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"ARE WE TALKING ABOUT THE SAME THING?" ANALYZING EFFECTS OF MASS CUSTOMIZATION AND PRODUCT-SERVICE SYSTEMS ON SUSTAINABILITY

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Abstract: *The importance of sustainability in business research and practice is still increasing. Taking into account circumstances such as shortage of resources, growth of population and stricter environmental legislation, fundamental changes to act economically, ecologically and socially are requiered. Mass Customization (MC) is a competitive strategy that can contribute to this by producing goods and services for individual needs of customers. In doing so, it aims to increase the product-customer relation, efficient production and a high degree of personalized goods, which may have positive effects on the human society and the environment. Similarly, Product-Service Systems (PSS) that consist of intertwined product and service components are often considered as MC-offering. Altough there are similarities both strategies are mostly discussed seperatetly. Thus, based upon a systematic literatur review, the present article reports on a study that aims to determine and compare effects of both MC and PSS in respect of economic, environmental and social sustainability.*

Key Words: ***Mass Customization, Product-Service Systems, Sustainability, Systematic Literature Review***

1. INTRODUCTION

The rapid deterioration of the natural environment, concerns over growth of population and corporate social responsibility are just some examples which pose elementary issues for our society [1]–[3]. To adress these challenges, sustainability has increasingly gained significance in business research and practice [4]–[6].

To contribute to sustainability, innovative business models have to be designed including new strategies that e.g. allow reusing product(-parts), individualizing products, increasing product quality to enable a stronger relationship between customer and offerings or thoroughly change comsumption behaviour. Here, the concepts of Mass Customization (MC) and Product-Service Systems (PSS) come into play.

With respect to offering and process change, MC and PSS business models are very similar to each other as was investigated in [7]. Thus, PSS that consist of intertwined product and service components may be considered as MC-offering. In spite of this, both research streams are mostly discussed independently from each other (e.g., regarding development processes, tools and effects on value perception, sustainability, etc.). The authors want to overcome this. In the following study, the focus is directed towards the exploration of effects on sustainability from both concepts. Accordingly, we seek to answer the following research questions:

- ***RQ1:*** *What are effects of MC and PSS on economimc, ecological and social sustainability?*
- ***RQ2:*** *What are similatires and differences between MC and PSS based on the effects on sustainability?*

For answersing this, the authors carried out a systematic literature review and coded the gathered articles (n=142) with respect to sustainability. Based on a total of 159 PSS entries and 132 MC entries, we consolidated a set of 40 different effects among four categories, namely: market-/finance-oriented; customer-oriented; partner-, network- and complexity-oriented; product-/production-oriented. In doing so, we provide an overview of sustainability effects and current challenges as well as illustrate what might be learned from both concepts (i.e., MC and PSS) in order to strengthen or better seperarte them.

The remainder of the paper is strucured as follows: As a first step, we briefly introduce sustainability, Mass Customization (MC) and Product-Service Systems (PSS) as well as outline related work to position and motivate our study (Section 2). Following our research design that consists of two extensive literaure reviews (Section 3), we present our main findings, namely (1) an overview of effects of MC and PSS on economic, ecological and social sustainability as well well as (2) the comparison of these effects to examine similarities and differences between both concepts (Section 4). Afterwards, we discuss our results, some of the major observations based on the comparison and the limitations (Section 5).

Finally, we provide insights regeading implications and future research by concluding our study (Section 6).

2. RESEARCH BACKGROUNG

In the following, we outline the concept of PSS, MC and sustainability as well as provide related studies of combining sustainability with PSS or/and MC.

2.1. Sustainability

Sustainability first came up in 1987 from the World Commission of Environment and Development, which is also known as the *Brundtland report*. They define sustainability as "the development which meets the needs of the present without compromising the ability of future generations to meet their own needs" [1, p. 43].

Sustainability is a frequent used and broad term [8]. To handle the complexity of this term, it is usually divided into three dimensions, for example: *Triple Bottom Line* and *Three Pillar Model* (economic, environmental and social), or *Triple Ps* (people, planet and profit) [9]. Economic sustainability focuses on efficient and responsible use of resources to enable long-term competetive advantges. For instance, business performance, finances, market presence and repurchase rates. Ecological sustainability refers to the consumption of resources in a sustainable manner to reduce environmental impacts, for example by lowering energy use, emissions and waste. Social sustainability deals with ensuring well-being of the people involved in an organization (internal and external), for example by improving working conditions, equality and health.

For implementing sustainability in consumption and production, typically three strategies are distinguished [10]. First, efficiency aims to improve resource performance and usage. For instance, the reduction of environmental damage by optimizing input-output rations of production or consumption [11]. Second, consistency focuses on circular approaches with the goal to create no waste by reusing every output in further steps. Third, sufficiency aims to achieve fundamental changes of habits, for example by altering patterns of consumption (i.e., customer) and production (i.e., producer). To address these issues, new and innovate business models or strategies are necessary [11] such as models that consider MC or PSS.

2.2. Mass Customization (MC)

As an answer to heterogeneous and dynamic buyer markets, the business model pattern "Mass Customization" was introduced (e.g., [12], [13]). Companies that do MC generate highly specialized, customized solutions by integrating the customer in a co-design process. Core of the concept represents a stable solution space which combines the possibility of customer integration, the differentiation advantage through options and the cost position of a mass-producer by the use of the appropriate production and product development processes [14].

Therefore, all corporate processes, either administrative or related to goods and service realization, have to be set up as modular design, which is configured with regard to the individual customer order. In the broader sense this comprises the aggregation of the entire supply chain [15].

For a detailed compilation of characteristics and a discussion of the success factors and implementations of MC business models refer to [12], [16], [17].

Regarding sustainability, one of the main hypotheses is that MC, due to addressing individual customer needs, is able to reduce overproduction and resource consumption as well as to extend the product usage phase in the product life-cycle [5]. For a brief introduction in the different research streams of mass customization and sustainability, refer to [18].

2.3. Product-Service Systems (PSS)

Core of the PSS-concept is the integration of product, software and service development into one common development process. As result, the focus shifts from selling products and/or services separately to selling functionality or corporate capabilities [19]. Some authors restrict the business case for PSS only to business-to-business applications. In this case, the PSS is a result of a value co-production which is conducted within a aggregated supply chain, based on a common development process [20].

Necessary for developing and implementing PSS is ability to adapt to customer requirement changes rapidly and efficiently as well as to anticipate these changes in the early phase of PSS development. This favors modular and parametric designs that enable the PSS to be altered by exchange of components or reconfiguration / re-parametrization. Since PSS target at long lasting business relationships, customer requirements have to be captured and monitored in the use phase of the PSS as well [21].

Based upon the contents of physical product and service components of the value creation, Tukker [22] destinguishes three different types of PSS and the corresponding business models (Fig. 1):

- *Product-oriented*: For instance, product-related services such as startup and initial operation, maintenance contracts, supply of consumables, financing plans; Advice and consultancy such as training, logistics and optimization.
- *Use-oriented:* For instance, product lease, product sharing, product pooling.
- *Result-oriented:* For instance, activity management or outsourcing, pay per unit, functional result.

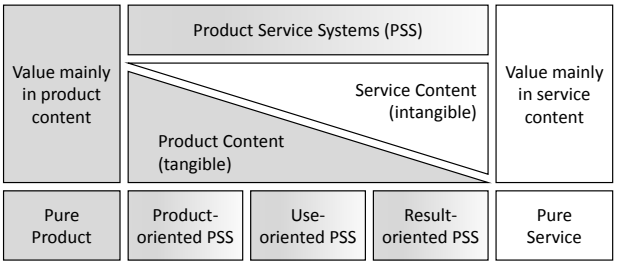

Fig. 1. *Main Categrories of PSS* (acc.to Tukker [22])

Regarding sustainability, the discussion of effects is very similar to those of MC. This is quite logical since both rely on strong customer-vendor interactions from a business relationship point of view and on modular adaptable designs from the development point of view

[7]. Nevertheless, especially use- and result-oriented PSS have the potential to radically change consumption behavior and thus impact sustainability in a holistic way [7]. Part of this discussion is going to be presented in the following Section 2.4.

2.4. Related Studies

Different research streams already deal with the analysis of PSS and sustainability. In the following, these streams are briefly introduced.

Most concrete are studies that develop assessment models for PSS. Commonly, techniques such as life cycle assessment (LCA) and life cycle costing (LCC) are transferred from other domains into PSS engineering. A conceptual framework for as well LCA as LCC is introduced by Favi et al. [23], which is discussed for a washing machine and a corresponding PSS. Applying this method, the PSS is assessed with better eco-sustainability, when a pay-per-washing cycle is used. Other, more holistic assessment tools that also include the other two dimensions of sustainability are proposed, for instance by Chou et al. [24] and Hu et al. [25]. Both approaches are strictly not limited to the framework itself but also propose performance indices and assessment values. The clarity is partly comparable to the sustainability balanced scorecard [26].

A different research stream aims to formulate conceptual frameworks for sustainability evaluation that can be integrated already in the development phase of the PSS or its components. Representative for this stand the two approaches from Hansen et al. [27] and Niemöller et al. [28]. The first discribes the sustainability innovation cube which evaluates product innovations in general but can be applied also to PSS. Here, using the three dimensions of life cycle stage (production & logistics, usage, end-of-life), need (technology, usage system, culture) and target (economic, ecologic and social effects) 27 clusters are derived which contain different analysis or support methods. These as well as performance indices then have to be configured to the needs of the company where the evaluation is executed. The framework is yet conceptual and lacks of an integration of product and service development. The latter approach synthezises a maturity model, where the three sustainability dimensions as well as some of their intersections are described and conceptualized. The proposed model is meant as decision aid with respect to the over-all business strategy and does not focus on the assessment of single design aspects of the PSS.

Exisiting projects also try to specify the impacts of PSS on sustainability. For instance, the project *SusProNet* was one of the first European networks on Sustainable Product-Service Development that was funded by the European Union [22]. Consolidated, it was shown that PSS may contribute to all three strategies of sustainability (efficiency, consistency and sufficiency). Nevertheless, it is doubted that a saving of ressources can be achieved per se. The so called rebound-effect describes an increase of over-all consumption because of increased efficciency and better exploitation of production equipment, e.g. in use-oriented PSS.

Especially dedicated to use-oriented PSS is a research stream that examines the effects of product sharing on the three pillars of sustainability [83]. However, the critisism here is the same as in SusProNet that an increase of consumption overcompensates positive effects of the business model. Additionally, questions are raised which deal with the consumer behaviour: Use-cases in industry document that the reduced responsibility for the products used, which coincides with sharing, benefits reduced caution and reservation during usage and so shortens product life times or meantime between maintenance.

The last research stream that considers PSS and sustainability is the examination of design guidelines, like design for service supportability, design for disassembly and recycling or design for sustainability (refer e.g. to [29]–[31]).

3. RESEARCH DESIGN

In order to gather and classify, which effects MC and PSS have on sustainability, we carried out a three-stage research design consisting of two literature reviews (Stage 1 and Stage 2) as well as a follow-up workshop with three researchers for comparing both concepts based on their effects (Stage 3).

3.1. Gathering Effects from MC (Stage 1)

A rigorous and systematic literature review requires an appropriate structure and the disclosure of the entire process including the selection of keywords and sources, the derivation of search phrases, the specification of evaluation criteria etc. (e.g., [32], [33]). For identifying effects on sustainability from a MC perspective, we first analyzed useful search items and combined them in the form of a search phrase for the selected sources (i.e., Google Scholar and AISeL) (Table 1).

Table 1. *Search phrase*

Google Scholar	“mass customization“ AND („sustainability“ OR „sustainable“)
AISeL	(“mass customization” OR “mass customisation”) AND “business model*” AND (sustainable OR sustainability OR ecologic** OR environment** OR social OR economic**)

In total, we found 220 articles that met our purpose. As proposed by Webster and Watson [32], a complete keyword search as well as an evaluation of titles and abstracts was applied to each article. After verifying the remaining articles (n=76) by the full text, we identified 33 articles. Next, these articles were analyzed and coded iteratively to examine and classify the effects (Table 3, column: “Appearance in MC”). To contribute to the reliability and validity, the relevance of each article as well as the coding of each article were conducted by at least two researchers.

For more details of identifying and analyzing the effects from MC, see Gembarski et al. (2017) [18].

3.2. Gathering Effects from PSS (Stage 2)

Similar to Stage 1, for identifying effects on sustainability from a PSS perspective, we initially analyzed search items. Therefore, we particularly draw

on related terms that are well investigated and specified in the *DIN PAS 1094* [34], and Knackstedt et al. (2008) [35]. Because there is a lot of relevant literature in German, we decided to include German terms as well and combined these items to a search phrase (Table 2).

Next, we selected databases and search engines. First, we choose Google Scholar to get a broad and interdisciplinary overview of prior research including various studies and academic papers. Because of a continuous, decreasing relevance of the articles regarding our research purpose, we only considered the first 100 articles of Google Scholar. Second, to get more information concering PSS and their business models, underlying business processes and required ICT, we selected AISeL, which provides leading journals and proceedings from Information System Research.

Table 2. *Search phrase for AISeL and Google Scholar*

("Product-Service Systems" OR "PSS") OR ("Product-Service Bundle" OR "Customer Solution") OR ("Hybrides Leistungsbündel" OR "Produkt-Service-System" OR "Hybrides Produkt" OR "Produktbegleitende Dienstleistung") AND ("Sustainability" OR "Sustaina*") OR "Nachhaltigkeit"

After collecting articles that met our purpose, we used an iterative approach for the classification of the results within a concept matrix. In total, we ran through three iterations until all articles from the literature review were classified. For each iteration, we applied an inductive approach that aims to identify effects in an empricial manner [36]. In the first iteration, we coded articles from Google Scholar and created an inital classification that captures the effects of PSS on sustainability. In the second iteration, we included articles that are provided by AISeL to extend and revise our inital classification. Finally, in iteration 3, the results were consolidated in a follow-up workshop.

3.3. Comparing the Effects (Stage 3)

Based on the classified results from both prior stages, we explored the similairites and differences of the effects on sustainability between MC and PSS. Therefore, we conudcted a one-day workshop with all three reseachers, compared each of the examined effects and discussed how they releate to each other.

4. RESULTS

4.1. Literature Analysis

Following our search methodology, we found 142 articles (Google Scholar: 100; AISeL: 42) relevant for the aim of this study. As proposed by Webster and Watson [32], a complete keyword search as well as an evaluation of titles and abstracts was applied to each of the articles (Evaluation I) (n=38). Non-relevant articles were eliminated. Finally, the remaining articles (n=25) were verified by the full text (Evaluation II). In order to contribute to the reliability and validity of the results, the relevance of each article was evaluated by at least two researchers independently and consolidated afterwards (Fig. 2).

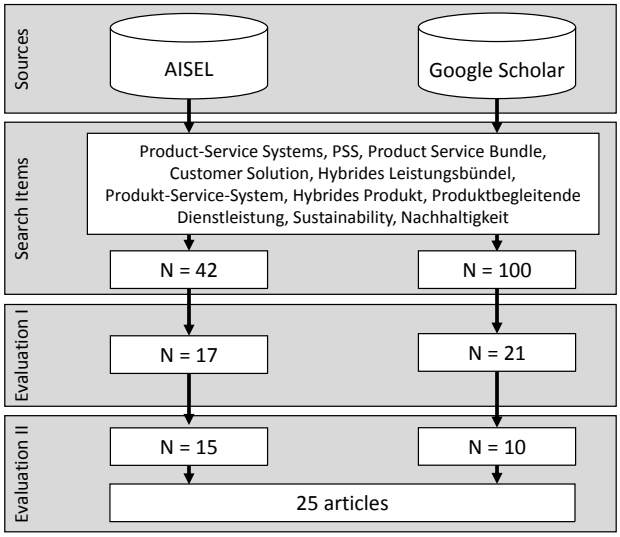

Fig. 2. *Overview literature review process*

4.2. Literature Synthesis

Next, we classified all articles obtained by using a concept matrix (Table 3). We divided this matrix into the following dimensions: *Category*/*Effect* (consolidated effect based on the coding), *Sustainability* (economic, ecological and social effects), *Quantity* (percentage of articles dealing with certain effects), and *Appearance* (MC/PSS source of the effects).

Based on the examined concept matrix five main observations emerge: First, we refer to the focus of the found literature. The selected MC articles mainly focus on social (87%) or economic sustainability (84%). With the aspect of environmental sustainability, only 9 out of 33 papers (28%) are concerned. While the selected PSS literature focuses on social (84%) and economic sustainability (96%), environmental sustainability is handled only by 56%.

Second, as indicated in the quantity column in Table 3, over 48% of the PSS papers deal with all three sustainability aspects (22% of the MC paper), with two of the aspects 40% (78% of the MC paper) and 12% just with one aspect (for the MC paper almost 22%).

Third, we refer to the source of the 40 effects. As 159 entries are detected form the PSS literature, 132 entries are based on the MC literature. The effect “increased individualization and personalization (addressing customer needs)” is by far the most frequently mentioned one with 11% from PSS and 20% from MC.

Fourth, considering the proportion of the analyzed literature (i.e., in which literature does a certain effect appears?), it can be stated that some effects are predominant in both MC and PSS alike. For example, the effect “increased individualization and personalization” can be found in 79% of the analyzed MC papers and in 68% of the analyzed PSS literature.

Fifth, there are some great differences in the sets of articles between PSS and MC. For instance: while the effect “increased supply chain integration/coordination of value partners” does not come up in the analyzed MC papers, 64% of the analyzed PSS papers address it, for example by investigating how value networks need to act in order to allow PSS development.

Table 3. *Concept matrix including comparison of MC and PSS effects on sustainability*

Category/Effect		Sustainability			Quantity		Appearance	
		Economic	Ecological	Social	MC % (n=33)	PSS % (n=25)	MC Reference	PSS Reference
Market-/finance-oriented effects	increased profits	●	-	-	15	12	[5], [6], [37]–[39]	[40]–[42]
	reduced costs	●	-	-	18	24	[5], [6], [37], [43]–[46]	[22], [47]–[51]
	increased competitive advantages	●	-	-	12	20	[5], [37], [52], [53]	[54]–[57]
	efficient production	●	-	-	24	12	[5], [6], [43], [45], [46], [52], [53], [58]–[63]	[22], [47], [48]
	reduced safety stock	●	-	-	6	0	[5], [43]	-
	reduced information costs	●	-	-	6	8	[43], [64]	[22], [54]
	increased willingness to pay	●	-	●	18	0	[6], [39], [43], [53], [63], [65]	-
	efficient marketing	●	-		9	0	[6], [43], [53]	-
	successful business model	●	-	-	3	0	[66]	-
	differentiability in the market	●	-	-	0	32	-	[41], [42], [55], [67]–[71]
	increased cost-structure complexity	●	-	-	0	12	-	[40], [72], [73]
	increased value of products	●	-	-	0	36	-	[22], [40], [41], [48], [54], [56], [68], [69], [71]
	reduced life cycle costs (provider)	●	-	-	0	28	-	[31], [47]–[50], [74], [75]
Customer-oriented effects	increased individualization and personalization (addressing customer needs)	-	-	●	79	68	[5], [6], [27], [37]–[39], [43], [45], [46], [52], [53], [59]–[63], [65], [66], [76]–[83]	[22], [40]–[42], [47], [48], [51], [54], [55], [57], [67]–[70], [72]–[74]
	stronger customer relationship	-	-	●	21	48	[46], [52], [53], [61], [62], [64], [84]	[22], [40], [41], [47]–[49], [51], [54]–[56], [68], [74]
	fear to claim (customer)	-	-	●	3	0	[63]	-
	group-based individualization	-	-	●	9	0	[27], [53], [63]	-
	increased trust	-	-	●	3	0	[85]	[48]
	increased customer satisfaction	-	-	●	24	28	[6], [38], [39], [43], [53], [62], [65], [84]	[22], [42], [48], [54], [57], [67], [68]
	increased product-customer relationship	●	●	●	15	24	[5], [6], [46], [53], [82]	[47]–[49], [54], [67], [74]
	strengthen company image	●	-	-	0	4	-	[42]
	changed consumption behavior	●	●	●	0	36	-	[22], [31], [47]–[50], [54], [86], [87]
	reduced customer responsibility	-	-	●	0	8	-	[47], [50]
	rebound effects on consumption	●	●	●	0	16	-	[31], [50], [74], [87]
Partner-, network and complexity-oriented effects	mass confusion (customer); “service paradox” [56]	-	-	●	24	8	[37], [38], [43], [52], [53], [62], [63], [77]	[40], [56]
	un-sufficient knowledge to design products (customer)	●	-	●	12	0	[38], [52], [53], [63]	
	enabling short-term changes	●	-	-	6	0	[43], [77]	
	easier access to information (producer/provider)	●	-	-	24	4	[5], [27], [43], [53], [61], [62], [76], [79]	[54]
	increased complexity of customer/product requirements	●	-	-	0	12	-	[55], [57], [68]
	increased supply chain integration / coordination of value partners	●	-	-	0	64	-	[22], [31], [41], [42], [47], [48], [50], [51], [54], [56], [67], [68], [68]–[70], [72], [73]
Product-/production-oriented effects	shortened delivery time	●	-	-	21	0	[5], [6], [37], [44], [46], [61], [62]	
	increased product quality	●	-	-	12	4	[5], [39], [44], [61]	[48]
	increased product complexity	●	-	-	24	12	[5], [6], [46], [52], [53], [61], [62], [88]	[48], [55], [57]
	waste reduction	-	●	-	9	16	[5], [46], [62]	[47]–[49], [87]
	energy efficiency	-	●	-	0	4	-	[75]
	reduced plagiarism	●	-	-	0	8	-	[72], [73]
	intensified product usage	●	●	-	0	16	-	[22], [31], [48], [86]
	increased dematerialization	●	●	-	0	16	-	[48], [50], [54], [74]
	increased refurbishment	●	●	-	0	20	-	[47]–[49], [70], [74]
	increased recycling	●	●	-	0	36	-	[31], [40], [48]–[50], [54], [57], [74], [86]

5. DISCUSSION

Overall, the concept matrix enables a comparison (similarities and differences) of MC and PSS regarding their effects on sustaiability from a holistic perspective.

In general, it appears that MC literature indicates more concrete effects like "reduced safety stocks", "shortened delivery times" or "fear to claim" for individualized products. In contrast, PSS literature analyzes those effects more from a conceptual level. A possible yet simple reason for this might be the existance of concrete MC implementations and the corresponding reports about enablers and obstacles of their success. Moreover, single long-term case studies investigate the interconectedness of MC and green management as the implementation of environmental sustainability principles into a business model (e.g., [89]). In PSS literature, two major observations occur: (1) The description of implemented PSS business models is rare and mostly not profound regarding business processes, component development, customer-vendor interactions or the transition of the business model over time. (2) Existing business models that follow PSS principles are not labeled as such, as can be seen in the oil & gas industry. Nevertheless, MC and PSS both emphazise customer integration and the complexity of their respective offerings. On the one hand this is expressed through the effect of "mass confusion", on the other hand by product and service complexity. However, in PSS literature the increasing complexity of customer demands is strengthened by the consideration of the time line. Since the PSS concept inherently focusses on the life-cycle in general, a reconfiguration of existing deployed PSS components is frequently discussed. This includes also efforts for recycling, refurbishment and circular economies, which are only present to a minor degree in the MC domain. Intrestingly, PSS literature draws also attention to legal aspects (ownership and responsibility) and to plagiarism which is obviated by the complexity of joint product and service offerings.

Another observation from the matrix is that both MC and PSS bundle different values to differentiate their offering at the market. However, while in MC commonly integrated solution offerings or product-related offerings are distributed, PSS mostly highlight the combination of products and services as an development goal. Therefore, PSS literature reports more about the entire life cycle like end-of-life phases and dematerialization in particular.

With respect to PSS it appears that the coordination of the value network and the integration of different partners in the supply chain is a central point of discussion since 64% of the identified articles refer to this issue. From a MC perspective, this discussion focusses on the portfolio of capabilities and robust process design which is a key principle of MC. Additionally, PSS literature adresses the change of consumption behaviour more frequently than MC, which also mirrors the life cycle perspective of PSS offerings.

Limitations. Although we followed well-established methodological recommendations for conducting literature reviews [32], the selection of keywords and sources as well as the evaluation of the relevance are based on own decisions and interpretations, which have limitations. First, we could have added more keywords (e.g., "environmental effects" for sustainability or "value bundle" for PSS). Second, we could have added more sources (e.g., ScienceDirect or Scopus)—however, we argue that our selection allows for a multidisciplinary overview that includes different perspectives on the concepts. An extended search with additional keywords and sources may enable the identification of more literature that contributes to this field (e.g., [90], [91]). Third, a completely different methodological approach could be applied, for example expert interviews and surveys to gather effects and compare both PSS and MC.

Overall, we chose this research design because we would argue that it is appropriate for conducting traceable and rigorous research.

6. CONCLUSION

As emphazized by various authors and numerous of studies, sustainability is an essential issue that needs to be considerd by (new) business strategies such as MC and PSS in order to allow acting economically, ecologically and socially. Thus, the main goal of our article is to identify current effects (*RQ1*) as well as exmaine similarities and differences between both MC and PSS based on the effects (*RQ2*). Therefore, we build on two extensive literature reviews that explore sustainability effects of PSS and MC. Based on 159 PSS entries and 132 MC entries gatherd during the coding procedure with three reseachers, we examined a consolidated set of 40 effects across four main categories. We contribute to a synthesized and strucutred overview of current positive effects as well as negative effects (i.e., raising challenges) that are discussed in the context of PSS and MC.

While PSS and MC are often adressed seperately, we argue that both concepts have a lot in common and research could learn from each other. For instance, on the one hand, capabilities and key principles of MC could be transferred to PSS since MC focusses on the offering and methods for customer-vendor-interaction. To those belong choice navigation, solution space development and robust process design but with a clear focus to joint development of product and service components. As other current studies of the authors show, the lack of common development tools for products and services offers immense research potentials.

On the other hand, the life cycle perspective of PSS could be transferred to MC. Single enablers for MC such as modular designs, are discussed with regard to sustainability and especially recycling and refurbishment. Although MC aims at long lasting business relations and through learning relationships on high transaction costs for changing a supplier, MC offerings usually satisfy customer needs at one point in time. Monitoring requirements also during the use phase and also integrating data analytics like used for predictive maintenaince could be interesting.

Furthermore, as mentioned earlier, the shift to use- or result-oriented solution offerings as proposed by Tukker, has the potential of radically impact the sufficiency strategy of sustainability. Following the principles that

Pine and Gilmore [92] have formulated regarding the progression of economic value, integrating MC and PSS could contribute to the experience economy or to transformations for real customer involvement and customering.

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