

Meta-informações das revisões bibliográficas (2018)

1. Referência completa do artigo

BOEHM, M.; THOMAS, O. Looking beyond the rim of one's teacup: A multidisciplinary literature review of Product-Service Systems in Information Systems, Business Management, and Engineering & Design. **Journal of Cleaner Production**, v. 51, p. 245–260, 2013.

2. Autores

Matthias Boehm

2.1. Tipo: He was a Doctoral Candidate in the Information Management and Information Systems. Today, he is working at IBM Almaden Research Center (San Jose, United States)

2.2. Idade: NONE

2.3. Anos pesquisando no assunto: 3 (2011 ~ 2013)

2.4. Instituição: Osnabrück University (Germany)

2.5. Colegas da mesma instituição: Oliver Thomas, Carl Stolze

2.6. Quantidade de artigos já publicados:

- On Google Scholar: 45 papers
- In Scopus: 34 papers
- On Researchgate: 9 (including articles (4), conference paper (4) and technical report (1))

2.7. Outros artigos significativos (mais citados) sobre outros temas

Three most cited papers in Scopus (within 32 papers):

- Hybrid parallelization strategies for large-scale machine learning in systemML (23)
- Dependency-based IT Governance practices in inter-organisational collaborations: A graph-driven elaboration (18)
- Data management in the MIRABEL smart grid system (14)

Three most cited papers on Google Scholar (within 42 papers):

- Dependency-based IT Governance practices in inter-organisational collaborations: A graph-driven elaboration (36)
- Towards an Integrated Approach for Resource-Efficiency in Server Rooms and Data Centers (17)
- Towards sustainable IT by teaching governance practices for inter-organizational dependencies (13)

2.8. Outros artigos significativos (mais citados) neste tema (papers mentioning only service engineering have been not considered):

Other cited paper in Scopus (within 2 papers):

- Understanding IT-Management and IT-Consulting Teaching as Product Service System: Application of an Engineering Model (2)

Two most cited papers on Google Scholar (within 3 papers):

- Understanding IT-Management and IT-Consulting Teaching as Product Service System: Application of an Engineering Model (3)
- Developing IS Leaders through Integrated Teaching Processes–Design and Engineering of a Product-Service System (2)

2.9. Co-autores recorrentes:

Based on Scopus:

- Wolfgang Lehner (Technische Universität Dresden, Germany);
- Dirk Habich (Technische Universität Dresden, Germany);
- Berthold Reinwald IBM Almaden Research Center (United States);
- Uwe Wloka (Hochschule für Technik und Wirtschaft Dresden, Germany);
- Professor Tomas Oliver (Osnabrück University, Germany);

Based on Researchgate

- Professor Oliver Thomas (Osnabrück University, Germany);
- Rüdiger Breitschwerdt, Ph.D. (Hochschule Flensburg, Germany);
- Christina Niemöller, Ph.D. (Salt and Pepper Software Solutions);
- Professor Frank Teuteberg (Osnabrück University, Germany);
- Carl Stolze (Osnabrück University, Germany)

Oliver Thomas

2.10. Tipo: Professor in the Information Management and Information Systems

2.11. Idade: NONE

2.12. Anos pesquisando no assunto: 7 years (2008 ~ 2014)

2.13. Instituição: Osnabrück University (Germany)

2.14. Colegas da mesma instituição: Matthias Boehm; Carl Stolze

2.15. Quantidade de artigos já publicados:

- On Google Scholar: 274 papers
- In Scopus: 109 papers
- On Researchgate: 204 (including articles (55), book (12), chapter (39), conference paper (95) and technical report (3))

2.16. Outros artigos significativos (mais citados) sobre outros temas:

Three most cited papers in Scopus (within 102 papers):

- Process Modeling Using Event-driven Process Chains (Book Chapter) (148)
- A value-driven approach to the design of service-oriented information systems-making use of conceptual models (23)
- Tool support for the collaborative design of reference models - A business engineering perspective (21)

Three most cited papers on Google Scholar (within 262 papers):

- Process Modeling Using Event-driven Process Chains (Book Chapter) (272)
- Understanding the Term Reference Model in Information Systems Research: History, Literature Analysis and Explanation (143)
- Semantic Process Modeling - Design and Implementation of an Ontology-Based Representation of Business Processes (93)

2.17. Outros artigos significativos (mais citados) neste tema (papers mentioning only service engineering have been not considered)

Four most cited papers in Scopus (within 7 papers):

- Design and Usage of an Engineering Methodology for Product Service Systems (15)
- IT-supported value-added chains for the integration of products and services (4)
- Towards a design science-driven product-service system engineering methodology (2)
- Understanding IT-management and IT-consulting teaching as product-service system: Application of an engineering model (2)

Three most cited papers on Google Scholar (within 12 papers):

- Product-Service Systems: Konstruktion und Anwendung einer Entwicklungsmethodik (49)
- Design and Usage of an Engineering Methodology for Product Service Systems (23)
- Vorgehensmodelle des Product-Service Systems Engineering: Überblick, Klassifikation und Vergleich (19)

2.18. Co-autores recorrentes:

Based on Scopus:

- Professor Michael Fellman (University of Rostock, Germany);
- Novica Zarvic (University of Rostock, Germany);
- Peter Loss (Universitat des Saarlandes, Germany);
- Markus Nüttgens (University of Hamburg, Germany);
- Rüdiger Breitschwerdt (Hochschule Flensburg, Germany).

Based on Researchgate:

- Professor Michael Fellman (University of Rostock, Germany);
- Markus Nüttgens (University of Hamburg, Germany);
- Christina Niemöller, Ph.D. (Salt and Pepper Software Solutions);
- Dirk Metzger, M.Sc. (Osnabrück University, Germany);
- Rüdiger Breitschwerdt (Hochschule Flensburg, Germany).

3. Introdução e/ou revisão bibliográfica introdutória, afirmações / constatações (tipo) versus citações (essa lista pode ser longa, por isso coloquei em forma de tabela)

Afirmação / Constatação	Tipo (*1)	Referência (*2)
About 50 years ago, back in 1962, Becker (1962) proposed his idea of shifting from products to services.	C	Becker (1962)
In those days, the U.S. was the first nation that has been called “service economy” [...]	C	(Fuchs, 1965)
[...] because half of the total labor force has been employed by the service sector.	G	(Fuchs, 1968)
At the end of the 1960s, Levitt (1969) stated that people do not buy products but buy the expectation of benefits.	G	(Levitt, 1969)
In 1976, Stahel and Reday-Mulvey (1981) presented a groundbreaking report to the	C	(Stahel and Reday-Mulvey, 1981)

European Commission. They hypothesized that by focusing not on products but on selling the utility of products new jobs could be created and energy- consumption could be decreased.		
The rapid development of information and communication technologies (ICT) starting at the beginning of the 1980s is one important factor that facilitated the shift from product-orientation to service-orientation dramatically.	C	(Bhagwati, 1984) (Sztipanovits, 2012)
More and more, companies began to use ICT to add value to their products or services.	G	(Vandermerwe and Rada, 1988)
Today, there is an industrial trend toward product-service integration in a way that ICT becomes the interface between products and services.	C	(Geum et al., 2011a).
In addition, globalization leads to the transferal of production to low-cost regions, competition has become fiercer, as well as customers have become more and more demanding.	G	(van Halen et al., 2005)
In future, there is a trend toward a very close integration of products, services, sensors, and the Internet e already discussed as Cyber-Physical Systems (CPS).	C	(Sha et al., 2009) (Broy et al., 2012) (Sztipanovits, 2012).
One of the first known definitions is in a report for the Dutch government in which Goedkoop et al. (1999) states that a PSS can be understood as “a marketable set of products and services capable of jointly fulfilling a user’s need”.	C	(Goedkoop et al., 1999)
PSS are defined as systems of products, services, sup- porting networks and infrastructure that are designed to be competitive, satisfy customer needs, and have a lower environ- mental impact than traditional business models.	C	(Mont, 2002a)
Rolls-Royce, for example, delivers a “power-by-the-hour” instead of transferring ownership of the gas turbine engines to the airline companies.	C	(Baines et al., 2007) (Huang et al., 2011)
Other examples of PSS can be found for photo copiers [...]	C	(Geum et al., 2011b) (Huang et al., 2011)
[Other examples of PSS can be found for] car sharing [...]	C	(Meijkamp, 2000) (Kuo, 2011)
[Other examples of PSS can be found for] office industry [...]	C	(Besch, 2005),
[Other examples of PSS can be found for] teaching [...]	C	(Brezet et al., 2001) (Boehm et al., 2011b),
[Other examples of PSS can be found for] IT solutions.	C	(Herzfeldt et al., 2010)
ICT is for many of the above mentioned examples for PSS an integral foundation [...]	C	(Ryan, 2004)

ICT is seen as an enabler of new business models which can be implemented by both manufacturing and service companies.	C	(Neely, 2008)
New working methods, consumption patterns and production chains are driven by IT solutions.	G	(van Halen et al., 2005)
A new service economy has arisen which is driven by IT.	C	(Manzini et al., 2001)
Additionally, a high level of customization of products and services becomes possible at a lower level of costs.	C	(Kellogg and Nie, 1995)
That is the reason why recently the PSS concept also has been discussed in more technical oriented disciplines like for example Information Systems.	C	(Gräßle et al., 2010)
Business Management (BM) mostly investigates bundling of products and services from a marketing perspective.	C	(Shostack, 1977) (Schmalensee, 1982) (Eppen et al., 1991)
Additionally, different terminology like “compact” [...] also have been presented to discuss the PSS concept.	C	(Bressand, 1986)
[Different terminology like] “servitization” also have been presented to discuss the PSS concept.	C	(Vandermerwe and Rada, 1988)
Especially North-European researchers have coined the term “Product-Service System”	C	(McAloone and Andreasen, 2004) (Mont, 2004) (Tukker and Tischner, 2006b)
Furthermore, similar conceptualizations have been given using terms like “functional sales” [...]	C	(Lindahl and Ölundh, 2001)
[similar conceptualizations have been given using terms like] “functional products” [...]	C	(Kumar, 2003)
[similar conceptualizations have been given using terms like] “total care products” [...]	C	(Alonso-Rasgado et al., 2004)
[similar conceptualizations have been given using terms like] “extended product”	C	(Thoben et al., 2001)
[similar conceptualizations have been given using terms like] “servicification” [...]	C	(Lodefalk, 2010)
[similar conceptualizations have been given using terms like] “covalent product” [...]	C	(Weber et al., 2002)
[similar conceptualizations have been given using terms like] “post mass production paradigm” [...]	C	(Tomiyaama, 2002)
[similar conceptualizations have been given using terms like] “Industrial Product-Service Systems IPS2”.	C	(Meier et al., 2011)
However, most often they [the conceptualizations] mean the same thing	C	(Lifset, 2000)

Terms like “hybrid product” [...] [have been used].	C	(Leimeister and Glauner, 2008)
[Terms like] “hybrid value bundles” [...] [have been used].	C	(Schrödl and Turowski, 2011)
[Terms like] “hybrid value creation” have been used.	C	(Thomas et al., 2007)
Parallel to research on PSS, the concepts of “new service development” respectively “service engineering” have been coined in America respectively in Germany and Israel.	C	(Bullinger et al., 2003)
In general, on recognizes that the development aspect is very important in many contributions [see some examples].	C	(Lindahl et al., 2006a) (Tukker and Tischner, 2006a) (Davis et al., 2010) (Müller and Stark, 2010) (Berkovich et al., 2011a, 2011b)
Due to the increasing number of contributions to the PSS concept [...] [many domains discovered the PSS concept for their work].	C	(Velamuri et al., 2011)
[Due to the] exploding amount of PSS research projects, many domains discovered the PSS concept for their work.	C	(Müller and Sakao, 2010)
The most critical issue about these developments is the fact that there are only quite limited connections between those researchers.	L	(Tukker and Tischner, 2006b)
Different terminology has often been used for describing apparently identical phenomena.	L	(Pawar et al., 2009)
As an overview on the research landscape is still missing, researchers for example dealing with PSS development cannot rely on all relevant contributions.	L	(Sakao et al., 2009b)
A further problem is the generalization of results. It is often impossible to apply them because new methods and models are tested only in a small number of examples.	L	(Mont, 2002b)
Hence, there is a need for consolidation for making research results usable by more researchers and applicable in practice	L	(Müller and Sakao, 2010)
So far, our question has not been asked in other literature reviews on PSS [see some examples]	J	(Baines et al., 2007) (Velamuri et al., 2011) (Cavalieri and Pezzotta, 2012)
The PSS concept in disciplines like Business Management and Engineering & Design has been compared	J	(Tukker et al., 2006)

(*1) Tipos de afirmação / constatação: G (geral), C (contexto), J (justifica o artigo / pesquisa), L (explicita a lacuna). A constatação da lacuna é muito importante. Mas é difícil diferenciar J de L.; (*2) Inserir somente autor(es) e ano. A referência completa encontra-se no próprio artigo

4. Casos citados e principais características dos casos

Six cases were cited, but they were not explained in details. They are: Rolls-Royce, which delivers a “power-by-the-hour” instead of transferring ownership of the gas turbine engines to the airline companies (Baines et al., 2007; Huang et al., 2011); photo copiers (Geum et al., 2011b; Huang et al., 2011), car sharing (Meijkamp, 2000; Kuo, 2011), office industry (Besch, 2005), teaching (Brezet et al., 2001; Boehm et al., 2011b), and IT solutions (Herzfeldt et al., 2010) (page 246)

5. Questão da pesquisa, Foco (escopo) e objetivos (geral primário e secundários)

- Research question: “What is the state-of-the-art in PSS research in the Information Systems (IS), Business Management (BM), and Engineering & Design (ED) disciplines and what are future directions especially concerning PSS development?” (page 246)

- Main goal: To conduct a rigorous and structured PSS literature review considering the three disciplines Information Systems (IS), Business Management (BM), and Engineering & Design (ED). (page 246)

- Specific goal: To support novice researchers who want to start in the PSS field in giving them a comprehensive overview on the field with respect to topics, peoples, publication medium etc. (page 246)

6. Qual o diferencial deste artigo (análise da revisão) com relação a outras revisões e/ou surveys? (segundo o autor, caso ele tenha citado). Avaliar uma por uma, caso o autor tenha feito isso. Pode montar uma tabela se for o caso.

The authors state that their research is novel in a way that a high number of articles from three disciplines [Information Systems, Business Management and Engineering & Design] had been systematically identified, analyzed, and compared. They argue that the proposed research question had not been asked in other literature review on PSS.

Additionally, the answer to the research question would be valuable for researchers of all three disciplines.

The authors did not present a deep evaluation of each aspect related to the originality/value of the paper regarding other publications.

7. Metodologia

7.1. Descrição Geral: Nome do(s) método(s); se é qualitativo, quantitativo ou combinação de ambos

Methods: systematic literature review combined with graph-theoretical approach.

Characteristics: The authors employed a multi-disciplinary analysis based on three phases, which are the review protocol (what is the research question and scope); search strategy (how to identify relevant literature); and, documentation and analysis (what we can learn from a rigorous analysis of the literature).

The conceptual organization and a neutral perspective were taking in order to integrate previous research of three different disciplines.

Approach: Combination of qualitative and quantitative approaches.

7.2. Período de análise das referências (publicações desde que ano)

First time frame: 1992 to 2012. Justification: covering a time span of 20 years of research. After the time frame has been expanded in order to cover also previous highly relevant contributions (since 1973).

7.3. Tamanho da amostra analisada:

265 papers

7.4. Quantidade de referências citadas:

209 references

7.5. Foram realizadas observações complementares?

The authors explicitly included publications in German language.

7.6. Fontes da revisão (casos, periódicos específicos, e quais bases de dados). Quais as justificativas para escolher essas fontes.

Cases: NONE

Specific journals: NONE

Relevant databases: EbscoHost, Springer Link, ScienceDirect, WISO Database, AIS Electronic Library, EmeraldInsight, Wiley InterScience, IEEEXplore, INFORMS, and ProQuest. Justification: To find a diverse range of publications, like for example journal articles, conference proceedings, theses, books and trade journals.

Other databases (internet search engines): Google and Google Scholar. Justification was not presented.

7.7. Estratégia para construção da string de busca

The authors selected terms described by Velamuri et al. (2011) and Thomas et al. (2008a) in order to derive a set of the most relevant ones: Product-Service Systems, Compack, Complex Package, Value Bundle, Covalent Product, Servicification, Post Mass Production Paradigm, Hybrid Product, Hybrid value creation.

The authors did not present further information.

7.8. String de busca

NONE

7.9. Filtros

- Literature search in databases in both English and German languages;
- Literature search in internet search engines in both English and German languages;
- Removal of duplicates, book reviews, editorials, and teaching cases;
- Reading of abstracts and conclusions;

- In parallel, search of relevant contributions in the query results of the Internet search engines and reading of abstracts;
- Integration of the lists (from databases and internet search engines) and completely reading of the papers;
- Analysis of references and conduction of a backward and forward search.

7.10. Técnica / método de análise utilizada

The descriptive investigation was employed and the graph-theoretical approach.

Firstly, data were recorded, as follows: the source (journal, conference or other) and full reference; discipline of outlet; language and country of the first author; number of authors and type (researcher and/or practitioner); purpose of article and research questions; research design and research methodology; main topic area and main findings; industry of investigation; perspective and discipline of the article; whether the study provides a definition of PSS, and four keywords characterizing the article.

The definitions found in the PSS literature were assigned to one of the three disciplines [Information Systems, Business Management and Engineering & Design].

Following, the concept of PSS was analyzed based on graph-theoretical approach of definition graphs for each discipline (please see page 248). In the graph, concepts are nodes and pairs of concepts are the edges.

7.11. Metodologia para definição de pesquisas futuras

NONE

But, in the “Research Agenda” section of this study, the authors presented that future researches were proposed from the findings and based on additional notes that were recorded during the papers analysis. The authors independently analyzed the data and searched for gaps and possible future research opportunities. Afterward, the results have been discussed and condensed into a list. Then, argumentation for each issue was developed and references in literature were searched in order to ensure even a better motivation for the issues.

8. Resultados

8.1. Quantidades resultantes antes e após cada filtro

Filter	Sources	
	Databases	Internet search engines
After query and before removal of duplicates and editorials etc.	2.882	-
After query and before search for relevant contributions and inspection of abstracts	-	205.194
After removal of duplicates and editorials etc. and	261	-

before inspection of abstracts and conclusion		
After inspection of abstracts and conclusions, and before completely reading	91	48
After completely reading and after backward and forward search	265 (out of which 140 papers were without duplicates and 125 papers were added after backward and forward search)	

8.2. Definições (resultantes da análise ou mesmo adotadas como premissas no início da publicação)

In each discipline there are very different definitions of the PSS concept (statement obtained from the analysis of the literature).

8.3. Evolução da pesquisa / das publicações no assunto

Out of the 265 investigated articles, 41 (15%) can be assigned to the field of Information System, 77 (29%) to Business Management and 147 (55%) to Engineering & Design. The largest amount of published papers is in the Engineering & Design field. Regarding those papers, most of them have been published recently (the peak of publications in Engineering & Design, with 7 papers, was in 2006 due to a special issue of the Journal of Cleaner Production).

The first publications in the PSS field were made in 1973 within Business Management, and Information System field started to cover the PSS topic only from the year 2007 on.

In total, the most productive years were 2009 (with 32 publications) and 2006 (with 30 publications).

8.4. Comunidades / “tribos” / “igrejas”/ áreas de conhecimento / disciplinas identificadas

The authors considered three disciplines, as follows:

- Information System;
- Business Management;
- Engineering & Design.

8.5. Características de cada tribo (os atributos e/ou explicações são definidos pelo próprio artigo)

- Information System: NONE;
- Business Management: discipline that subsumes researches in such as marketing or consumer studies;
- Engineering & Design: NONE.

8.6. Principais “achados” (*findings*)

Overview on the PSS field

The most productive authors are: Tomohiko Sakao from Engineering & Design, with 11 papers; Oliver Thomas from Information System, with 11 papers; and, Erick Sundin from Engineering & Design, with 10 papers.

About 91.7% of the papers have been written by researchers, 6.4% by researcher and practitioners, and 1.9% only by practitioners [it could infer that the action research is not a widely used scientifically method].

The papers have been mostly published in journals and conferences (199 papers). There are some papers published in periodicals including Harvard Business Review and Sloan Management Review (7 papers), or books (59 papers).

The main publication media within each discipline is presented below:

	Information System	Business Management	Engineering & Design
Journals	-Wirtschaftsinformatik -Business & Information Systems Engineering	-Industrial Marketing Management -International Journal of Operations & Production Management -European Management Journal -Journal of Marketing -Journal of Manufacturing Technology Management	-Journal of Cleaner Production (with the highest absolute number of papers) -Journal of Manufacturing Technology Management -The International Journal of Advanced Manufacturing Technology -Journal of Engineering Design
Conferences	-Wirtschaftsinformatik -Multikonferenz Wirtschaftsinformatik -Americas Conference on Information - Systems European Conference on Information Systems - Australasian Conference on Information Systems -Hawaii International Conference on System Sciences -Pacific Asia Conference on Information Systems	-None	-International Design Conference -LeNS Conference -CIRP International Conference on Industrial Product Service Systems

Conceptual research is predominant. In general, quantitative design and Design Science do not play a key role.

Regarding the employed research methodologies, methods of creating models, architectures and frameworks are most often used within Information System and Engineering & Design disciplines. Speculation/commentary method is most employed within Business Management discipline, and library research is used in all disciplines. Methods like laboratory experiments or context analysis are only used in the Engineering & Design discipline. Surveys and prototyping are rarely used. The proportion of use of each method in each discipline is presented in the study.

Considering the perspectives taken in for analyzing each paper (which are presented in the page 250), the strategic and business level views are most taken in. Business Management focusses on the strategic view, Information System concentrates on the business level, and Engineering & Design encompasses a broad mixture of several views including the business level view, design view and strategic view.

Definition of PSS

There is a variety of definitions (8 from the Information System discipline, 23 from Business Management discipline, and 43 from Engineering & Design discipline), terminologies and concepts on the PSS field meaning more or less the same.

The term “Product-Service System” is the most used.

Based on the definition graphs created (please see topic 11 of this report), the PSS characteristics in each discipline could be synthesized, as follows:

- Information System discipline: a PSS is a hybrid product and service, combined to a value bundle. This bundle is an integration of the components and can be seen as a transaction or an offer. It solves a problem and offers therefore as a solution customer utility.
- Business Management discipline: Products and services are combined to a bundle or system. The focus is set to the problem-solving ability and added value. By doing so, the needs of customers should be satisfied. Additionally, PSS is seen here as a paradigm and organizational frame and strategy.
- Engineering & Design discipline: The emphasis is also on the function fulfillment and utility as well as the fulfillment of user needs. Also, the lowered environmental impact and sustainability are highlighted. Furthermore, aspects like (user-centric) life cycle management, value propositions, supporting (value) networks, and the (technological) infrastructure as well as the business model character as an innovation strategy are named. The aspects of marketability and integrated view on products and services in terms of planning, development, delivery, and usage are characteristic for PSS.

Then, a core definition of PSS was proposed by the authors: Product-Service System (PSS) is an integrated bundle of products and services which aims at creating customer utility and generating value.

Notion of PSS

The notion of PSS is clarified considering each one of the three disciplines. The most discussed aspects are presented as follows:

- Information System discipline: modeling of PSS; requirement engineering; development of a framework for hybrid value creation considering development, usage and replacement as core process; foundation of hybrid products; IT as prerequisite for many PSS.
- Business Management discipline: discussion about the definition of service; solution concept; transformation of business to service orientation; bundling and the integration

- of products and services; marketing view on the transition from products to services; process models for the servitization; requirement of organizing the business process to develop hybrid products; management challenges in the servitization; business models.
- Engineering & Design discipline: discussion of the concept of PSS; PSS engineering methods; benefits of PSS; drivers and barriers for PSS; elements of PSS; characteristics of PSS; PSS business model; PSS methods [including investigation of a method for designing PSS in practice]; PSS Engineering; sustainability and product innovation; models of sustainable PSS.

In some of the papers analyzed within the Engineering & Design discipline presents a self-critically reflect that focusing solely on case studies and models is not sufficient.

Concepts in the PSS field

Please see the concept matrix presented in the topic 11 of this report. The concepts which occurs most often in each discipline is presented below:

- Information System discipline: modelling;
- Business Management discipline: related concepts (dealing with associated concepts on PSS);
- Engineering & Design discipline: PSS Engineering approach (mostly widely discussed across all disciplines).

8.7. Outros tópicos que não foram tratados aqui (sugestão para nova meta-informação ou resultados significativos)

Considering the results section of this study that has been analyzed, NONE.

8.8. Proposições de pesquisas futuras (geral)

- Looking across borders and integrate results from other disciplines;
- Further clarification of the terminology in order to achieve a common foundation in which all the different concepts can be clearly distinguished.
- Considering a broader set of views (perspectives), as innovation view, organizational view or sustainability view;
- Explicating the methodology, considering a traceable procedure applicable in practice;
- Presenting a deep understanding of the PSS concept or PSS engineering approaches;
- Conducting an evaluation for achieving more practically relevant results;
- Extending international collaboration instead of conducting a study for one industry in one country. Comparing some cases;
- Integrating practitioners in the study. More collaboration between researchers and practitioners;
- Changing research design doing quantitative empirical research designs;
- Enhancing set of research methods instead of focusing on a limited set of research methods;
- Discussing the future of PSS including technological aspects.

8.9. Contribuições (para academia / prática / ambas?)

Implications for theory: The results help researchers, and especially but not exclusively novice researchers, to understand the concept of PSS. And, the overview on previous

literature reviews and comparison with the contribution of this study is useful especially for other researchers who want to get a quick over view on relevant articles of the PSS field.

Implications for practice: The derived definition and elaborated notion of PSS is a useful basis for practitioners in order to develop PSS. Core definition, overview of the research field, and meta-analysis are a good starting point in discussing the PSS area in practice.

9. Conclusões

9.1. Trabalhos futuros (que o autor se propõe, diferente das proposições futuras)

Literature review including publications in other languages than German and English.

9.2. Limitações

Not all contributions to the PSS field were identified and analyzed.

Only articles in English and German were included in the scope of this study.

10. SUA ANÁLISE

10.1. Pontos fortes

The paper presents a structured PSS literature review in the Information Systems (IS), Business Management (BM), and Engineering & Design (ED) disciplines. By means of it, a unified definition of a PSS was formulated considering the contributions of those three disciplines.

For doing it, the authors employed the systematic literature review combined with the graph-theoretical approach. By means of membership value (using a quantitative approach), definitions graphs were created to extract the core meanings and definitions of PSS in each discipline. The graph-theoretical approach allowed a more accurate analysis, which was not based only on a qualitative approach.

The investigation is multidisciplinary since it integrates three different disciplines of great importance for discussing aspects of PSS (as stated by the authors). Some perspectives were taken to compare the research of the three disciplines, avoiding an intuitive analysis.

Besides proposing a new core definition of PSS, in a holistic way, the paper presents the most productive authors, the main journals and conference proceedings, that is valuable for other researchers, especially for novice researchers. Also, a research agenda is elucidated.

10.2. Pontos fracos

The paper does not describe the main characteristics (or definition) of the three disciplines. Also, the authors did not present how the articles from the literature review were separated in each discipline.

In order to provide better understanding, the results could be more systematized in accordance with the discipline. In some situations, it is confusing to understand whether a data is related to one or another discipline.

Although the process until proposing a new definition of PSS is complex and well-structured, the definition per se is vague and similar to other ones already presented on the PSS literature.

PS.: The term “servitization” was not used in the search string.

10.3. Sugestões para melhoria do artigo

My suggestions are:

- Describing the mains definitions of each disciplines;
- Presenting the separation process of the papers according to the discipline;
- Better describing and give example of the was really graph-theoretical approach employed.

11. Figuras ou tabelas importantes (caso você queira copiar e citar nos tópicos anteriores)

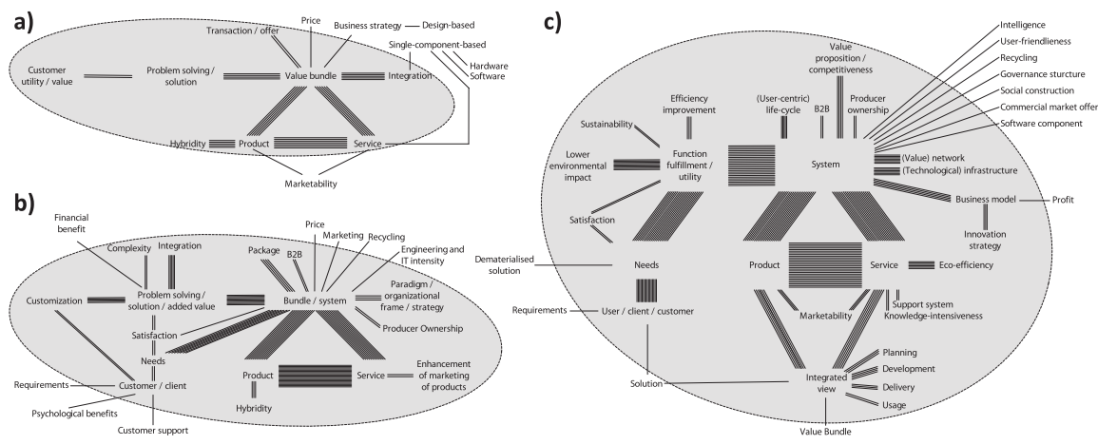


Fig. 7. Definition graphs for PSS in IS discipline (a), BM discipline (b), and ED discipline (c).

Table 5
Concept matrix.

Discipline	Concept																		
	PSS engineering approach	Related concepts	Sustainability	PSS concept	PSS design	Meta level analysis	Modelling	Service concept	Products vs. services	Consumer research	Requirements engineering	Service design	Solutions	PSS management	PSS perspective on IS	Business models	Product services	PSS development process	Life-cycle approaches
IS	5	2	3	1	4	3	8			1	5		1	2	4			1	1
BM	6	20	2	2		2	1	12	5	2		3	7	3		3	4	1	1
ED	33	14	18	16	13	11	3		4	5	3	5		2	3	3	2	4	3
SUM	44	36	23	19	17	16	12	12	9	8	8	8	8	7	7	6	6	6	5