

# Circular economy in relation to manufacturing companies producing kitchens - a method for realizing the theory in practice

Julia Ann Baker, Marco Samuel Moesby Tinggaard, Peter Enevoldsen, George Xydis

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## Abstract

Climate change is a pressing agenda around the globe. In order to cope with the changing climate and the depletion of resources many industries must change their ways. This research pursued an angle of analyzing the possibility of using circular economy in manufacturing businesses - more specifically the kitchen industry. Connections to the automotive industry were made and especially the way in which they use product service systems to expand their market a part of which leasing is a key method of financing a purchase. In connection to a business case revolving around Kvik A/S a new business model was created; bringing new ideas to the industry such as leasing and trade-in system in order to acquire and retain customers.

Keywords: Circular Economy, Manufacturing, Business Model, Kitchen Industry, Product service system, Recycle loop

## Introduction

The issue of climate change is on many worldwide agendas. Climate change is regarded as a global challenge (Solomon, 2008) in need of action. The European Union (EU) has waste management as one of their primary goals. The EU has created a waste hierarchy to convey its' priority order: prevention, reuse, recycling, energy recovery and least preferred, disposal (European Union Council, 1999). The waste hierarchy's vision is to divert waste from landfills into energy recovery (Lausset et al., 2017) due to the depletion of non-renewable resources. The un-reflected usage of resources is driven by that consumption has for long been considered a sign of wealth (European Union, 2015). In order to move into a more sustainable use of resources the current linearity of product lifecycles must be challenged (Ritzén and Sandström, 2017).

One way of opposing the linear lifecycle is the concept of circular economy (CE). In its simplicity CE suggests refraining from disposal of material through closing the loop of materials within the product lifecycle (Ritzén and Sandström, 2017) in order to reduce resource usage and thereby decreasing energy demand. Unlike traditional recycling CE emphasizes product, component and material reuse, remanufacturing, refurbishment and repair (Korhonen, Honkasalo and Seppälä, 2017) while also supporting renewable energy sources throughout the product value chain. In CE economic growth is no longer achieved by producing more goods, but by keeping them available for a longer time (Amui et al., 2017).

Manufacturing of kitchen furniture has changed over the last forty years, in the earlier days a kitchen was a crafted product built by craftsmen to fit the room it was designed for. Then came mass production and took production to larger factories, this tendency allowed for lower production cost, simultaneously getting rid of a lot of the customization. Studies show that mass customization can be achieved by putting modules together in an order that fits the user's requirements (Duray, 2002).

## CE and Manufacturing

Capitalism ushered the industrial revolution applying fossil fuels to the production industry and simultaneously introducing new mechanical inventions (Mathews, 2011). However it also brought what Polanyi called a "counter movement" (Polanyi, 2014) which among other factors includes the destruction of nature (Mathews, 2011). Therefore, the future of capitalism must take into account the mutual relationship between economic growth and the sustainability of resources (García-Olivares and Solé, 2015). In the book *Natural Capitalism* the transitioning from the manufacturing paradigm to a new type of production, where producers are not selling a product but a service is discussed. The customer does not own the product and does not have to pay for the raw material since these belong to the manufacturing company (Hawken, Lovins and Lovins, 2000).

Product Service systems (PSS) is a part of an environmental driven research which argues that mankind will face disaster, unless there is found a way to unlink economic growth from environmental pressure. The authors understood that a focus on final customer needs instead of focusing on the product fulfilling these needs, would give a larger degree of freedom in the design of a need fulfillment system (Tukker and Tischner, 2006). PSS could lead the way for companies to develop value propositions - thereby increasing their revenues, while decreasing the consumption of resources. One of the more frequently discussed approaches to change the current linearity within the product lifecycle, is CE (Ritzén and Sandström, 2017). Companies transitioning towards PSS and CE must change their business model (BM) towards service as a commodity instead of a physical product. Prolongment of product life will thereby be a driving incentive for the company, including ensuring proper material utilization (Tukker, 2015).

Furniture companies are struggling to increase and even maintain their market share (Zadnik Stirn, Gornik Bučar and Hrovatin, 2016). Consumers are more demanding than earlier which also makes the buying process more difficult. A number of factors influence the customer's buying behavior, however most important are: motivation, social and environmental demands and the company's' marketing strategy (Zadnik Stirn, Gornik Bučar and Hrovatin, 2016). In keeping with this

knowledge some manufacturing companies are moving towards Extended Producer Responsibility (EPR) as a way of minimizing the need for new raw materials and component parts (Bennett and Graedel, 2000). With EPR product ownership is becoming less common while product leasing is increasing. EPR therefore motivates manufacturers to take back their product when consumers normally discard them and then manage them at their own expense (Intlekofer, Bras and Ferguson, 2010). Many have argued that leasing is a “greener” form of business transactions than selling due to the fact that by maintaining ownership of the product the company is forced to increase the product lifetime and put in a strategy for reusing discarded products (Intlekofer, Bras and Ferguson, 2010).

Leasing is as mentioned a growing strategy in the manufacturing business, however it is not seen in the kitchen industry as of yet. This research project therefore aims toward analyzing if a leasing strategy in the kitchen industry is possible, using Kvik A/S as a business case.

### Research Design

The primary focus of this study is to understand circular economy and manufacturing as a theory. These two areas of theory are then combined with the aid of existing within the field. The aim is to understand how circular economy can be a part of manufacturing in the future. Therefore, a case study is performed to understand how the case company relates to the idea of circular economy. The case study will be performed as semi structured interviews with different people within the case company. The people for the interviews will be chosen via the snowball method (Saunders et al., 2015).

The intended outcome is a recommendation on how the case business could implement CE into their BM. This could be applied for other businesses within the same industry. Figure 2 shows the methods converted into a flow diagram for the intended research.

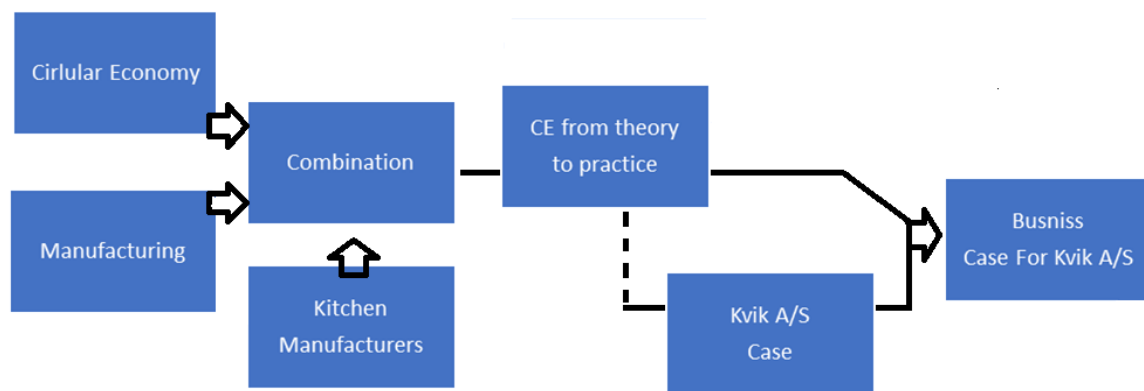


Figure 2: Flow diagram of the research design

### CE from theory to practice

One of the main problems with implementing CE is the need for closed loops when talking about artificial materials, since the natural metabolism of the earth cannot digest the materials. But an indefinite cycling of resources is almost impossible because of material degradation and the imperfect reclamation systems combined with the material separation processes (Haanstra, Toxopeus and van Gerrevink, 2017). A revised model for waste management within the society is needed since the practice now only partially lets the material go back to the company. Thus, a need for companies to handle recycling through take-back systems (Singh and Ordoñez, 2016). This will eliminate the possibility for the perfect circular lifecycle since it leaves no room for leaks (Haanstra, Toxopeus and van Gerrevink, 2017) Compared to the global scale only 11% of collected waste is categorized as recovery of materials another 19% is categorized as energy recovery, (Incineration) (Singh and Ordoñez, 2016) the steps towards CE will have to be small changes.

The first major change that must be undertaken is to change the mindset within the company from a product development and sales focus to be a service provisioning company, with a focus on provision of functionality through services. This requires a new business model to be formed (Sousa-Zomer et al., 2017). With a stronger reach in the network of the company to implement the necessary changes.

Shifting towards PSS will provide a basis for a company to better contribute to CE in general (Sousa-Zomer et al., 2017). The customers need to accept the change and they will have to embrace the PSS way of solving their product demands for the implementation of CE to persevere. Some studies indicate that for certain product demands the customers are willing to trade in product for a service (Haanstra, Toxopeus and van Gerrevink, 2017) which has been seen in the automotive industry.

The two strategies can help incentivize consumers to upgrade to products featuring new technology or replace old with new. Since trade-ins and off-leased products are returned to the company, they can gain better control over reuse and secondary market usage. Thereby gaining profit and engaging in sustainable production.

All in all, gaining competitive advantage through increasing customer satisfaction by providing more flexible solutions and being environmentally friendly (Lu and Xu, 2015). Leasing and trade-in strategies have become increasingly successful in the automotive industry which begs the question if the same success can be created in the kitchen industry.

The two industries have some similarities, as an example: large purchase sizes, product is usually used for many years and the product is a central item in a home. Therefore the gratification desire can be viewed as similar in the kitchen industry as in the automobile industry which in turn also influences the consumer image created by the product.

Next step in this research project is to combine the information gathered in above sections, towards a BM. A BM is the plan for a successful operating business, identifying sources of revenue, customer basis and cost structures. According to Ausrød, Sinha and Widding designing a BM is the act of weaving interdependent activities together to gain a lucrative business (Ausrød, Sinha and Widding, 2017).

The standard kitchen includes ten lower cabinets and two tall ones. Three of the lower cabinets each contain three drawers with a single front on each drawer. The kitchen has 20 fronts in total. Each drawer cabinet also includes a drawer tray and therefore 12 drawer slides are used. Each cabinet is placed on four plinth legs. There is one faucet, one sink, one cooktop, one oven, one microwave, one refrigerator and freezer. Small extra items such as two cutlery trays and three garbage cans with extraction mechanisms and ten rubber mats in the bottom of each cabinet. The kitchen has touch opening systems so no handles are used.

### **Discussion**

The theory in CE is not new but has been proposed before, in different forms. From the time when people realized that raw materials could be used up and until now, different theories have arisen to avoid depletion of materials. The most effective theory has been to minimize waste. Since people do not change their lifestyle the usage of raw material is still rising. Manufacturing has gone from mass production to mass customization as a reaction to the higher demands from the customers. And yet the customers are still more demanding and consuming than ever. This could be the reason for believing that the time has come to embrace the notion about CE.

The theory's closed loops support materials being recycled instead of being sent to energy recovery or disposal. To drive the high consumer demands further the thoughts behind PSS could lead the way for short product life cycles to decouple with the high material usage, since the PSS evolves around leasing of a service instead of buying a product. The impact of the overconsumption mentality will not have such a large impact on the environment, if companies using PSS design their products for reusability.

The proposed business model in this study is based on the business model canvas, and describes the different dimensions within the business model, but it offers little understanding regarding the relations between the different dimensions. This might have an influence when presenting the business model since the reader might interpret the relations differently than intended. This fact might have influenced the Kvik case since the lack of relations might have given the readers different understandings. A different model with more focus on relations might have created another result. The lack of financial angles in the study might alter the business model if pursued, this needs to be addressed by the case company in order to make sure that the BM is worth pursuing. The long timeframe of the implementation can cause the focus to be changed while still working towards the goal of a complete CE loop.

### **Conclusion**

The intention with this research was to look at the theory behind CE and manufacturing to see if it was possible to use circular thinking within the area of manufacturing. It was found to be plausible since the automotive industry has adopted leasing into their business models. Along with the thoughts about PSS this means that the customers buy a service rather than a product.

From this the work continued to analyze whether the same could be concluded within the realm of kitchen manufacturing. It has been found that it is possible to introduce the theory of CE into the realm of kitchen production, although it has to be in the form of small incremental steps in order for the organization to change its behavior. Also customers have to somewhat adopt to the new way of thinking like it has been seen within the automotive industry. This means that the new business model has to coexist with the old. This will allow for some customers to buy kitchens as a product while others buy a service that contains the functions of a kitchen, limited to a certain time plan.

### **Suggestions for further research**

Researchers wanting to dig further into this subject might want to look into the financial aspect of the business model. How can a kitchen manufacturer ensure that implementing CE is financially viable? There will most likely be a timeframe in which the new strategy is costing money so when would it be expected to turn around?

Another issue is the logistics; will the return of products decrease the sustainability of the business model due to transportation. There might be an interesting Life Cycle Assessment project in regards to the new loop (as seen in figure 5).

Also creating an implementation strategy for the new business model in collaboration with Kvik or another similar company. Since such an implementation has not been done before in the kitchen industry there might be unforeseen challenges in need of being addressed.

## References

- Aizcorbe, A. and Starr-McCluer, M. (1997). Vehicle ownership, purchases, and leasing: Consumer survey data. *Monthly Labour Review*, 120, pp.34-40.
- Amui, L., Jabbour, C., de Sousa Jabbour, A. and Kannan, D. (2017). Sustainability as a dynamic organizational capability: a systematic review and a future agenda toward a sustainable transition. *Journal of Cleaner Production*, 142, pp.308-322.
- Ausrød, V., Sinha, V. and Widding, Ø. (2017). Business model design at the base of the pyramid. *Journal of Cleaner Production*, 162, pp.982-996.
- Bennett, E. and Graedel, T. (2000). "ConditionedAir": Evaluating an Environmentally Preferable Service. *Environmental Science and Technology*, 34(4).
- BusinessDictionary (2017). *How has this term impacted your life?*. [online] BusinessDictionary.com. Available at: <http://www.businessdictionary.com/definition/manufacturing.html> [Accessed 15 Nov. 2017].
- CEFIC (2011). *Guidelines for measuring and managing CO2 emission from freight transport operations*. [online] Available at: <http://www.cefic.org/Industry-support/Responsible-Care-tools-SMEs/5-Environment/Guidelines-for-managing-CO2-emissions-from-transport-operations/> [Accessed 21 Apr. 2018].
- Danmarks Statistik (2016). *Finansieringsselskaber 2015*. [online] Available at: <http://www.dst.dk/da/Statistik/nyt/NytHtml?cid=22551> [Accessed 13 Dec. 2017].
- Duguay, C., Landry, S. and Pasin, F. (1997). From mass production to flexible/agile production. *International Journal of Operations & Production Management*, 17(12), pp.1183-1195.
- Duray, R. (2002). Mass customization origins: mass or custom manufacturing?. *International Journal of Operations & Production Management*, [online] 22(3), pp.314-328. Available at: <http://www.emeraldinsight.com/doi/full/10.1108/01443570210417614> [Accessed 17 Nov. 2017].
- Duray, R. (2002). Mass customization origins: mass or custom manufacturing?. *International Journal of Operations & Production Management*, 22(3), pp.314-328.
- European Union (2015). *Sustainable development in the European Union*. Luxembourg: Publications Office of the European Union.
- European Union Council (1999). *Council Directive 1999/31/EC on the landfill of waste*. Brussels.
- Frausing, E. (2018). *Freight*.
- García-Olivares, A. and Solé, J. (2015). End of growth and the structural instability of capitalism—From capitalism to a Symbiotic Economy. *Futures*, 68, pp.31-43.
- Haanstra, W., Toxopeus, M. and van Gerrevink, M. (2017). Product Life Cycle Planning for Sustainable Manufacturing: Translating Theory into Business Opportunities. *Procedia CIRP*, 61, pp.46-51.
- Hart, C. (1995). Mass customization: conceptual underpinnings, opportunities and limits. *International Journal of Service Industry Management*, 6(2), pp.36-45.
- Hawken, P., Lovins, A. and Lovins, L. (2000). *Natural capitalism*. New York: Little, Brown and Company.
- Hu, S. (2013). Evolving Paradigms of Manufacturing: From Mass Production to Mass Customization and Personalization. *Procedia CIRP*, 7, pp.3-8.
- Intlekofer, K., Bras, B. and Ferguson, M. (2010). Energy Implications of Product Leasing. *Environmental Science & Technology*, 44(12), pp.4409-4415.
- Korhonen, J., Honkasalo, A. and Seppälä, J. (2017). Circular Economy: The Concept and its Limitations. *Ecological Economics*, 143, pp.37-46.
- Lausset, C., Cherubini, F., Oreggioni, G., del Alamo Serrano, G., Becidan, M., Hu, X., Rørstad, P. and Strømman, A. (2017). Norwegian Waste-to-Energy: Climate change, circular economy and carbon capture and storage. *Resources, Conservation and Recycling*, 126, pp.50-61.
- Li, K. and Xu, S. (2015). The comparison between trade-in and leasing of a product with technology innovations. *Omega*, 54, pp.134-146.
- Lystbæk, C. and Bækgaard, L. (2017). *From Methods to Design: Teaching Research Methodology as a Reflective Practice*. 1st ed. [ebook] Herning. Available at: [https://aarhus.blackboard.com/bbcswebdav/pid-518519-dt-content-rid-727775\\_1/courses/BB-Cou-STADS-Hold-53783/b%20C3%A6kgaard-lystb%C3%A6k%20proe%202016.pdf](https://aarhus.blackboard.com/bbcswebdav/pid-518519-dt-content-rid-727775_1/courses/BB-Cou-STADS-Hold-53783/b%20C3%A6kgaard-lystb%C3%A6k%20proe%202016.pdf) [Accessed 8 Jun. 2017].
- Mannerling, F., Winston, C. and Starkey, W. (2002). An exploratory analysis of automobile leasing by US households. *Journal of Urban Economics*, 52(1), pp.154-176.

- Mathews, J. (2011). Naturalizing capitalism: The next Great Transformation. *Futures*, 43(8), pp.868-879.
- Pedersen, L. (2018). *Freight*.
- Polanyi, K. (2014). *The great transformation*. Boston, Mass.: Beacon Press, p.136.
- Ritzén, S. and Sandström, G. (2017). Barriers to the Circular Economy – Integration of Perspectives and Domains. *Procedia CIRP*, 64, pp.7-12.
- Ritzén, S. and Sandström, G. (2017). Barriers to the Circular Economy – Integration of Perspectives and Domains. *Procedia CIRP*, 64, pp.7-12.
- Saunders, M., Lewis, P., , a. and Thornhill, A. (2015). *Research methods for business students*. 1st ed. New York: Pearson Education.
- Singh, J. and Ordoñez, I. (2016). Resource recovery from post-consumer waste: important lessons for the upcoming circular economy. *Journal of Cleaner Production*, 134, pp.342-353.
- Solomon, S. (2008). *Climate change 2007*. Cambridge: Cambridge University Press, p.996.
- Sousa-Zomer, T., Magalhães, L., Zancul, E. and Cauchick-Miguel, P. (2017). Exploring the challenges for circular business implementation in manufacturing companies: An empirical investigation of a pay-per-use service provider. *Resources, Conservation and Recycling*.
- Trocchia, P. and Beatty, S. (2003). An empirical examination of automobile lease vs finance motivational processes. *Journal of Consumer Marketing*, 20(1), pp.28-43.
- Tukker, A. (2015). Product services for a resource-efficient and circular economy – a review. *Journal of Cleaner Production*, 97, pp.76-91.
- Tukker, A. and Tischner, U. (2006). Product-services as a research field: past, present and future. Reflections from a decade of research. *Journal of Cleaner Production*, 14(17), pp.1552-1556.
- Zadnik Stirn, L., Gornik Bučar, D. and Hrovatin, J. (2016). Examination of Decision Factors in the Process of Buying Kitchen Furniture Using Conjoint Analysis. *Drvna industrija*, 67(2), pp.141-147.