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Article

Creating shared value in the circular economy of Finland: A quadruple helix perspective

Murat Akpinar, JAMK University of Applied Sciences, School of Business, Rajakatu 35, 40200, Jyväskylä, Finland, murat.akpinar (at) jamk.fi

Abstract

Creating shared value (CSV) refers to strategies that improve the competitiveness of a company while simultaneously advancing the welfare of the society. This research adopts the three ways to achieve CSV in the context of the circular economy and aims to understand whether and how the government, including cities and municipalities, university, hybrid organizations, industry and the society, which are the key actors in the quadruple helix model, are involved in CSV initiatives in Finland's transition to the circular economy. Results suggest that circular economy demands a systematic approach, and not only companies, as stipulated in the original version of the CSV concept, but all actors in the quadruple helix model can contribute to realize CSV directly or indirectly. This finding contributes to theory by expanding the borders of CSV from a narrow focus on companies to a broader focus including also the government, university, and society. A second contribution is the identification of a fourth type of CSV by the society that is specific to the circular economy. The contribution to practice lies in the presentation of exemplary CSV practices from one of the world's leading countries in the circular economy.

Keywords: Creating shared value, quadruple helix model, circular economy, Finland.

1. Introduction

Growing concerns on global warming and the over-use of natural resources suggest that the traditional linear economy of extracting, producing, using and dumping materials is no longer sustainable (Pollard et al. 2016; Murray et al. 2017; Korhonen, Honkesalo and Seppälä 2018). In response, discussions on sustainable development, defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland 1987), gained momentum following the Brundtland report of the United Nations in 1987 (Geissdoerfer et al. 2017). The triple bottom line concept (Elkington 1997) was adopted following the United Nations World Summit in 2002, targeting a balanced integration among the social, economic and environmental dimensions of sustainability (Geissdoerfer et al. 2017). Finally, the United Nations identified 17 Sustainable Development Goals (SDGs) and 169 targets in 2015, which must be achieved latest by 2030 (United Nations 2015).

Circular economy assumes that the world's supply of natural resources is limited, and the world has a limited capacity to absorb waste and pollution (Murray et al. 2017). In their review of 114 definitions, Kirchherr et al. (2017) found out that as an umbrella concept it is a restorative or regenerative industrial system. The common denominator in most definitions is the concept of cyclical closed and slowing loop system (Murray et al. 2017). A comprehensive definition is provided by Geissdoerfer et al. (2017) as "*a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and*

energy loops through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling". It has gained increasing attention from mainly practitioners since the start of the 21st century as a suitable model for sustainable development. It has been integrated into government policies especially in China, Japan and the European Union (Murray et al. 2017). One shortcoming of the current literature on circular economy is that business models and consumers, key enablers of circular economy, are neglected (Lewandowski 2016; Kirchherr et al. 2017). Perhaps this is because circular economy concepts have been developed mostly by scholars from the fields of engineering and natural sciences in isolation from business studies (Korhonen, Nuur, Feldman and Birkie 2018). In future research, more emphasis on circular economy business models is needed as the private sector is expected to lead the transition to circular economy (Lewandowski 2016; Kirchherr et al. 2017), and these business models need to include consumers as their central enablers in order to be viable (Gallaud and Laperche 2016).

Creating shared value (CSV) refers to policies and practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities where the company operates (Porter and Kramer 2011). It was introduced as a response to the urgent calls for the renewal of businesses to take more responsibility for tackling social and environmental challenges. The underlying assumption of the concept is that by integrating social and environmental challenges into their core strategy companies not only create social value but also have an opportunity to gain competitive advantage over their rivals and achieve higher economic returns. The concept has been criticized in three ways. First of all, it has similarities with earlier concepts like the bottom of the pyramid, mutual value, blended value, stakeholder management, strategic corporate social responsibility, triple bottom line, and conscious capitalism (Crane et al. 2014; Dembek et al. 2016; Vallentin and Spence 2017). Secondly, it ignores the inherent tensions between creating economic value and social value (Crane et al. 2014; Vallentin and Spence 2017), and finally it views social needs not as ethically important ends but rather as means to achieve economic goals (Aakhus and Bzdak 2012; Beschorner 2013; Vallentin and Spence 2017). Despite these criticisms, CSV has gained a lot of attention from the academia, and many companies have undertaken successful CSV initiatives (FSG 2020), both in developed economies (see Ilmarinen and Akpinar 2018) and developing economies (see Mermercioglu et al. 2019). There are still significant opportunities for CSV in international business (Akpinar and Saleem 2019). This research contributes to the CSV literature by exemplifying in the context of the circular economy that its successful realization can't be solely attributed to companies. Rather, it is the outcome of interactions by government, university, hybrid organizations, industry (companies) and society. This finding opens a new horizon for the development of the CSV concept in future research. A second contribution lies in finding a fourth type of CSV in addition to the three types by Porter and Kramer (2011).

The quadruple helix model is derived from the triple helix model of innovation by adding society as the fourth helix to government, university, and industry. This model studies the co-evolutionary interactions of the four helices in the process of innovations (Carayannis and Campbell 2009). The theoretical framework of this study integrates the quadruple helix model with the three types of CSV, and it is applied to study successful circular economy practices from Finland. Finland is selected for this study because it is a leading nation which set out one of the world's most climate-ambitious government programs and published the world's first national road map towards a circular economy in 2016 (Sitra 2016). According to this road map, the target is to make Finland a global leader in the circular economy by 2025.

The structure of the rest of the paper is as follows. Section 2 reviews literatures on circular economy, CSV, and the quadruple helix model, and outlines the theoretical framework. Section 3 presents the methodology, and Section 4 shares the results. Finally, the paper ends with a discussion and conclusion in section 5.

2. Literature review

2.1 Circular economy

Rooted in the discipline of ecological and environmental economics, key concepts of circular economy include industrial ecology, industrial symbiosis, cradle-to-cradle design, sharing economy, performance economy, biomimicry, natural capitalism, blue economy and regenerative design (Ghisellini et al. 2016; Korhonen, Nuur,

Feldman and Birkie 2018; Ellen MacArthur Foundation 2020). Circular economy contributes to the sustainable development literature in two ways, first by its emphasis on the importance of high value and high quality material cycles, and second by the introduction of the sharing economy for a more sustainable production-consumption culture (Korhonen, Honkesalo and Seppälä 2018). Circular economy aims to eliminate the end-of-life concept by designing materials, products and business models using the 3R framework (reduce, reuse, recycle) according to the principles of the power of the inner circle, the power of circling longer, the power of cascaded use, and the power of pure circles (Ellen MacArthur Foundation 2013). These principles argue that the net value added for sustainability will be higher when used products are reused rather than remanufactured or recycled (the power of the inner circle), and lengths and numbers of cycles are extended (the power of circling longer). The net value added will also be higher if there are diverse reuse alternatives for used products (the power of cascaded use), and the circular economy operations are carried out with minimum waste and contamination (the power of pure circles). It is important to optimize systems rather than parts in order to achieve transformative and systematic change (Preston 2012; Pollard et al. 2016). Based on these principles Moraga et al, (2019) suggest six circular economy strategies: (1) to preserve the function of products or services by circular business models, (2) to preserve the product itself through lifetime increase, (3) to preserve the product's components through reuse, recovery and repurposing of parts, (4) to preserve the materials through recycling, (5) to preserve the embodied energy through energy recovery, and (6) to measure the linear economy as the reference scenario in order to benchmark progress.

According to Korhonen, Honkesalo and Seppälä (2018) circular economy has the potential to contribute to the economic prosperity, environmental quality and social equity dimensions of sustainable development. Economic gains are achieved through reduced raw material and energy costs, optimal use of scarce resources, reduced costs from environmental taxation, reduced losses in value and leaks, reduced waste management and emissions control costs, positive responsible business image and new market opportunities. Environmental gains include reduced use of virgin materials, increased use of renewable sources of energy, and as a result, reduced wastes and emissions. Finally, social gains are new employment opportunities and enhanced sense of community, as well as cooperation and participation through the sharing economy. Kircherr et al. (2017) and Murray et al. (2017) suggest that the primary aim of circular economy projects is economic prosperity followed by environmental quality, and their impact on social equity is mostly overlooked. The negligence of the social equity dimension is highly significant because "*a world in which poverty is endemic will always be prone to ecological and other catastrophes*" (Brundtland 1987).

Circular economy practices have been studied at micro (e.g., companies), meso (e.g., eco-industrial parks), and macro levels (e.g., eco-cities, sharing economy) (Yuan et al. 2006). These studies show that implementing circular economy has challenges related to measuring the net sustainability contributions, lock-in to existing resource-intensive infrastructures, managing network level inter-organizational cooperation, political obstacles for putting an appropriate price on resource use, high up-front costs, and lack of consumer enthusiasm (Preston 2012; Korhonen, Honkesalo and Seppälä 2018). Zink and Greyer (2017) argue that three conditions must hold in order for circular economy to succeed. First, secondary goods must be true substitutes for primary goods. Second, secondary goods must not increase the aggregate demand for goods, and finally secondary goods must draw consumers away from primary goods. To speed up the transformation to circular economy, there is also need for a major push towards international cooperation because trade in waste and resources as well as supply chains are international (Preston 2012).

2.2 CSV

CSV embeds a social purpose in the culture of the company such that management tackles social problems proactively in the company's core strategy, which simultaneously creates economic value for all stakeholders (Porter and Kramer 2011; Pfitzer et al. 2013). Tackling social problems creates economic advantages because social problems hurt company productivity by incurring additional costs, and they represent unserved market opportunities (ibid.). According to Crane et al. (2014) this proposition fails to acknowledge the inherent tensions between economic value and social value. Vallentin and Spence (2017) further argue that CSV takes a narrow conception of the company's role in society and does not deal with the fundamental problems of corporate

irresponsibility. In addressing this criticism, de los Reyes et al. (2017) integrate an ethical framework to CSV, and Lee (2019) suggests using the logic of appropriateness to overcome the issue of managerial bounded rationality.

According to Porter and Kramer (2011) there are three types of CSV. In Type 1, companies innovate new products and services to meet an unmet social need of an unserved or underserved market (Type 1 CSV). The bottom of the pyramid concept by Prahalad (2010) can be considered as Type 1 CSV. Especially disadvantaged societies in emerging markets and least-developed markets offer opportunities for Type 1 CSV (Michelini and Fiorentino 2012; Akpinar and Saleem 2019). In Type 2 CSV, companies restructure their value chains in order to address social problems while improving their productivity. Examples of Type 2 CSV are the optimization of material flow routes, improvements in employee health and safety, and the recycling of waste materials, an act of circular economy (Porter and Kramer 2011). Finally, in Type 3 CSV, companies develop the capabilities of their local clusters by developing the infrastructure, training people, and collaborating with cluster members.

Implementing an economic mission and a social mission simultaneously is challenging because managers are subject to the problem of bounded rationality (Lee 2019). Perhaps Type 3 CSV is the most challenging to implement because it requires high investments with long pay-off period (Porter and Kramer 2011). This makes it difficult to gain the engagement of a variety of stakeholders, let alone free riders. According to Kramer and Pfitzer (2016), a collective-impact approach with shared value-oriented leadership is always necessary for implementing Type 3 CSV successfully. This kind of leadership requires a shared value-oriented entrepreneurial vision, a common agenda and strategic alignment, networking capabilities and good communication with all stakeholders, and a shared system for measuring economic and social value (Pfitzer et al. 2013; Kramer and Pfitzer 2016). CSV initiatives are more likely to succeed if there is consistency between the creation of economic value and social value (Maltz and Schein 2012).

Proper measurement of economic and social value is challenging since CSV is a dynamic concept (Pfitzer et al. 2013). Porter et al. (2012) suggest using multiple measures in order to capture the many dimensions of this dynamic concept. In Type 1 CSV while measures to assess economic value include increases in revenues, market share, market growth and profitability, measures for assessing social value can be improvements in patient care, carbon footprint, nutrition, and education. In Type 2 CSV measures of economic value can include improved productivity, reduced logistical and operating costs, secured supply, improved quality, and improved profitability, and measures for social value can be reduced energy use, reduced water use, reduced raw materials, improved job skills, and improved employee incomes. Finally, in Type 3 CSV, economic value can be assessed with measures like reduced costs, secured supply, improved distribution infrastructure, improved workforce access, and improved profitability, and social value can be measured with improved education, increased job creation, improved health, and improved incomes in the cluster.

2.3 Quadruple helix model

In transition to the knowledge-based economy, dynamic and nonlinear interactions between government, industry, and university, so-called the triple helix model, are influential in driving innovative regions (Etzkowitz and Leydesdorff 2000). They can be top-down on the one extreme under the leadership of government (i.e. the ‘statist’ configuration), and on the other, the three spheres can be completely independent from each other with minimal interactions (i.e. the ‘laissez-faire’ configuration) (ibid.). In both of these configurations, the three actors have clear-cut roles. Government makes policies, establishes the legislative framework, provides infrastructure, and supplies research funding; industry carries out business activities; and university educates talent and generates knowledge (Etzkowitz 2018). The ideal scenario, however, is the ‘balanced’ configuration where the spheres intersect with each other. This is because these intersections, called boundary spaces, create the most favorable environments for innovation through the emergence of hybrid organizations (Ranga and Etzkowitz 2013; Champenois and Etzkowitz 2018). In this configuration government, industry and university do not only perform their own roles but also take the role of, or substitute the weak or underperforming other (Etzkowitz 2018; Etzkowitz and Zhou 2018). The importance of the different roles of the three helices can also change during different stages of new business formation and growth (Steiber and Alänge 2013). For example, while the importance of university is the highest in the inception and launch stages and diminishes towards the growth and maturity stages, the importance of industry increases as new ventures move from the inception stage towards the

maturity stage (Pique et al. 2018). Furthermore, as Pique et al. (2018) argue, interactions among the helices are the highest during the inception and launch stages, and they diminish during the growth and maturity stages.

Technology transfer, organizing innovation, collaboration and conflict moderation, substitution, and networking are the key activities in triple helix relationships, organized under the knowledge, innovation and consensus spaces (Ranga and Etzkowitz 2013; Meyer et al. 2018). The aim of the knowledge space is to create and develop knowledge resources for innovations. This can be achieved through relocating existing education and research resources, attracting leading researchers, and creating new education and research resources. The aim of the innovation space is the development of local innovation-based start-up companies. This can be achieved through building an innovation ecosystem that supports technology transfer, entrepreneurship and new business development. Finally, the aim of the consensus space is to coordinate interactions between the knowledge and innovation spaces by bringing together triple helix actors into a collaborative process of exchanging ideas and resources and negotiating shared purposes.

Despite its wide acceptance, the triple helix model has been criticized for its exclusion of the entrepreneur from the model (Brännback et al. 2008), due to its ignorance of challenges related to the ownership of intellectual property rights (Tuunainen 2002), and the exclusion of the society (Carayannis and Campbell 2009). There are different views on the role of the society in the model. Rather than seeing it as a fourth helix, Etzkowitz (2018) suggests that the society is a platform on which the triple helix model is built. Etzkowitz and Zhou (2018), on the other hand, perceive the society as part of the triple helix, replacing industry, in issues related to sustainability. The society is added as a fourth helix in the quadruple helix model introduced by Carayannis and Campbell (2009). Later on Carayannis et al. (2012) add the natural environment as a fifth helix and introduce the quintuple helix model. From the purposes of this study, the quadruple helix model is the most suitable because in addition to the three helices the society is a key actor to influence sustainability issues, as already recognized by Etzkowitz and Zhou (2018) in their adapted triple helix model for sustainability. It is also optimal because the society represents bottom-up actions (Carayannis and Rakhmatullin 2014). The society is also user and co-creator of innovations (ibid.). The natural environment, on the other hand, is the resource what circular economy aims to preserve for future generations. It is not an actor, which can contribute to resolve sustainability issues. In that respect, the quadruple helix model, and not the quintuple helix model is selected for the purposes of this study. There are a number of studies on the innovation ecosystem of Finland which use the triple helix model (see Solesvik 2017; Meyer et al. 2018; Akpinar and Qi 2020), but this is one of the first studies that utilizes the quadruple helix model.

2.4 Theoretical framework

Table 1. The theoretical framework. Adapted from the quadruple helix model (Carayannis and Campbell 2009) and Porter and Kramer's (2011) three types of CSV

	Type 1 CSV New products and services	Type 2 CSV Restructuring the value chain	Type 3 CSV Cluster development
Government	?	?	?
University	?	?	?
Hybrid organizations	?	?	?
Industry	?	?	?
Society	?	?	?

The theoretical framework is developed by integrating the four helices of the quadruple model (Carayannis and Campbell 2009) and the hybrid organizations created at the intersections of the helices to the three types of CSV (Porter and Kramer 2011) in order to study successful CSV initiatives in the circular economy (see Figure 1). This

framework will allow mapping CSV practices in the circular economy by their type and contributors. This mapping of the CSV initiatives will increase our understanding on whether CSV is specific only to companies (Porter and Kramer 2011) or whether other actors of the quadruple helix also contribute to the realization of successful CSV initiatives. It will also reveal which types of CSV are more common in the circular economy.

3. Methodology

3.1 Research approach and context

The research approach is qualitative, with the aim to identify and analyze successful CSV initiatives in the circular economy from Finland. This approach suits well to the exploratory nature and the objectives of this research. The research strategy is historical analysis, which studies the past and analyzes past events in a systematic way (Gottschalk 1969). Historical analysis is used for studying processes and changes over time (Gummesson 2000). Therefore, it suits well for understanding the transformation from the linear economy to the circular economy. In the empirical study, the developed theoretical framework acts as the guide in organizing the initiatives by their types of CSV and by the roles of the government, university, hybrid organizations, industry and society. In-depth comparisons of a variety of CSV initiatives in the circular economy enrich our understanding of the roles of the various actors in successfully realizing these initiatives. Lessons learned will not only contribute to developing our theoretical understanding of CSV but also serve as examples for other countries, which aim to develop circular economy initiatives.

Finland is located in Scandinavia, between Russia in the east, the Baltic Sea and the Gulf of Finland in the south, Gulf of Bothnia and Sweden in the west, and Norway in the north. It has a population of 5.5 million, and the majority of the people live in the southern cities of Helsinki, the capital, Espoo, Vantaa, Turku and Tampere. Finland is rich in the natural resources of forests, covering nearly 70% of its land. As a result, the country has been a leading global player in its related traditional industries, like pulp and paper, and ship-building. A member of the European Union since 1995, Finland was successful to build an innovation-driven economy and become the world's most competitive economy in 2000 thanks to investments in its education system and R&D ecosystem (Sölvell and Porter 2011). This was evidenced by the emergence of the world's leading mobile phone manufacturer, Nokia. Finland's competitiveness, however, has been degrading during the last decade following the fall of Nokia (El Husseini and Akpinar 2019). One of the strategic responses of the Finnish government to the country's declining competitiveness was to embrace the circular economy as a future opportunity. The government set the goal to make Finland a global leader in the circular economy by 2025, and Sitra, the Finnish Innovation Fund, wrote the world's first road map in 2016 for Finland to achieve this ambitious goal (Sitra 2016). The road map sets concrete action plans for improvements for all stakeholders. Finland also hosted the first ever World Circular Economy Forum in Helsinki in 2017, already establishing itself as a leader in circular economy. Based on these achievements and ambitions, Finland is selected as the research context for the empirical study of this research.

3.2 Data collection and analysis

Data is collected from extensive secondary sources. The main source is the archives of Sitra, the organization which is leading Finland's transformation to the circular economy. All of the 252 documents that are available in English language in the archives of Sitra are reviewed, and in addition, other useful documents mentioned in these documents are accessed. Further sources of secondary data include the websites of companies, governmental organizations, universities and research institutes, and other organizations that are involved in the successful CSV initiatives in the circular economy. Data collection and analysis go hand in hand. Following Cresswell (2014) data is analysed by the method of qualitative content analysis using the following codes from the theoretical framework: G – government, U – university, H – hybrid organizations, I – industry, S – society, T1 – Type 1 CSV, T2 – Type 2 CSV, and T3 – Type 3 CSV (see Figure 1). Data from the secondary sources is reduced by the aid of the above codes and then organized using the filtering and sorting functions of Excel for further analysis. During the analysis

a fourth type of CSV is identified from the data, and it is coded with T4 – Type 4 CSV. Finally, the four types of CSV are matched with the helices of the quadruple helix model as well as hybrid organizations. As the amount of data is at a manageable level, no special qualitative data analysis software is used.

Two measures are taken to improve the validity and reliability of findings. First, the consistent use of an established theoretical framework in the empirical study increases internal validity. Second, the use of multiple reliable secondary data sources enables data triangulation and increases reliability. Reliance on purely secondary data can be considered a limitation of the study. It is true on the one hand that interviews could provide rich insights, but on the other hand, the diversity of the CSV initiatives and the involvement of a variety of stakeholders from the quadruple helix model make it challenging to find suitable interview candidates with thorough knowledge on the diversity of initiatives and stakeholders. Furthermore, the availability of extensive documentary secondary data makes it sufficient to draw objective conclusions in line with the purposes of this research.

4. Results

Results suggest that the transition to the circular economy demands a systematic approach, in line with the earlier suggestions by Pollard et al. (2016) and Preston (2012), that captures a diversity of stakeholders and cooperation among them across sectoral and industry boundaries. This evidence supports the validity of the choice of the comprehensive quadruple helix model as the basis for the theoretical framework in this study. Finland considers circular economy as a new path to prosperity, creating economic, environmental and social benefits, thus a clear CSV initiative. In addition to the environmental value added, the circular economy is expected to contribute to Finland's economy by 2030 with two to three billion euros in added economic value and 75,000 new jobs in added social value. Balance between economic, social and environmental values is the guiding principle in Finland's road map to circular economy, which is based on four strategic goals. The first goal is to boost the competitiveness of Finnish companies and create new jobs. The second goal is to transfer to low-carbon energy use, and the third goal is to return materials to the cycle many times. Finally, the fourth goal is to change the society's everyday decisions towards more sustainable alternatives. Key policy actions to achieve these goals are creating a market for organic recycled nutrients, minimizing food waste throughout the food chain, supporting biogas systems and other renewable energy solutions in agriculture, maximizing the overall value of forest-based products and services, encouraging public procurement to select wood-based products, supporting the commercialization of bioproducts and bioservices, incentivizing wood construction, promoting the use of secondary raw materials from industrial side streams, including eco-design requirements in product design and construction, developing a more service-based transport system, incentivizing biofuels in order to terminate fossil fuel use in private cars by 2040, accelerating the circular economy through funding, promoting exports and public procurements, providing education, changing the focus of taxation, and eliminating regulation barriers. Taking these goals and policy actions into account, and taking a holistic perspective, the roles of the different stakeholders of the quadruple helix are presented in the next sections.

4.1 Government

The move to the circular economy is so big that it requires government support which extends over several terms of office. Regulations, incentives and steering across the boundaries of administrative sectors are necessary to activate this move. The Finnish government incorporated the circular economy as one of the key themes of its program already in 2015. It has also accepted to comply with international agreements (e.g., the Paris climate agreement). It provides strong support as an enabler and facilitator by determining the mindset, funding R&D activities, adopting legislation, and safeguarding continuity to allow the development of the circular economy. The government granted two million euros in 2019 as development and investment aid to Finnish companies to test new circular economy business models. The voluntary green deal agreements between the government and business sectors have promoted the circular economy. In addition, the Ministry of the Environment, the Ministry of Agriculture and Forestry and Sitra have been planning to launch Europe's first environmental impact bond. The Finnish government has also been working on the idea of shifting taxation in favor of sustainable development.

Taxation levels in Finland on for example hybrid and electric cars are already much less than on cars with fossil fuels. The government at national and local levels (e.g., municipalities and cities) have contributed to the circular economy also through their increased share of sustainable public procurement deals. The KEINO Competence Center for Sustainable and Innovative Public Procurement provides tools to public organizations for this purpose.

Especially municipalities and cities will become important enablers of the circular economy by integrating it to their regional and urban planning. They participate in networks such as the CIRCWASTE network and the Towards Carbon Neutral Municipalities network, where they share good local practices with each other. They are also active in the sorting and recycling of materials. Waste is sorted as bio waste, paper, metal and glass in households. While bio waste and unsorted waste is collected from households by garbage trucks, people return sorted paper, metal and glass to collection places in their neighborhoods. Smart land use, light traffic and public transport, expansion of recharging networks for electric cars, procurement of services rather than products, nutrient cycling of public catering services will be the priorities for Finnish municipalities and cities. These exemplary achievements were recognized in the 'Circular Economy Municipality of the Year' competition, which was undertaken in 2019 by the Finnish Environment Institute and the Association of Finnish Local and Regional Authorities. One good example is the circular economy center in the city of Kerava. The center, jointly established by Jalotus Upcycling Collective, the City of Kerava and Sitra, is like a shopping center where people can borrow and repair things. Other good examples include the testing of small, self-driving electric buses in cities, and the development of the Kera residential neighborhood in Espoo based on circular economy solutions. The city of Espoo has achieved to decrease carbon emissions by 17% during the 2010s and aims to become a carbon neutral city by 2030. In order to achieve this goal, the City of Espoo and Fortum, the energy company, have committed to shift to carbon-neutral heat production by 2030. Secondly, the city of Espoo aims to increase the transport mode shares of bicycle and pedestrian traffic and public transport. For this goal, 58 kilometers of bicycle lanes were completed in 2018 to reach total 1299 kilometers, and the number of city bike stations increased from 10 in 2017 to 105 in 2018.

CSV contributions of the government and its municipalities and cities are indirect but at the same time highly significant. In other words, they create shared value by enabling the CSV initiatives of the other stakeholders. Without the government's support, many of the CSV initiatives would not materialize.

4.2 University

The higher education system in Finland includes next to universities also universities of applied sciences. Their CSV contributions can be seen in their participation in R&D activities as well as development of educational programs for the circular economy.

R&D and innovation in clean technologies are strengths of Finland, as the country ranked second in the Global Cleantech Innovation Index in 2017. Researchers use funding from national sources like the Academy of Finland, a hybrid organization under the Ministry of Education, Science and Culture. In funding strategic research, the Finnish government decides the key themes every year. Circular economy has been a key topic under the theme of "reform or wither – resources and solutions" in 2018, the themes of "towards a sustainable, healthy and climate-neutral food system" and "innovative materials and services to promote resource wisdom and sustainable development" in 2019, and "dealing with climate change - the human perspective" in 2020. An influential actor in the Finnish R&D ecosystem is the Technical Research Centre of Finland (VTT), a hybrid organization established by the Finnish government as an independent research center under the Ministry of Trade and Industry. Circular economy has been one of VTT's core areas of expertise and research, and there have been successful circular economy start-ups established by VTT researchers. VTT launched a project in 2018 together with companies, research institutes and educational organizations to develop new wood-based business activities to replace plastics.

In education, Lappeenranta University of Technology offers a master degree program in English on circular economy. Similarly, Aalto University, Tampere University of Technology, Lapland University of Sciences, Vaasa University, and Oulu University, as well as HAMK, Savonia, Metropolia, Haaga-Helia, Laurea, Novia and Vaasa universities of applied sciences introduced circular economy studies. The School of Arts, Design and Architecture at Aalto University developed an outdoor space to be used as a test site for circular economy and cultural change.

While R&D activities which lead to innovations for the circular economy can be considered as Type 1 CSV, educational initiatives can be considered as Type 3 CSV, aiming to develop the local circular economy cluster as well as the understanding and awareness of the society.

4.3 Hybrid organizations

In addition to Academy of Finland and VTT, which were presented in the previous section, key hybrid organizations in Finland for the circular economy are Sitra and Business Finland. Sitra, which wrote in 2016 Finland's road map to the circular economy, has been the leader in this transition. In doing that Sitra collected opinions from citizens, the government, companies, research institutes, municipalities and cities, and established the Circular Economy Steering Group, consisting of 21 leaders representing diverse stakeholders. Sitra has been awarded the world's leading public sector accelerator of the circular economy at the World Economic Forum in 2018. Recognized as the promoter of the circular economy in Finland, Sitra has been funding the development of educational programs on circular economy. In addition, together with Avanto Ventures and Nordic Innovation, Sitra funded in 2018 the project to establish the LOOP Ventures circular economy accelerator, aiming to accelerate the transition of Finnish companies to circular economy. Furthermore, it has been helping the Technology Industries of Finland to train 500 companies and run pilot workshops to develop business models for the circular economy, compiling a list of more than 100 most interesting circular economy companies in Finland. Having the reputation of an impartial non-politicized actor with governmental connections and strong substance expertise, Sitra is the change agent of the circular economy in Finland. Contributions of Sitra can be classified as Type 3 CSV.

Another key hybrid organization for the circular economy is Business Finland. This is an expert organization that was created on January 1, 2018 through the merger of Finpro, which used to offer services to Finnish companies for their international expansion, and Tekes, which used to provide funding for innovation activities. In 2018 Business Finland launched a 300 million-euro Bio and Circular Finland program and created the Circular Business Development Lab, aiming at the internationalization and new business development of circular economy products and services. This initiative can be classified as an indirect contribution of Type 1 CSV. In another project, Business Finland has been cooperating with the Council of Tampere Region, Aalto University and Jyväskylä University to establish an internationally competitive battery ecosystem in Finland. This initiative is a contribution of Type 3 CSV.

4.4 Industry

Finnish companies have introduced solutions for the circular economy in five kinds of business models, namely product life extension, product as a service, sharing platforms, renewability, and resource efficiency and recycling (see Table 2). With their new business models, these companies have not only contributed to the environment but also increased their sales revenues, i.e. Type 1 CSV. In the future they are expected to export their products and services and thus contribute further to the Finnish economy by creating new jobs.

In addition, the Kemi-Tornio region in Finland has developed a well-functioning industrial symbiosis model, and Sitra has been cooperating with experts to spread the model in Finland and create a national network of eco-industrial parks. As an example, slags created during production in the Kemi-Tornio eco-industrial park are used as earthwork material for house construction, replacing the use of natural gravel. In another example, the Outokumpu steel mill uses carbon monoxide gases and ashes as fuel in lime kilns, replacing fuel oil. Experts at the Kemi-Tornio center for the circular economy see side streams as resources rather than waste. The Ministry of the Environment is developing a national information platform of waste and side streams to promote industrial symbiosis further. These examples can be classified as Type 2 CSV. Another good example of industry collaboration is the national Palpa recycling system for beverage bottles and cans. In this system, consumers pay a refund on purchase and receive it back when they return the bottles and cans to the return machines. Finns are among the world leaders in beverage bottle and can recycling with a rate of 90%. This efficient system also can be considered as a Type 2 CSV.

Table 2. Circular economy business models and example companies from Finland. Author's own collection from Sitra's webpages.

Business model	Example companies from Finland
Product life extension	Battery Intelligence (extending the lifespan of batteries), Pa-Ri Materia (reselling used office furniture), 3 Step IT (reselling IT equipment), Fiskars Group (reselling second-hand crockery), Varusteleka (reselling second-hand products), Konecranes (remote monitoring and providing real-time maintenance to industrial equipment), Valtra (remanufacturing used gearboxes) and Viako (providing household items in kits for temporary accommodation)
Product as a service	Valtavalo (selling lighting as a service), Vapaus (leasing shared-use bicycles and electric cars to companies), Encore (loading pallets as a service), OP Co-ride Oy (renting shared-use cars), Naava (selling smart green walls as a service), Lindström (work uniforms as a service), Naps Aurinkovoimala (selling solar power as a service) and Kyyti (on-demand ridesharing)
Sharing platforms	Zadaa (an online platform for second-hand clothes), Kiertonet (an online auction site for public sector organizations), eRENT (an online equipment sharing platform for companies), AirFaas (an online platform for sharing factory resources), Venuu (a marketplace for renting event venues), Rent-a-Park (an online platform for sharing parking space) and Tori.fi (an online flea market)
Renewability	Moninutra (producing health products from forest industry by-products), Jospak (producing food packaging with less plastic), Ecolan (producing fertilizers from power plant ash), Neste (producing biofuels and biochemicals from waste), Doranova (producing biogas and fertilizers from biowaste), Convion (generating renewable power and heat next to the site of use), Forchem (refining tall oil), Infinited Fiber (producing textile fiber from waste) and Spinnova (manufacturing wood-based textile fiber)
Resource efficiency and recycling	Cireco (smart construction tools for circular economy), Calefa (reuse of waste heat from industry), Honkajoki (reuse of animal-based waste as pet food and biofuels), Netlet (an online shop for surplus construction materials), Loop restaurant (planning the day's menu from surplus food from supermarkets), Betolar (low carbon construction materials from industrial side streams), Altia (new uses for production side streams) and Carbons Finland (refinement of biochar)

4.5 Society

Move to the circular economy demands radical changes in consumption habits, and this requires education at all levels starting from day care and primary school. The goal in Finland is to make everyone circular economy experts, capable of applying circular economy solutions in their daily practices. In other words, the objective is to create circular economy natives in Finland, who will increase the energy efficiency of their housing, use more light traffic, public transport and electric cars, eat more vegetable-based food and waste less food, share more and own less, and use more services than products.

For this purpose, Finland has integrated circular economy courses at all levels of education. During the 2018/2019 school year, 75% of 12-year-olds and 40% of 15-year-olds in Finland have learned about the circular economy. A good example is the 'Me & My City' (Yrityskylä) experience-based learning environment where Finnish 6th grade pupils learn to create their own society using circular economy principles. Other good examples include the 'Circular Classroom', the 'Adventure game My2050', and the 'Future Energy skills and Gamification (FEG)' project, which offer new ways to learn about sustainable development. Furthermore, the 'Lifestyle test' allows students to calculate their personal carbon footprints, and the '100 Smart ways to live sustainably' offers suggestions for a more sustainable life. The Finnish Nature League organizes visits to schools to motivate young people between ages of 13 and 16 towards circular economy. In addition, the Green Flag education program by the Foundation for Environmental Education Finland (FEE Suomi) provides a certificate on sustainable development to children in day care centers, primary schools, secondary schools, and leisure time organizations. There are also nature and environment schools organized by municipalities, e.g., the Villa Elfvik Nature School in Espoo and the Environment School Polku in Helsinki. Data banks are created to improve the competences of the local society on how they can contribute to a more sustainable environment (e.g., Uusimaa environment

responsibility competence bank, available at www.hyria.fi/osaamispankki in Finnish and Swedish). Finally, the media also contributes to increasing awareness and knowledge about the circular economy.

Finland has a small, rather homogenous population. The Finnish society is known for its high level of education, advanced recycling culture, appreciation of nature, good level of environmental awareness and protection, understanding of scarcity, resource efficiency and appreciation of high quality. Moreover, Finns obey the rules, and there is well-functioning dialogue between different political parties based on a high level of trust. These characteristics shall contribute to a smooth transition to the circular economy. Acting according to circular economy principles saves money for the society while contributing to the environment. However, it is not possible to classify this under any of the three types of CSV. It can be classified as Type 4 CSV and named as '*acting according to circular economy principles*'.

5. Discussion and conclusion

This research aimed to investigate from a holistic perspective CSV contributions of a variety of stakeholders in the circular economy using the quadruple helix model. The results derived from the CSV initiatives in Finland's circular economy suggest that many stakeholders contribute though in different ways. The indirect contributions of the government and cities and municipalities are highly significant to enable and facilitate the CSV initiatives of other stakeholders. Funding and legislation are the two key mechanisms used by the government in this role. Universities and universities of applied sciences carry out two important activities: R&D activities that lead to circular economy innovations (Type 1 CSV) and education on the circular economy that lead to cluster development (Type 3 CSV). Education is not the responsibility of only higher education institutions. As the case of Finland shows, it starts from the day care and the primary school, and it is the most important activity in order to realize the successful transformation of the society to the circular economy. The roles of hybrid organizations are various, including the leadership of the whole process (e.g., the case of Sitra) and the development of new products and markets as well as local clusters (Type 1 and Type 3 CSV, e.g., initiatives of Business Finland). Industry has the key role in innovating new products, services and business models and commercializing them (Type 1 CSV). It can also deliver Type 2 CSV through for example industrial symbiosis. Finally, the changing habits of the society is what will determine the success of the transition to the circular economy. The society can also achieve CSV by acting according to the principles of circular economy, and this new type is coined as Type 4 CSV. In doing that the society saves money and contributes to the environment simultaneously, i.e. creates shared value. This research makes two significant theoretical contributions. First, it provides evidence that CSV is not a concept that is specific to companies only, as it was originally meant by Porter and Kramer (2011). A variety of stakeholders do contribute to and create shared value. Secondly, it introduces a fourth type of CSV by the society in addition to the three types of Porter and Kramer (2011). This type, however, is specific to the circular economy.

This research offers a number of practical implications for policy makers and businesses who plan to implement the circular economy in their countries. First, agreeing with Pollard et al. (2016) and Preston (2012), the circular economy requires a systematic change with contributions from a variety of stakeholders across sectoral boundaries. As such, managing the transition requires a holistic approach, and the quadruple helix model can suit well for this purpose. Second, there is need for clear leadership to implement the transition. The leadership of Sitra, an independent hybrid organization in Finland, provides a good example. Third, a crucial step is the activation of the society for the circular economy, and that will happen through education starting from very early ages in day care. Fourth, good examples of Finnish innovations presented under the five business models of the circular economy suggest ideas for similar businesses in other countries. This also fills a gap in the circular economy literature that calls for research on circular economy business models (Lewandowski 2016; Kirchherr et al. 2017).

This research is subject to three limitations which offer avenues for future research. First, it is a holistic descriptive study. Future research should go deeper in certain areas in order to extract deeper insights. Second, this research utilizes mainly secondary data. Future research that focuses on specific areas should also use primary data. Third, this research is specific to Finland. Using the developed framework of this research, future research could offer comparative studies from other leading countries in the circular economy such as Japan, China, Canada, and Germany.

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