed enough to help too. The thoughts of the interviewees about this step are the following:

- *'Better take a lot of small steps, instead of a big step that can never be realised'.¹⁷⁹*
- *'Start with a pilot and try it out and then scale up'.¹⁸⁰*

As a last step, the interviewees mention the importance storytelling and sharing information. After the first trajectories have been performed, it is important to show what has been achieved so far, this way employees get to know with what the possibilities are and what the impact can be. Achievements should also be shared with other companies, in public purchasing it is allowed to cooperate, so it is important to share knowledge with other organisations to learn from each other.

- *'Communicate about your successes, storytelling is hugely important'.¹⁸¹*
- *'Exchange knowledge with other companies'*

4.3.1. Comparing the seven-step model to introduce a circular economy model of this research to other three other change management models, four steps can still be added to make to seven-step model more complete

Figure IX shows the seven that that according to the interviewees successfully lead to the introduction of a circular economy model. This figure can guide public organisations who want to introduce a circular economy model.

¹⁷⁷ Interview 2, (2018), p. 36

¹⁷⁸ Interview 6, (2018), p. 105

¹⁷⁹ Interview 1, (2018), p. 15

¹⁸⁰ Interview 4, (2018), p. 66

¹⁸¹ Interview 1, (2018), p. 14

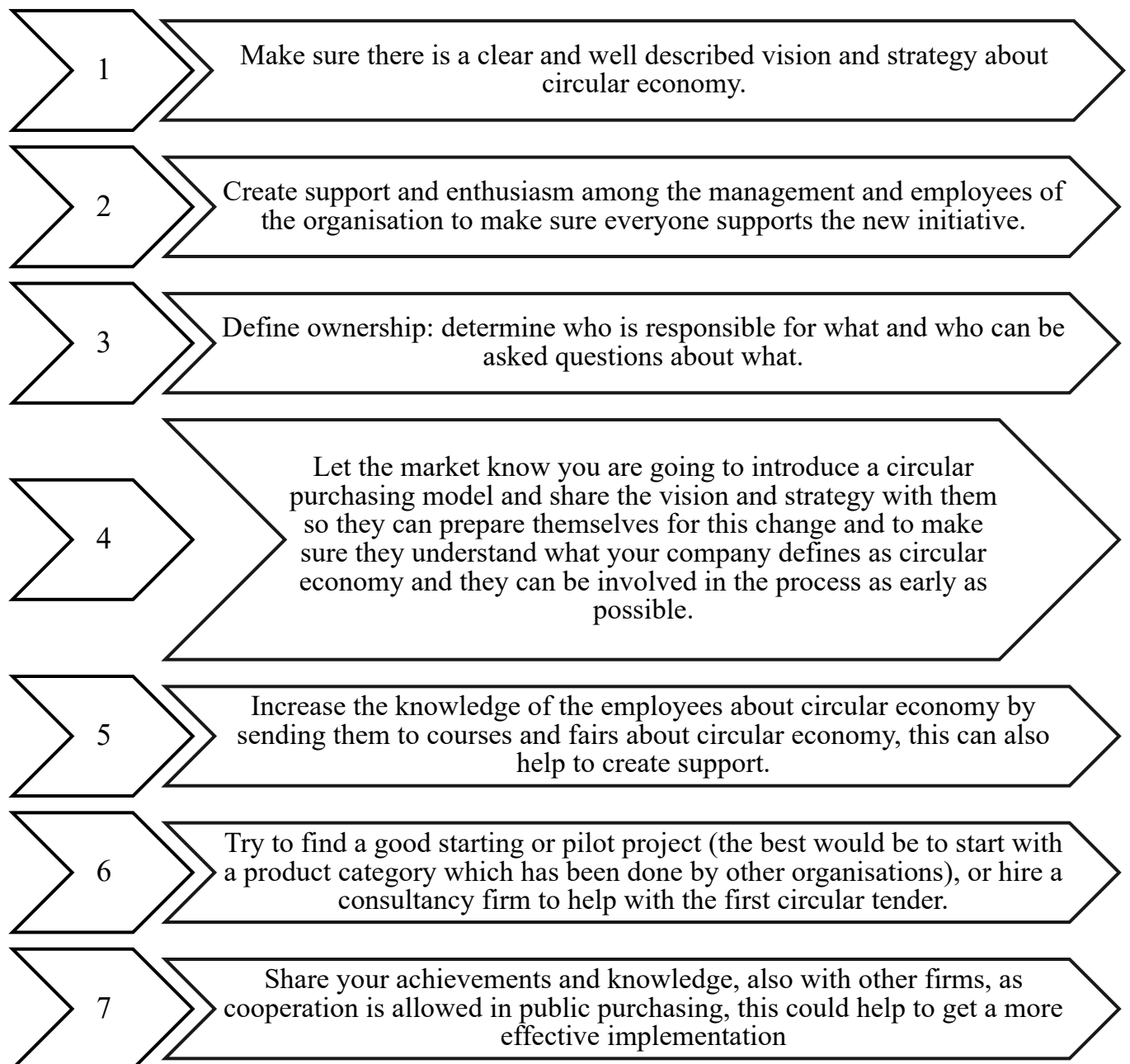


Figure IX: The seven-step model on how to introduce a circular economy model according to the interviewees

In chapter 2.3.2, the three most used change management models and their steps are written down. A comparison between these models and the steps named in Figure IX show that four of the steps that were named by Kotter were also named in Figure IX. These are: forming a powerful guiding coalition, named here as create support and enthusiasm among the management and employees, creating a vision, communicating the vision and empowering others to act on the vision, named here as share the vision so that the market can prepare themselves for the change. This shows that the biggest part of the introduction of a new circular purchasing model is the same as other changes being implemented. The second change model

is the 10-step model by Jick¹⁸², in this model again, the importance of a shared vision and common direction is named¹⁸³. Also, the support from the employees and management is named again by creating a change leader team¹⁸⁴. The last point that was named in this research as well as in the model by Jick is communication, organisations should communicate in a right way to show what the change yields¹⁸⁵. The third and last model in change management is the 7-step change acceleration process model by Garvin¹⁸⁶. In this model again, steps were named which were also named in the seven-step Figure IX in this research. These are shaping a vision to ensure the employees see the desired outcome of the change in behavioural terms¹⁸⁷ and mobilizing commitment by building a supportive coalition¹⁸⁸. Several steps which are named in the three different change management models are not named in the seven-step model of this research. These steps that were not named in this research could be added to the model to increase its utility for the process of implementing a circular economy model. These are the following steps^{189,190,191}:

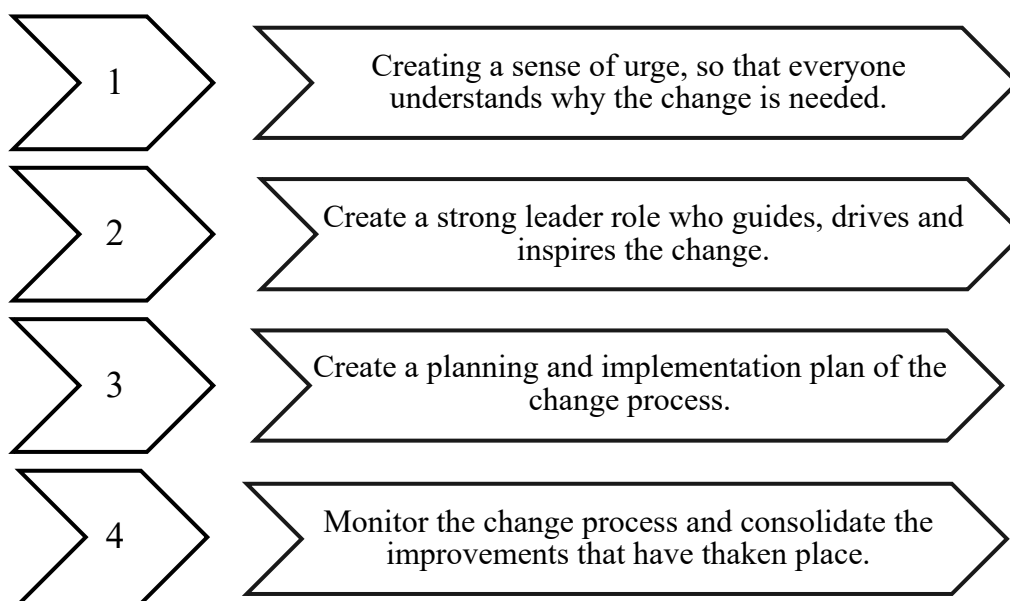


Figure X: Four steps that can be added to the 7-step change model of this research to make it more complete

¹⁸² See Jick & Peiperl, (1993), p. 195

¹⁸³ See Jick & Peiperl, (1993), p. 195

¹⁸⁴ See Jick & Peiperl, (1993), p. 195

¹⁸⁵ See Jick & Peiperl, (1993), p. 195

¹⁸⁶ See Garvin, (2003), p. 131

¹⁸⁷ See Garvin, (2003), p. 131

¹⁸⁸ See Garvin, (2003), p. 131

¹⁸⁹ See Kotter, (1995), p. 61

¹⁹⁰ See Jick & Peiperl, (1993), p. 195

¹⁹¹ See Garvin, (2003), p. 131

The steps which were not named in one of the three change management models but were named by the interviewees and subsequently included in the seven-step model are the last three steps:

1. increase the knowledge of the employees about circular economy by sending them to courses and fairs about circular economy, this can also help to create support.
2. Try to find a good starting or pilot project (the best would be to start with a product category which has been done by other organisations) or hire a consultancy firm to help with the first circular tender.
3. Share your achievements and knowledge, also with other firms, as cooperation is allowed in public purchasing, this could help to get a more effective implementation

These three steps are considered to be specifically applicable to the introduction of a circular purchasing model. By combining the seven-step model in Figure IX and the four extra steps from the change management models in Figure X, a complete model arises for the introduction of a circular economy in public purchasing. Figure XI has three colours, the steps which were named both by the interviewees and can be found in the change management process are coloured blue. The steps that were added to the seven-step model to make it more complete, but which were not named by the interviewees are coloured in red. The last and third colour, green, shows the steps that were not named in the change management models but were named as necessary by the interviewees and thus are only applicable to this particular change process.

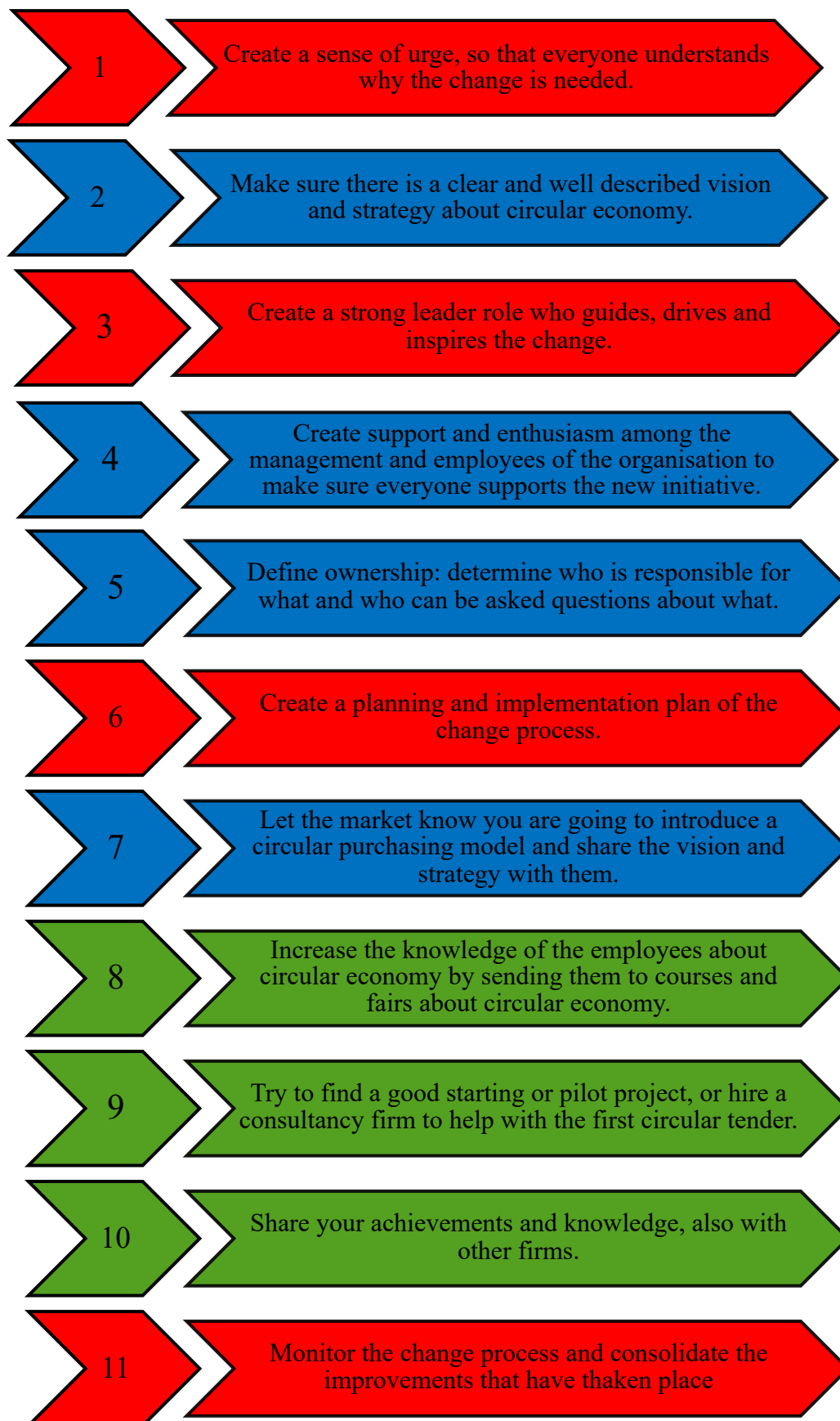


Figure XI: Combining figure IX and X: final steps on how to introduce a circular economy in public purchasing

4.4. The two factors that determine whether a product is suitable or non-suitable for use in a circular economy model at this moment are the market development and lifespan of the product.

To determine whether a purchasing category is suitable or non-suitable for the use in a circular economy model, first the factors that determine whether a category is suitable or not must be found. According to the interviewees there are two factors that determine the suitability of a product group. The first factor in this is the market development. The circular economy model has developed over the past years and is still developing at this moment¹⁹². A few years ago, quite some effort was needed to start using a circular purchasing model. In the last few years however, it is getting more and more developed and the concept is more elaborated now, improvements have been implemented. A company that starts to use this model now meets a market that is a lot more developed in this area than a few years ago¹⁹³. Suppliers are getting more familiar with the concept, which makes that the market gets more and more developed. Also, more and more meetings and congresses about circular economy are organised, which can help to develop the concept¹⁹⁴. This difference in market development can also be seen in the different product categories, a first thing is that some branches are further developed in the area of circular economy than others are which makes some circular trajectories easier than other. It can also be good to do a circular tender in a less developed market, so that it can start to develop more circular business models and products¹⁹⁵. According to the interviewees, at this moment we should not think about 100% circular, but ‘most circular’, because of technical barriers the market is for most products not ready to deliver a 100% circular product¹⁹⁶. Interviewee 3 agrees on the proposition that the suitability of products for circular purchasing at this moment is determined by the market development in the circular economy field. New techniques are needed to create new circular products, and not all markets are yet far enough developed to put such a product on the market¹⁹⁷. Interviewee 5 thinks that market development is the most important factor for the suitability of product categories in a circular economy model. She quoted:

*‘The question here is, how far developed is the market, and can the market be stimulated in a certain way?’*¹⁹⁸

¹⁹² See Interview 2, (2018) p. 41

¹⁹³ See Interview 4, (2018), p. 63

¹⁹⁴ See Interview 6, (2018), p. 109

¹⁹⁵ See Interview 2, (2018), p. 40

¹⁹⁶ See Interview 2, (2018), p. 41

¹⁹⁷ See Interview 3, (2018), p. 59

¹⁹⁸ Interview 5, (2018), p. 90

In her opinion, there is a lot more possible than what we do now, but that therefore stimulation of the market is essential to develop new circular initiatives. Husted and Reinecke state that all spend categories require their own sourcing strategy. The supplier market is one of the elements that should be taken into account when making a category strategy¹⁹⁹. The relationship between the market development and suitability for use in a circular economy model is that products with a more developed market are more suitable for use in a circular economy model^{200,201,202}.

The other factor that is named by the interviewees that has influence on the suitability of a product group in a circular economy is the lifespan of a product. For products with a shorter lifespan, it is easier to show the utility and added value than for products with a long lifespan: *'Office furniture for example is very visible with a short lifespan, this is more complicated for a bridge for example'*.²⁰³

It is easier to introduce a circular economy model in products with a short lifespan than in products with a long lifespan. Also, in for example the building markets, developments take place and the suitability increases²⁰⁴, this however is still less than products with a short lifespan. One of the business models of a circular economy is not becoming the owner of a product but buying the service, for example buy light instead of lamps or seating hours instead of chairs. In this business model, the supplier remains the owner of the product, meaning that the supplier will develop it as such that the lifespan is as long as possible and little maintenance is needed²⁰⁵. For products with a long lifespan however, it is hard to find suppliers who want to use this business model because these products have a lifespan of dozens or hundreds of years and who knows what will happen then and how the world will look like then?²⁰⁶. Furthermore, it is easier for products with a short lifespan to see what the circular economy yields compared to products with a long lifespan. A coffee cup which is 100% recyclable immediately shows result, less new coffee cups have to be bought and less waste will be created. For building products for example this is different, the results of a circular building will only partly show during its lifespan (less energy use, use of recycled materials, etc.). The end result however will only become visible after the building is demolished, a part of the building can be recycled. For products with a long lifespan it takes more time to show what the yields of using a circular economy model are. That is why nowadays preference is given to product categories with a short lifespan. So, lifespan has effect on the suitability of product categories in a circular

¹⁹⁹ See Husted & Reinecke, (2009), p. 22

²⁰⁰ See Interview 2, (2018), p. 40

²⁰¹ See Interview 3, (2018), p. 59

²⁰² See Interview 5, (2018), p. 90

²⁰³ Interview 5, (2018), p. 94

²⁰⁴ See Interview 5, (2018), p. 94

²⁰⁵ See Interview 7, (2018), p. 135-136

²⁰⁶ See Interview 7, (2018), p. 135-136

economy, product categories with a shorter lifespan are more suitable to use in a circular economy model now because it is more saleable for suppliers and also more visible²⁰⁷.

4.4.1. Six of the most common purchasing categories in public purchasing are assessed on their suitability for use in a circular economy model, catering being the most suitable category and building being least suitable at this moment

For this research six of the most common used purchasing categories of public institutions were rated on their suitability for use in a circular economy model. The suitability of the product category is based on the market development of the suppliers of that specific category and the lifespan of the product in the product category. For both of the factors a scale was developed to score the different product categories. For market development the highest possible score is 10 points, this is awarded to a category if the market is completely developed in the area of circular purchasing, categories in which the market is totally not developed score 0 points. For the lifespan the highest score of 10 points is awarded when the lifespan is less than one year. Product categories with a lifespan over 20 years score 0 points. The results of the scoring can be found in Table VI:

Category	Market development (0-10)	Lifespan in years	Points
	10 = 10 points 0 = 0 points	0 = 10 points 20 = 0 points	
Office furniture	9 (9)	10 (5)	14
Catering	7 (7)	0 (10)	17
ICT	1 (1)	4 (8)	9
Company clothing	5 (5)	3 (8,5)	13,5
Telecommunication	1 (1)	3 (8,5)	9,5
Buildings	5 (5)	> 20 (0)	5

Table VI: Product categories assessed on their suitability for use in a circular economy model and their market development and lifespan

To create a visible result of the suitability of use in a circular economy model of the different product groups, Figure XII has been made. This figure shows both of the factors that have effect on the suitability of product categories in a circular economy model. The X axis shows the market development of the different product categories in the field of circular economy, the better the market has developed itself in the field of circular economy, the better the product category's suitability for use in a circular economy model. The market development is based on the answers given by the interviewees about the product categories being suitable and not

²⁰⁷ See Interview 7, (2018), p. 136

being suitable for use in a circular economy model. The Y axis of the graph shows the lifespan of the product, the shorter the lifespan of a product, the better the suitability for use in a circular economy model. Figure XII visualises the suitability of the different product categories. Categories that are most suitable have a short lifespan and a high developed market. This means in the figure suitability is highest in most right up corner and lowest in the left low corner.

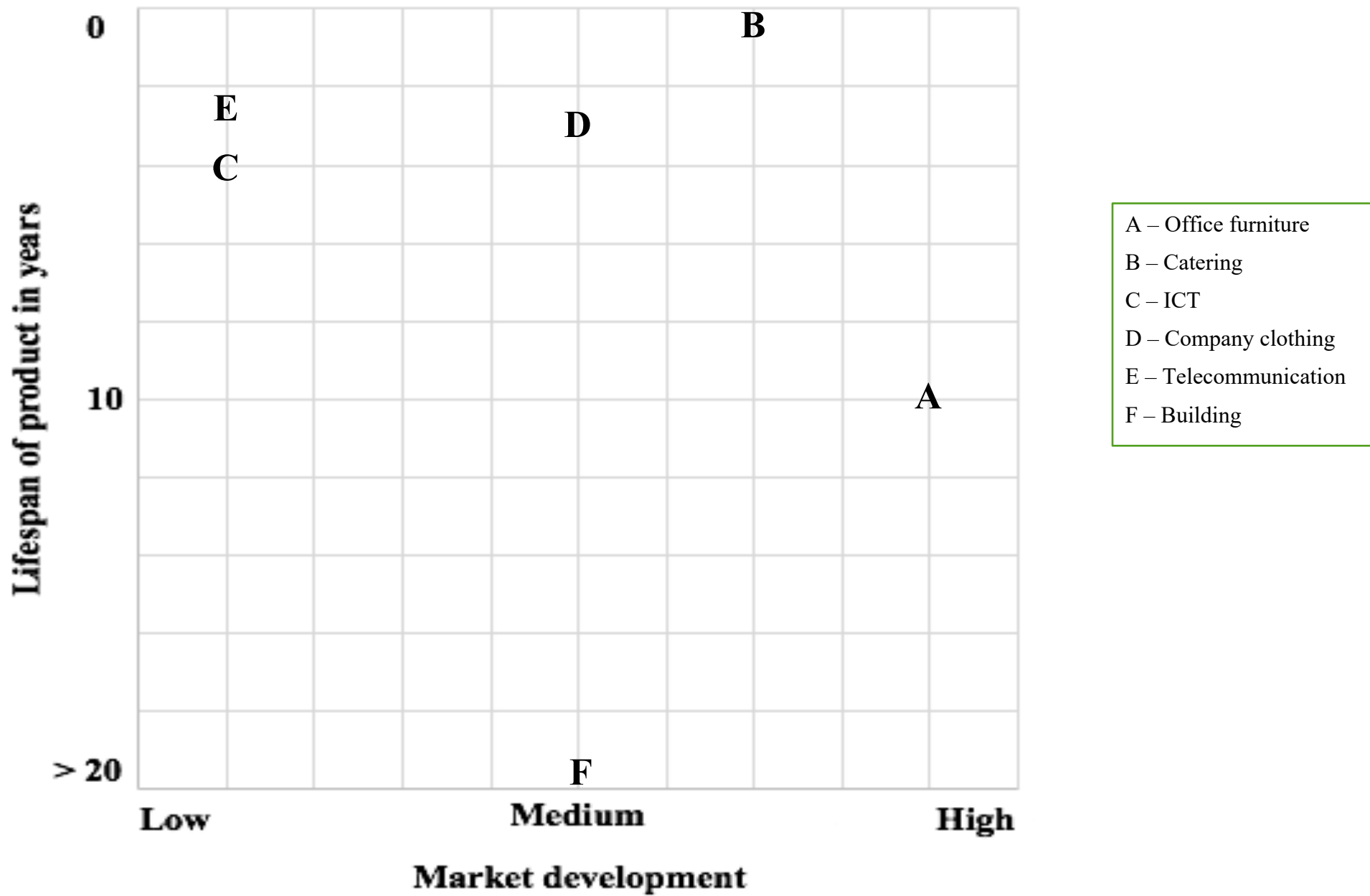


Figure XII: The suitability of purchasing categories for circular economy

Overall, the interviewees all agreed that the product categories that can be seen as facilities or consumer items were the categories which had the most developed markets²⁰⁸. Furthermore, the lifespan of products in these categories is mostly short which also makes them suitable for circular purchasing²⁰⁹. This can also be seen in figure XII, in which product categories A & B score good in their suitability for use in a circular economy model. The first product category, office furniture (A, 14 points) was named by the interviewees as one in which the market was best developed. All the interviewees and the companies that were visited had experience in circular purchasing for this product category. At this moment there are several suppliers that have implemented circular solutions for office furniture²¹⁰. These solutions range from demountable and repairable chairs to a new business model as seating-as-a-service. Although the lifespan of office furniture is about 10 years, this is still short enough to make it quite suitable for circular purchasing. Category B (17 points), the catering, was also named as suitable for circular purchasing at this moment. Coffee cups, which are a part of this category, is an example that was named a lot and with which almost all of the interviewees had experience²¹¹. Also, circular coffee, or other hot drinks, was named as an example for circularity in catering. The market in catering is seen by the interviewees as a developed market in this area²¹². The other product category that has a] good suitability for a circular economy model was category D, the company clothing (13,5 points)²¹³. This product has a lifespan that is quite short, there are however still some challenges in the market development. Technical barriers prevent 100% circular textile²¹⁴. Despite these barriers, multiple interviewees mentioned that they implemented a circular solution for this category. The two categories, C (9 points) and E (9,5 points) or ICT and Telecommunication can be seen as less suitable for use in a circular economy at this moment. Both do have short lifespan which is positive for the suitability, however the market development for these categories is low^{215, 216, 217}. Almost no circular projects have been done for these categories despite the valuable materials in it. The short lifespan however could make it easier to introduce new circular solutions here. A product that is upcoming is category F (5 points), the building category. This is a category in which the lifespan is long, dozens, or even hundreds of years. This makes it hard to show what the effect of circular building can be

²⁰⁸ See Interview 4, (2018), p. 63

²⁰⁹ See Interview 5, (2018), p. 94

²¹⁰ See Interview 1, (2018), p. 14

²¹¹ See Interview 1, (2018), p. 26

²¹² See Interview 2, (2018), p. 41

²¹³ See Interview 3, (2018), p. 56

²¹⁴ See Interview 3, (2018), p. 44

²¹⁵ See Interview 4, (2018), p. 70

²¹⁶ See Interview 5, (2018), p. 94

²¹⁷ See Interview 6, (2018), p. 111

for the future^{218, 219}. Also, this is a market in which not a lot has been done, but it is upcoming and more and more circular buildings are being built²²⁰.

4.5. When introducing a circular economy model, public organisations should prevent to make mistakes: cooperate with and involve suppliers as soon as possible and don't think an innovation can be implemented without investments from personnel as well as financial.

During the process of implementing the circular economy model, the interviewees experienced a few problems and mistakes which can delay or obstruct the introduction of the new purchasing model. To prevent this to happen to other public organisations, firstly the mistakes are named here. One of these mistakes is that some organisations shift the problem that they have to their supplier. For suppliers, the use of a circular economy model can also be new, they are used to selling products and not to reusing them again. If you do not cooperate with your supplier to change this process of only selling to reusing, but only let the supplier find the solution, they probably will not subscribe to the tender anymore because they are not going to solve your problem alone²²¹. This problem can be solved by cooperating with the suppliers and involving them early on in the process to find a good solution to the problem. Another mistake named by one of the interviewees is that purchasers often like to be all-round, they like to know a bit of a lot of things instead of knowing a lot of one or less things. According to interviewee 3 it is important to let the purchasers only purchase in certain segments²²². Knowledge, experience, visibility in the market and getting track of the developments in the market can be created by doing the same thing for a long time. Furthermore, the interviewees name the mistake that organisations think that they do not have enough influence on the market and see a lot of barriers in introducing a circular economy model. Interviewee 5 notes that the market will not change anything in their process unless they are asked to do so. If no one asks the market to implement a circular economy, they will not do so. Another mistake is that people often think that it is hard to introduce a circular purchasing model. It is true that the introduction of a circular economy model can be hard at the beginning, but the development in using a circular purchasing model in public companies can be seen as an exponential graph: 'At the beginning you need to work hard to get progress, but afterwards it starts to go easier'²²³. This quote shows that first big

²¹⁸ See Interview 5, (2018), p. 94

²¹⁹ See Interview 7, (2018), p. 136

²²⁰ See Interview 1, (2018), p. 24

²²¹ See Interview 3, (2018), p. 55

²²² See Interview 3, (2018), p. 55

²²³ See Interview 1, (2018), p. 6

effort is needed to make a small share of the total spend of the purchasing department circular. However, after the first steps have been made the progress and total percentage of circular purchasing spend will increase more easily. Multiple organisations have implemented a real circular economy in which good business cases arise that are profitable²²⁴. A last mistake that a lot of organisations make is that they think that circular purchasing is always more expensive than normal purchasing. As with a lot of new things, first an investment is needed, so at the beginning it can be that circular purchasing is more expensive than normal purchasing but after some time the total cost of ownership will get cheaper because of the realisation of a circular economy²²⁵. Interviewee 1 mentions that you have to look at the context, after some time, suppliers get to know with the concept and change their business models. A producer of a chair for example is not used to reusing the material of old chairs, if a chair can be produced in such a way that most of the material can be reused, then the 'new' chair can be sold cheaper than before²²⁶. Another business model in this is that a chair is built modular, this makes that a supplier can easily replace parts of the chair and the chair keeps its value over a longer period²²⁷. If you look at the product itself, it will probably be more expensive, a circular chair is probably more expensive than a normal chair. However, if you can reuse a part of the chairs and some chairs only need some parts replaced, this eventually is cheaper than buying all new chairs²²⁸. Another thing that could make circular purchasing cheaper is that suppliers start to innovate their products, they increase the lifespan of products. This will save costs in the management phase because less personnel are needed to maintain the product²²⁹.

Next to mistakes about circular economy, there are also problems that can obstruct or delay the introduction of the circular economy model. One of these factors is the will of the people to be unique. If for example, the working clothes of employees are all the same it would be a lot easier to recycle and reuse them instead of all companies having different working clothes²³⁰. Another factor that is named, is the bureaucracy in public organisations. Public organisations do often have a lot of different departments, each being responsible for different things²³¹. To encounter this problem and to create a circular philosophy, it is necessary that the different departments work together and communicate with each other in a good and efficient way²³². A third limiting factor for the development and introduction of a circular economy is

²²⁴ See Interview 1, (2018), p. 20

²²⁵ See Interview 1, (2018), p. 13

²²⁶ See Interview 1, (2018), p. 12

²²⁷ See Interview 1, (2018), p. 13

²²⁸ See Interview 5, (2018), p. 88-89

²²⁹ See Interview 7, (2018), p. 127

²³⁰ See Interview 1, (2018), p. 4

²³¹ See Interview 1, (2018), p. 4

²³² See Interview 1, (2018), p. 4

the fear of change that people have. People find it hard to change and can be sceptic towards changes²³³. People find it hard to do things differently and change their mindset²³⁴. Also, in the already bureaucratic world of public purchasing, people can be a bit hesitant to integrate again another extra thing into the tender²³⁵. This shows the importance of creating support among the employees, but also the management²³⁶. You need to have a good story about why the circular economy model is implemented and convince people that it is a good business model²³⁷. This can also be the case for the clients, purchasers need to convince their clients why circular purchasing can be better and even cheaper than normal purchasing²³⁸. Also, the purchasers need to understand that in the circular economy model their role changes from only being the purchaser to becoming a purchasing chain director, it is important to connect the different parts in the chain and take care of good communication between the different parts of the chain²³⁹. A fourth problem is that suppliers say that they have circular made products, but afterwards you find out that it is a lot less circular than the organisation prefers^{240,241}. This problem can again be prevented by asking a lot of questions about the circularity of the product and how a supplier integrated circularity in their product. The last factor that can cause problems in the interviewees opinions is the knowledge about the circular economy. Circular economy is quite a complex and broad subject and it can be hard to find out what circularity exactly is and how it can be integrated in your particular organisation^{242,243}. A solution to this can be to get as much knowledge into your company as possible, communicate with other companies who already started circular purchasing and make sure employees understand what the concept is and what it can do for the company^{244,245}.

5. An eleven-step model was created to introduce a circular economy model in public purchasing and the suitability of product categories differs based on their lifespan and market development.

²³³ See Interview 1, (2018), p. 20

²³⁴ See Interview 5, (2018), p. 85

²³⁵ See Interview 7, (2018), p. 125

²³⁶ See Interview 5, (2018), p. 85

²³⁷ See Interview 2, (2018), p. 39-40

²³⁸ See Interview 6, (2018), p. 105

²³⁹ See Interview 7, (2018), p. 133-134

²⁴⁰ See Interview 2, (2018), p. 28

²⁴¹ See Interview 4, (2018) p. 67

²⁴² See Interview 5, (2018), p. 89

²⁴³ See Interview 6, (2018), p. 102

²⁴⁴ See Interview 2, (2018), p. 33

²⁴⁵ See Interview 5, (2018), p. 89

To get an overall conclusion to this research, in this chapter the research questions and propositions will be answered, starting with sub-question 1 and proposition 1. The first question was:

1.1 What are the differences in the use of the circular economy model in the purchasing departments of public and private companies?

According to the interviewees there are several points that Telgen et al. name as differences between public and private purchasing that have effect on the introduction of a circular economy model in public purchasing. Four of these extra demands can have an accelerating effect on the introduction of a circular economy model in public purchasing compared to private purchasing, these are:

1. The many goals that public organisations have can make the introduction of the circular economy model easier, public organisations do also have a societal responsibility which can be a good reason to start circular purchasing.
2. Public organisations have open budgets, because of the open character of public purchasing, public organisations can already let the market know a tender is coming, giving them the opportunity to prepare themselves before the tender comes on the market.
3. Cooperation is allowed in public purchasing, this can make it easier for other public organisations to introduce a circular economy model because they can use the things that have already done before by others.
4. Because public organisations are large buyers, and they are allowed to work together they can have a bigger influence on the market and pressure them to develop circular products.

There are also four of the extra demands public purchasing has to adhere to compared to private purchasing that have an inhibiting effect on the introduction of a circular economy model in public purchasing:

1. External demands, like transparency, which can cause that public organisations do not always get the most circular supplier.
2. Public organisations have external demands they have to adhere to, including transparency, integrity and accountability, which can result in not getting the most circular supplier.
3. Risk-averse behavior in the public sector can cause that people find it hard to try new things, they can be afraid of the risks and the legal obstructions that may follow.

4. The public tender laws and regulations make it harder for public companies to purchase circular, because they cannot just choose the most circular supplier, also the tender needs to be of higher quality.

The last extra demand is political goals, this demand can both have an accelerating and inhibiting effect on the introduction of a circular economy model in public purchasing. Ambitious and sustainable goals can stimulate the introduction while conservative and non-sustainable goals can inhibit the introduction.

So, the differences between using a circular economy model in private and public purchasing according to the interviewees are the factors named above, these nine extra demands make that implementing a circular economy model can both be accelerated and inhibited. The proposition that: public purchasing has to adhere to multiple extra demands compared to private purchasing, which means that implementing a circular economy in a public organisation is more complicated than in a private organisation is not true. There are extra demands to public purchasing compared to private purchasing as the article by Telgen et al. explains, and according to the interviewees, some of these extra demands do also have effect on the introduction of a circular economy model. This effect however does not always inhibit the introduction of a circular economy model. Four of the extra demands even have an accelerating effect on the introduction of a circular economy model in public purchasing. It cannot be said that introducing a circular economy model in public purchasing is more complicated than in private purchasing. It can be that purchasers perceive introducing a circular economy model in public purchasing is more complicated because of the tender laws they have to adhere, this research shows this is true, however, this research also shows that other demands can help public organisations to introduce a circular economy model. A contribution to the literature has been made here by combining the extra demands that public purchasing has to adhere to with the introduction of a circular economy model. The model developed shows how the extra demands of public purchasing are related with a circular economy model, this specific relationship has not been researched in other articles before.

In the second sub question a seven-step model was developed in which the steps are named that help organisations to introduce a circular economy model. Following research question was answered here:

1.2 What are the steps for public organisations to introduce a circular economy in public procurement?

According to the interviewees there are seven steps that a public organisation should take to get a successful implementation of the circular economy model. These steps can be seen in figure

IX. These steps were compared to the three most used change management models to see what the differences are between the seven-step implementation model created in this study and normal change management processes. Four of the steps named in the seven-step model are also named in the change management models. The change management models however also name extra steps that should be made if an organisation is planning to execute a change process. These were: (1) create a sense of urge, (2) create a strong leader role, (3) create a planning and implementation plan and (4) monitor the change process. By combining the developed seven-step model with the four extra named steps a complete model (Figure XI) is developed that names that steps that a public organisation should take to introduce a circular economy model. In short, the steps are:

1. Create a sense of urge
2. Make sure there is a clear and well described vision and strategy
3. Create a strong leader role
4. Create support and enthusiasm among management and employees
5. Define ownership
6. Create a planning and implementation plan
7. Let the market know you are going to introduce the new model
8. Increase the knowledge about circular economy
9. Find a good starting or pilot project
10. Share achievements and knowledge
11. Monitor the change and consolidate improvements

The proposition that the steps for implementing a circular economy model can partly be based on the steps used in the most used change management models is true. As can be seen in the part above, there are certain steps that an organisation can take to get a successful implementation of the circular economy model, these steps are also partly named in the change management literature. However, three of the steps that are named in the eleven-step implementation model are only named in this model and not in the change management literature. A contribution to the change management literature has been made here by combining the existing change management literature with new findings of this research, no other research has created a model before by combining these two forms of data. The result is a model which shows how public organisations can implement a circular purchasing model, this means that also a practical contribution has been made. Public organisations can use this 11-step model in practice to introduce a circular purchasing model.

The third sub-question was about the different purchasing categories public organisations have and their suitability for use in a circular economy model. The question was:

Which of the most common purchasing categories of public organisations are suitable, semi-suitable and non-suitable to integrate in a circular economy model?

To get an answer to this question, first the factors that influence the suitability for use in a circular economy model had to be found. According to the interviewees, there are two factors that can have an influence, these are the market development and the lifespan for that specific product category. Some branches are further developed and offer more solutions for a circular product than others, this makes these branches more suitable for circular purchasing at this moment. The lifespan can have an influence on the suitability because shorter lifespan's make it easier for companies to show the added value that the circular product has. For this research, six of the most used product categories were assessed on their suitability. A contribution to the literature was made here by looking at the different characteristics of purchasing categories to assess their suitability for use in a circular economy model. This particular relationship has not been researched in other articles about circular economy before, this research can be added to the literature about circular economy and has expanded the theoretical knowledge of what determines whether a product category is suitable for use in this new purchasing model or not. Furthermore, a practical contribution was made by developing a figure in which public organisations can assess different purchasing categories on their suitability for use in a circular economy model, they will need the lifespan and market development of these categories to do so. By using the figure created in this research public organisations can see which of their product categories are suitable to purchase in a circular way and which are not, this way they can make sure the implementation of the new model will be as effective as possible.

The product categories with the highest suitability were products that can be seen as facilities or consumer products, these were office furniture and catering. These categories scored high because of the well-developed market of the office furniture category and short lifespan of the catering category. Also, multiple circular solutions have been implemented for these categories. The next most suitable category is the company clothing, this category has a short lifespan, the market however is not as far developed as the catering yet. There are still some technical barriers that prevent 100% circular clothing. The next two categories are ICT and telecommunication, the market for these categories is almost undeveloped in the field of circular economy. The short lifespan however could make it easier to develop and introduce new circular solutions. The least suitable product category is building, in this category the market has already developed some circular solutions, the problem here however is the lifespan.

Buildings do have a lifespan of dozens or hundreds of years, this makes it hard to visualise the effects that introducing a circular solution to this has.

Proposition 3. There is a difference in the suitability of implementing a circular economy in different purchasing categories, because of their characteristics.

After answering the research question, we can say that the proposition is true. At this moment, the interviewees think there is a difference in the ease of implementing a circular economy model for different product categories.

After answering all the sub-questions, the main research question can be answered:

What are the steps to introduce a circular economy model in public purchasing departments and do public purchasing categories differ in their suitability for use in a circular economy model?

The eleven-step model developed in this research gives an answer to the first part of the research question. This model gives a complete set of steps that public organisations should take if they plan to introduce a circular economy model. Furthermore, the suitability of this introducing this model does differ for the different purchasing categories. Purchasing categories of which the market is well developed, and which have a short lifespan are most suitable for the use in this model. Purchasing categories with a low market development or long lifespan are less suitable at this moment. This research has contributed to the literature in multiple ways, first the relation between the extra demands that public purchasing has to adhere to and circular economy was examined resulting in a model that shows nine extra demands and their influence on circular economy. This particular cannot be found in other research. Second an eleven-step model was created which guides public organisations in how to introduce a circular economy model. This model can be added to the change management literature, as it includes the steps on how to manage the change process of introducing a circular economy in public organisations. Lastly a model was created in which public organisations can assess the suitability of different purchasing categories based on their lifespan and market development. The literature has not researched the factors that influence the suitability of product categories for use in a circular economy model before, these factors that influence the suitability for use in a circular economy model can also be added to the literature now.

6. Saxion should follow the eleven-step model for introducing the circular economy model developed by this study and choose a suitable product category to start with using the suitability model.

If Saxion wants to implement this model, the advice would be to look at the extra demands they have to adhere to as a public organisation. As explained in chapter 4.2.3. there are demands that have an accelerating and inhibiting effect on the introduction of a circular economy model. By finding out how these demands apply to Saxion they can use the demands that can accelerate the introduction of the circular economy model. Furthermore, it would be advised to follow the steps named in the eleven-step implementation model. The first important step here would be to find a good vision and strategy. An interview with one of the members of the current executive board made clear that currently Saxion has no vision or strategy in the field of circular economy. As this is an important step for a successful introduction of a circular economy model, it would be wise to sit together with different departments and the executive board to find a vision and strategy which everyone would agree with and in which everyone can find their own contribution. They should share their ambition for a circular economy model and their vision on this topic with the market, so the market can prepare themselves for this change. Ambassadors of the new model can be appointed to give advice and enthuse the employees. The knowledge of employees about this topic should be increased via trainings or congresses, this would also help employees to find out how they can contribute to this project. To make sure the implementation of the new model goes as good as possible, Saxion should find a product category which already has a lot of suitable circular solutions, finding a good pilot project with a suitable product category can help to get a successful implementation. This pilot project can first be performed at one of the three locations of Saxion and if successful be expanded to the other locations. Since public organisations are allowed to cooperate with other public organisations it would be advised to share knowledge about this topic with other public organisations or other university for applied sciences. This can for example be done via the HIP (Purchasing platform for universities of applied sciences). After the first projects have been successfully completed, the results of these projects must be shared. This storytelling helps to get people to know with what Saxion does in the field of circular economy or sustainability and can help to improve the image of the School. If the employees of Saxion feel their knowledge about this topic is not sufficient enough to ensure a successful implementation, it would be advised to hire a consultancy firm which can help them with setting the vision for example or starting the first pilot project.

There are also some extra advise points Saxion can use, since Saxion is a school, it can use and integrate their own education in the projects to implement the circular economy model. In January 2014, Saxion has established a platform for sustainability consisting of 4 members from different backgrounds (a teacher as well as directors). This platform collects and concentrates all the activities around sustainability at Saxion to create an overview of all

ongoing projects. This way they want to purposefully extent and improve the sustainable practices at Saxion. They stimulate research in sustainability, education in sustainability and sustainable operations management. There are different researches that have been conducted at Saxion related to sustainability, among these are energy scans of the different buildings and solar parking, there are also initiatives from different kinds of academies at Saxion. This platform could help as a leading platform for the school in introducing a circular economy model.

Sustainability and circular economy are getting more and more important in today's education, students can be asked to help with the implementation via assignments and researches. Saxion has a lot of knowledge in their own organisation which it can use, for example the lectorate about sustainability. There are also some projects which have already been performed by students or lectors. One of these is done by the creative academy, the Saxcell project, the creative academy (ACT) has done different projects and developed a material called SaXcell. This is a material with an efficiency of 98%, meaning that 98% of the material can be reused^{246,247}. This fibre could for example be used for the working clothes at Saxion if they work together with these researchers. An initiative that is currently already executed at Saxion is the 'waste project'. This project, which started at the end of 2017, is a project which is executed with suppliers and students of Saxion. At this moment, only paper and chemical waste are collected separately (separation at source), all the other waste is separated later (post-separation). This means that currently all different rooms have different garbage cans which are emptied every day. Despite of the separation of paper, still a big fraction of the waste consists of paper, this is because of the coffee cups. In this pilot, Saxion will start with source separation. The number of garbage cans will be decreased, and the different fractions of waste will be collected separately. These measures will lead to financial benefits and a more positive/sustainable image of Saxion. For Saxion the image of being a sustainable organisation is important because students attach more and more value to it. This waste project can be a good starter for the introduction of a circular economy. The project allows Saxion to show what a circular economy can deliver and how it can be put into practice.

7. The researcher did use the same method and questions for all interviewees, however different interpretation of the questions can lead to different answers, follow-up studies should take place to ensure the quality of the results found.

²⁴⁶ See MVO, p. 1

²⁴⁷ See SaXcell, p. 1

As in any research, there are limitations that affect the liability of the results. Since this study is a qualitative study, based on interviews the results are all from the experiences of the participants in this study. By only interviewing participants who have real experience with the introduction of a circular economy model, the validity of this research can be confirmed. Also, the researcher chose to use semi-structured in-depth, open questions interviews, because this method delivers the most data possible and other methods were not applicable or not possible because of the limited resources. There is however one problem with interviews, the results are always opinions and experiences of the participants, this can have an influence on the results. Also, Qu and Dumay mention that: *'Different interviewers will evoke different responses from the same interviewee given the way questions are asked and probed'*²⁴⁸. Many of the results that came out of the interviews however were mentioned by more than one of the interviewees. This helps to increase the reliability of the results because the interviewees did not know each other's answers. Since this research has created a step by step plan for the introduction of a circular economy model for all public organisations, the external validity of the research is high. The interviewees almost all named the same steps on how to introduce the new model, which makes it likely that these steps work for all public organisations. There are no results that did not match with the expectations, the results that came out of the interviews were as expected.

For this research it was needed to interview seven participants to collect enough results for answering the research questions. However, if more people with experience in this field will be interviewed, it can be that other or more results are found. Furthermore, all the participants in this research had a positive experience with introducing a circular economy model. This positive view on the model can have an influence on how objective the respondents are about the implementation of the new model. This positive view however can also be because there are only little bad experiences with introducing this model which makes it not plausible that this is a problem in this research.

To evaluate the added value of this research and the models that were developed here, it would be good to do a follow-up study. This follow up study could be done with some public organisations who would like to introduce a circular economy model. These companies should then implement a circular economy model using the new eleven-step model that was created in this research. After this implementation has been taken place an evaluation should take place to find out whether the steps that were followed led to a successful implementation. This evaluation can help to see whether these steps are enough to implement a circular economy in a good way, or more steps are needed. Another good follow-up study would be to research the

²⁴⁸ Qu & Dumay, (2011), p. 247

suitability of more product categories based on the factors that influence the suitability according to the interviewees in this research. This way public companies can get an overview of the categories for which the introduction is suitable and for which categories not, this could help organisations in deciding with which product category they should start to implement a circular economy model. Also, a research can be done to find out whether there are more factors that determine the suitability of product categories for use in a circular economy model. The results of this research show two factors that influence the suitability of product categories, however a larger scale research might give more results. A last interesting research would be to find people who have had a bad experience with introducing this model. In this research all the interviewees were enthusiastic about the model and did not name much problems that it has. If people that are more sceptic would be interviewed, this could help to find more of the problems that introducing this model has which otherwise would not be named and a fairer overview can be given. Overall the topic of circular economy is still upcoming, and a lot of research has to be and can be done on this topic.

8. Appendix

A8.1– Questions interview site visits

Dear interviewee,

My name is Wesley Jannink, master student purchasing & supply management at the University of Twente. This interview will be performed as a part of my master thesis about the possibilities of introducing a circular economy within public organisations. The goal of this study is to find the best practice in performing circular economy purchasing in purchasing departments, and the best way the circular economy purchasing can be introduced in public organisations. This research is executed for Saxion school for applied science. The research question is:

What are the steps to introduce a circular economy model in public purchasing departments and do public purchasing categories differ in their suitability for use in a circular economy model?

In this interview, the sub-questions: What are the steps for public organisations to introduce a circular economy in public procurement and which of the most common purchasing categories of public organisations are suitable to integrate in a circular economy, will be answered.

Participation in this interview is completely voluntary and the given answers will be treated confidentially.

Questions:

1. What is, according to you, the current best practice in the area of public purchasing, and why? Do you have examples of this best practice?
2. What is the currently the best way to implement circular purchasing within public organisations (total circular economy/in parts), and why?
3. Why did you/your organisation choose for implementing circular purchasing?
4. What is the current size of circular purchasing in your organisation (€/%), what is purchased circular and what is not?
5. How did you implement circular purchasing in your organisation?

6. Which steps were needed to make circular purchasing possible (preparations/advice)?
7. 'In your opinion, are public organisations inhibited in performing circular purchasing by the extra demands they have to adhere to compared to private purchasing? If yes, why? If no, why not?'
8. What are the pros of circular purchasing?
9. What are the cons of circular purchasing?
10. Did you encounter problems when introducing circular purchasing within your (public) organisation? If yes, what kind of problems?
11. Which product categories are, according to you, suitable/semi-suitable/non-suitable for circular purchasing? What makes a product suitable/non-suitable?
12. Do you have other tips/recommendations for introducing circular purchasing?
13. Do you still have questions or comments about the interview?

If questions arise after the interview, or contact with the researcher is needed for another reason, this can be done via: w.r.jannink@student.utwente.nl

A8.2 Informed consent interview (in Dutch)

INFORMED CONSENT FORMULIER

Naam van het onderzoeksproject

Mogelijkheden circulaire economie in publieke inkoop

Doel van het onderzoek

Dit onderzoek wordt geleid door Wesley Jannink. U bent van harte uitgenodigd om deel te nemen aan dit onderzoek. Het doel van dit onderzoek is het vinden van de best practice in circulair inkopen op dit moment, of dit ook toepasbaar is binnen publieke organisaties en of de toepasbaarheid van circulair inkopen verschilt per inkoop categorie.

Gang van zaken tijdens het onderzoek

U neemt deel aan een interview waarin aan u vragen zullen worden gesteld over circulair inkopen. Een voorbeeld van een typische vraag die u zal worden gesteld: "Hoe is het circulair inkopen toegepast binnen uw organisatie".

U dient tenminste 18 jaar te zijn om deel te nemen aan dit onderzoek.

Tijdens het interview zal, aan de hand van een topic list, dieper worden ingegaan op de circulaire economie. Van het interview zal een audio-opname worden gemaakt, zodat het gesprek later ad-verbatim (woord voor woord) kan worden uitgewerkt.

Dit transcript wordt vervolgens gebruikt in het verdere onderzoek.

Potentiële risico's en ongemakken

- Er zijn geen fysieke, juridische of economische risico's verbonden aan uw deelname aan deze studie. U hoeft geen vragen te beantwoorden die u niet wilt beantwoorden. Uw deelname is vrijwillig en u kunt uw deelname op elk gewenst moment stoppen.

Vergoeding

U ontvangt voor deelname aan dit onderzoek geen vergoeding. Door deel te nemen aan dit onderzoek zult u meer inzicht krijgen in het onderzoek dat op dit moment plaats vindt op het gebied van circulaire economie.

Vertrouwelijkheid van gegevens

Uw privacy is en blijft maximaal beschermd. Er wordt op geen enkele wijze vertrouwelijke informatie of persoonsgegevens van of over u naar buiten gebracht, waardoor iemand u zal kunnen herkennen.

Voordat onze onderzoeksgegevens naar buiten gebracht worden, worden uw gegevens **anoniem** gemaakt.

- uw naam wordt vervangen door anonieme, op zichzelf betekenisloze combinatie van getallen.

In een publicatie of presentatie zullen of anonieme gegevens of pseudoniemen worden gebruikt. De audio-opnamen, formulieren en andere documenten die in het kader van deze studie worden gemaakt of verzameld, worden opgeslagen op een beveiligde locatie bij de Universiteit Twente en op de beveiligde (versleutelde) computers van de onderzoekers.

Vrijwilligheid

Deelname aan dit onderzoek is geheel vrijwillig. U kunt als deelnemer uw medewerking aan het onderzoek te allen tijde stoppen, of weigeren dat uw gegevens voor het onderzoek mogen worden gebruikt, zonder opgaaf van redenen.

Dit betekent dat als je voorafgaand aan het onderzoek besluit om af te zien van deelname aan dit onderzoek, dat dit op geen enkele wijze gevolgen voor u zal hebben. Tevens kun je tot 20 werkdagen (bedenktijd) na het interview alsnog de toestemming intrekken die je hebt gegeven om gebruik te maken van jouw gegevens.

In deze gevallen zullen uw gegevens uit onze bestanden worden verwijderd en vernietigd. Als u besluit om te stoppen met deelname aan het onderzoek, of als u vragen of klachten heeft, of uw bezorgdheid kenbaar wilt maken, of een vorm van schade of ongemak vanwege het onderzoek, neemt u dan a.u.b. contact op met de onderzoeksleider:

Wesley Jannink: Wesleyjannink95@hotmail.com

Toestemmings-verklaring

Met uw ondertekening van dit document geeft aan dat u minstens 18jaar oud bent; dat u goed bent geïnformeerd over het onderzoek, de manier waarop de onderzoeksgegevens worden verzameld, gebruikt en behandeld.

Indien u vragen had, geeft u bij ondertekening aan dat u deze vragen heeft kunnen stellen en dat deze vragen helder en duidelijk zijn beantwoord. U geeft aan dat u vrijwillig akkoord gaat met uw deelname aan dit onderzoek. U ontvangt een kopie van dit ondertekende toestemmingsformulier.

Ik ga akkoord met deelname aan een onderzoeksproject geleid door Wesley Jannink. Het doel van dit document is om de voorwaarden van mijn deelname aan het project vast te leggen.

1. Ik kreeg voldoende informatie over dit onderzoeksproject. Het doel van mijn deelname als een geïnterviewde in dit project is voor mij helder uitgelegd en ik weet wat dit voor mij betekent.
2. Mijn deelname als geïnterviewde in dit project is vrijwillig. Er is geen expliciete of impliciete dwang voor mij om aan dit onderzoek deel te nemen.
3. Mijn deelname houdt in dat ik word geïnterviewd door Wesley Jannink. Het interview zal ongeveer 45 minuten duren. Ik geef de onderzoeker (s) toestemming om tijdens het interview opnames (geluid/ beeld) te maken en schriftelijke notities te nemen. Het is mij duidelijk dat, als ik toch bezwaar heb met een of meer punten zoals hierboven benoemd, ik op elk moment mijn deelname, zonder opgaaf van reden, kan stoppen.
4. Ik heb het recht om vragen niet te beantwoorden. Als ik me tijdens het interview ongemakkelijk voel, heb ik het recht om mijn deelname aan het interview te stoppen.
5. Ik heb van de onderzoeksleider de uitdrukkelijke garantie gekregen dat de onderzoeksleider er zorg voor draagt dat ik niet ben te identificeren in door het onderzoek naar buiten gebrachte gegevens, rapporten of artikelen. Mijn privacy is gewaarborgd als deelnemer aan dit onderzoek.
6. Ik heb de garantie gekregen dat dit onderzoeksproject is beoordeeld en goedgekeurd door de ethische commissie van de BMS Ethics Committee. Voor bezwaren met betrekking tot de opzet en of uitvoering van het onderzoek kan ik me wenden tot de Secretaris van de Ethische Commissie van de faculteit Behavioural, Management and Social Sciences op de Universiteit Twente via ethicscommittee-bms@utwente.nl
7. Ik heb dit formulier gelezen en begrepen. Al mijn vragen zijn naar mijn tevredenheid beantwoord en ik ben vrijwillig akkoord met deelname aan dit onderzoek.
8. Ik heb een kopie ontvangen van dit toestemmingsformulier dat ook ondertekend is door de interviewer.

_____	_____	_____
Naam deelnemer	Handtekening	Datum

_____	_____	_____
Naam Onderzoeker	Handtekening	Datum

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