Lauri Korkeamäki

Manufacturer Perspectives on Outcome-based Service Offerings

Essays on the concept, financial consequences and customer relationships

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Julkaisun nimike
Lopputuloksiin perustuvat palvelut tuotevalmistajan näkökulmasta: Esseitä konseptista, taloudellisista vaikutuksista ja asiakassuhteista

Tiivistelmä
Tuoteliiketoiminnan hyödykkeistyminen ja koveneva globaali kilpailu ovat trendejä, jotka painostavat valmistavan teollisuuden yrityksiä kohti palvelullistumista. Sekä tutkijat että yritykset ovat tunnistaneet lopputuloksiin perustuvien palvelustrategioiden merkityksen. Kyseisiä palveluita tarjoavat valmistajat ottavat lisää vastuuta asiakkaidensa operatiivisesta toiminnasta takaamalla lopputuloksia, joita tuotepalvelujärjestelmät tuottavat. Lupaavuudestaan huolimatta lopputuloksiin perustuvat palvelut nostavat huomattavasti riskitasoa palveluntarjoajan näkökulmasta. Kyseisiä palveluita tavataan usein kompleksisissa systeemeissä, joissa useat laitteet ovat yhteydessä toisiinsa, niihin liittyvät sopimukset ovat hyvin yksityiskohtaisia, ja lisäksi usean toimijan on toimittava synkronoidulla tavalla riskien hallitsemiseksi. Tämä väitöskirja tarkastelee ilmiötä valmistajan silmin, mutta edistää tietoutta lopputuloksiin perustuvista palveluista useasta näkökulmasta. Tutkimuksen tavoitteena on tuottaa tietoa kyseisistä palveluista sekä niiden konseptin, seurausten, että vaatimusten osalta. Tämä väitöskirja pyrkii siis tuottamaan vastauksia *mitä, miksi* ja *miten* kysymyksiin, jotka saattavat askarruttaa lopputuloksiin perustuvien palveluiden mahdollisuuksia punnitsevia johtajia. Kysymysten näkökulmalliset erot johtivat monimenetelmälliseen otteeseen. Väitöskirja rakentuu siis sekä kvantitatiivisten että kvalitatiivisten menetelmien varaan. Tutkimuksessa havaittiin, että kyseiset palvelut esiintyvät eri nimillä kirjallisuudessa, mutta ”outcome-based” etuliitettä tulisi suosia sen yksitulkintaisuuden takia sekä lakiteknisistä syistä. Lisäksi pitkittäistä empiiristä näyttöä kyseisten palveluiden taloudellisesta kannattavuudesta löydettiin. Kompleksisuutensa ja räätälöitävyytensä puolesta ne ovat kuitenkin vaikeasti skaalattavissa, joten investointeja digitaalisiin palvelullistumismenetelmiin ja ratkaisujen modulaarisointiin tarvitaan. Toisaalta palveluntarjoajien tulisi myös olla tietoisia, että operoidun järjestelmän pysyessä asiakkaan taseessa saattaa tämä käyttää palvelua hyväkseen oppimistarkoituksessa. Hallitakseen aiheutuvia legitimiteettikriisejä valmistajat voivat hyödyntää diskursiivisia legitimointistrategioita.

Asiasanat
Lopputuloksiin perustuvat palvelut, Lopputuloksiin perustuvat liiketoimintamallit, Palvelullistuminen

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Manufacturer Perspectives on Outcome-Based Service Offerings: Essays on the Concept, Financial Consequences and Customer Relationships

Abstract

Pressured by product commoditization and intensifying global competition, manufacturers in business markets have turned to servitization. Outcome-based service (OBS) offerings have been highlighted as a particularly prominent service strategy by academics and practitioners alike. Manufacturers following a given service strategy assume more accountability for their customers' operations by guaranteeing outcomes generated by product-service systems (PSSs). Despite many opportunities, offering OBSs entails significantly higher risks for service providers. For example, OBS offerings often involve complex systems of interconnected equipment, the associated contracts are highly detailed, and the activities of multiple actors must be synchronized to mitigate the risk of not achieving the outcomes. This dissertation takes the point of view of a risk-taking manufacturer and contributes to the body of knowledge on OBSs from multiple perspectives.

The objective of this research is to contribute to the streams of the OBS literature regarding the concept, consequences and requirements of OBSs. In the process, this dissertation aims to provide answers to the *what, why* and *how* questions that may perplex managers contemplating the opportunities provided by OBS offerings. The multiperspectival approach prompts a mixed methodology. Thus, the current dissertation builds on both quantitative and qualitative methods. It is found that OBS offerings appear in the literature under various names but that the "outcome-based" prefix should be preferred due to its univocality and legal technical reasons. Furthermore, longitudinal empirical evidence is found concerning the profit potential of OBS offerings for machinery and equipment manufacturers. Moreover, OBS providers can mitigate scaling problems by investing in digital servitization and solution modularity. On the other hand, providers should be aware that customers who remain the owner of the PSS may intentionally leverage OBS offerings as a learning opportunity. Lastly, to manage legitimacy struggles that arise such as those mentioned above, providers can mobilize discursive legitimation strategies during lengthy OBS contract periods.

Keywords

Outcome-Based Service Offerings, Outcome Business Models, Servitization

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Abbreviations

aOBC	Availability Outcome-Based Contract
ACCOUNT	Accounting (an AJG Field)
AJG	Academic Journal Guide
B2B	Business-to-Business
B2C	Business-to-Consumer
BE	Between Estimator
CIRP	College International pour la Recherche en Productique = International Academy for Production Engineering
COGS	Costs Of Goods Sold
DFFITS	Difference in Fits
ECON	Economics, Econometrics and Statistics (an AJG Field)
eOBC	Economic Outcome-Based Contract
ETHICS-CSR-MAN	General Management, Ethics, Gender and Social Responsibility (an AJG Field)
FE	Fixed Effects
GLS	Generalized Least Squares
INNOV	Innovation (an AJG Field)
IPP	Independent Power Producer
JUFO	Julkaisufoorumi = Publication Forum
MKT	Marketing (an AJG Field)
MLE	Maximum Likelihood Estimator
NACE Rev. 2	Statistical Classification of Economic Activities in the European Community, Revision 2 (from 2006)
OBC	Outcome-Based Contract(ing)
oBC	Output-Based Contract
OBM	Outcome Business Model/Outcome-Based Business Model

OBS	Outcome-Based Service
OEE	Overall Equipment Effectiveness
O&M	Operations and Maintenance
OPS-TECH	Operations and Technology Management (an AJG Field)
OR-MANSCI	Operations Research and Management Science (an AJG Field)
PA	Population Averaged
PBC	Performance-Based Contract(ing)
PBL	Performance-Based Logistics
POLS	Pooled Ordinary Least Squares
PPA	Power Purchase Agreement
PSS	Product-Service System
PUB-SEC	Public Sector and Health Care (an AJG Field)
R&D	Research and Development
RE	Random Effects
SLA	Service Level Agreement
SMEs	Small and Medium-Sized Enterprises
STRAT	Strategy (an AJG Field)
VBC	Value-Based Contract

Publications

This dissertation consists of four enclosed research articles.

[1] Korkeamäki, L. (2021). Further semiotic perspectives on the outcome-based VS performance-based semantic dispute. In M. Kohtamäki, T. Baines, R. Rabetino, A. Z. Bigdeli, C. Kowalkowski, R. Oliva & V. Parida (Eds.) *The Palgrave Handbook in servitization* (1st Ed., pp. 133–147). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-75771-7_9[1]

[2] Korkeamäki, L., Kohtamäki, M. & Parida, V. (2021). Worth the risk? The profit impact of outcome-based service offerings for manufacturing firms. *Journal of Business Research*, *131*(July), 92–102. https://doi.org/10.1016/j.jbusres.2021.03.048[2]

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1 INTRODUCTION

1.1 Background

> *"We don't know what to do! We don't even know how to charge for this. We know how the old contracts operated and we can estimate our potential profit, but now we have no idea what to charge for performance-based logistics or how to manage our relationships with our suppliers."* (Knowledge@Wharton, 2007, para. 18)

As expressed through the words of Serguei Netessine, a Professor at the Wharton School, representatives from the defense and aerospace industries conveyed their anxiety regarding performance-based logistics (PBL) at the Wharton Service Supply Chain Thought Leaders Forum back in 2006. Indeed, in a subsequent pioneering paper, Netessine and his colleagues argued, "*Not surprisingly, such a radical change in the approach to contracting has caused confusion among suppliers of after-sales support services. The academic literature, however, offers little guidance with respect to how such contracts should be executed*" (Kim *et al.*, 2007, p. 1844). Since 2007, however, academic research on outcome-based service (OBS) offerings, such as PBL in the defense and aerospace industries, has made considerable headway. For instance, OBS deliveries are more likely to succeed when provider and customer incentives are aligned (Datta & Roy, 2011; Sjödin, *et al.*, 2020) and when contractual governance is accompanied by relational governance (Selviaridis & Norrman, 2014). Additionally, many benefits regarding OBS offerings have been emphasized. For instance, using a dataset from an airplane engine manufacturer, Guajardo *et al.* (2012) showed that product reliability was approximately 25-40% higher under a performance-based contract (PBC) compared to a time-and-materials-type contract. Furthermore, studies emphasize that an OBS offering is "*an inherently resource conscious strategy whose underlying economic model is good for the physical environment*" (Randall *et al.*, 2011, p. 341).

Despite the progress made, OBS is an intricate concept with multiple unanswered questions remaining despite years of top-tier research. For example, regarding the diversity of terminology, the associated contracts have been coined PBL contracts (Nowicki *et al.*, 2008; Spring & Araujo, 2009), PBCs (Essig *et al.*, 2016; Sumo *et al.*, 2016), performance contracts (Larbi, 2001; Selviaridis & Spring, 2018), service level agreements (SLAs; Alamri *et al.*, 2018; Liang & Atkins, 2013), value-based contracts (VBCs; Huang *et al.*, 2020) and outcome-based contracts (OBCs; Visnjic

et al., 2017). Adding to the confusion, the different terms are often used interchangeably (Grubic & Jennions, 2018a). This phenomenon begs multiple questions: what are the causes of the terminological variety, and is there even a single superordinate term?

Regardless of the inherent complexity characterizing OBS offerings (Caldwell & Howard, 2014; Hou & Neely, 2018), the emergence of the topic as an interesting subject for industrial and academic actors alike derives from a relatively intuitive premise: service providers should be compensated based on the outcomes their services yield instead of the time and material costs incurred to carry out service activities. The latter, time-and-materials-type services (Homburg & Stebel, 2009), have an inherent fundamental flaw: if the service provider is compensated on a resource-cost basis, it is naturally in the provider's financial interest to inflate his or her resource consumption (Ng *et al.*, 2013, p. 733). This is especially problematic in the case of industrial services, where spare part sales are often the predominant source of original equipment manufacturers' profits (Cohen *et al.*, 2006). In contrast, in the case of OBS offerings, the customer pays—at least partly—based on the outcomes achieved, which is why the provider must consider resource inputs (such as spare parts) as costs cutting his or her margins (Sjödin, Parida, Jovanovic, *et al.*, 2020). Thus, a separate branch of OBS research has attended to ways for providers to minimize costs and, hence, maximize profits (Patra *et al.*, 2019, p. 370). Indeed, the greater accountability assumed by the provider grants him or her the mandate to search for improvements and conduct trial and error (Visnjic *et al.*, 2017, p. 178). However, greater accountability exposes the provider to greater risks (Hou & Neely, 2018; Schaefers *et al.*, 2021). Although theoretical, analytical and case-based evidence of the profit potential of OBS offerings exists (see, e.g., Hypko *et al.*, 2010a; Nowicki *et al.*, 2008; Öner *et al.*, 2015; Patra *et al.*, 2019), more comprehensive empirical evidence (Guajardo *et al.*, 2012; Nullmeier *et al.*, 2016) regarding OBS provider firms' profitability in general is lacking.

Furthermore, compared to transactional business models, outcome business models (OBMs) entail closer collaboration between customers and providers (Sjödin, Parida, Jovanovic, *et al.*, 2020), which is why relational aspects such as trust and complementarity have been emphasized by many OBS scholars (Homburg & Stebel, 2009; Ng *et al.*, 2013; Selviaridis & Spring, 2018). The relational view of OBS offerings has also expanded beyond the dyadic relationship between the customer and the provider (Howard *et al.*, 2016). The network/ecosystem perspectives on OBMs are evidently important because as OBS offerings are often found in complex engineering contexts (Grubic & Jennions, 2018a; Ng & Nudurupati, 2010), effective outcome production will also depend on

third-party activities (such as those of subsuppliers; Visnjic *et al.*, 2017). Although contributions with regard to the relational requirements and consequences of OBS offerings have added much to our knowledge, multiple angles remain uncharted when the phenomenon is put under scrutiny by "the sociological eye" (Whittington, 2007). For instance, although extant OBS research underpins the role of trust as a crucial factor for successful OBS deliveries (see, e.g., Omizzolo Lazzarotto *et al.*, 2014; Randall *et al.*, 2011), little emphasis has been placed on the closely related concept of legitimacy (Suchman, 1995; Tost, 2011). Essentially, it is presumed that collaboration will benefit both parties and that both can continuously add value. Thus, legitimacy is arguably a vital concept for sustaining arms-length collaborative relationships, such as between an OBS provider and a customer, as it is, by definition, "*a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate*" (Suchman, 1995, p. 574). The given notion indicates that research regarding the relational aspects of OBS offerings is but in its infancy.

1.2 Research objectives

In their recent paper, Schaefers *et al.* (2021) categorize research streams concerning OBCs into 1) a stream discussing the concept, 2) a stream discussing the consequences, and 3) a stream discussing the requirements. The overarching objective of this dissertation is to contribute to each of the three streams of OBS research. Specifically, it intends to advance the understanding of OBS offerings in terms of the concept, financial consequences, and the requirements regarding customer relations. Through both extensive and intensive research designs, I intend to combine different traditions of economic and social thought (Downward & Mearman, 2007) to produce the above-mentioned multiperspectival contribution to the OBS literature. The first article (Article 1) attempts to provide further semiotic perspectives on the "performance-based vs outcome-based" terminological debate in the associated academic literature. Subsequently, the research objective of the second article (Article 2) is to provide further empirical evidence (beyond case- and scenario-specific contributions) of the OBS profit impact in practice. By mapping the ecosystem of a specific OBS offering, the third article (Article 3) attempts to elaborate system ownership-induced considerations. Lastly, the fourth article (Article 4) taps further into the relational aspects of OBS offerings and investigates the sources of legitimacy struggles in an OBS relationship and how a provider creates, defends and recreates legitimacy in turn. Although the current dissertation includes considerations beyond the provider perspective, its principal objective is still to advance the theoretical knowledge of OBS offerings specifically from the provider perspective. After all, industrial

providers are the parties exposed to significantly higher risks when deciding to pursue OBS strategies (Selviaridis & Norrman, 2014).

1.3 Research questions and theoretical gaps

In our endeavors to become renowned experts in our respective disciplines, we scholars—and humans, for that matter—plunge deep into specific niches and strive to be recognized in these domains. For example, some OBS scholars focus on the associated contract designs and terms (e.g., Homburg & Stebel, 2009; Li *et al.*, 2014; Selviaridis & van der Valk, 2019; Tan, 2020), while others dedicate themselves to building models to optimize spare-parts inventories under PBL (e.g., Hur *et al.*, 2018; Nowicki *et al.*, 2012). The given focus is important because it enables the accumulation of specialized knowledge. On the other hand, as the strategic management literature posits (see, e.g., Porck *et al.*, 2020), the subsequent silo mentality often inhibits the cross-perspective exchange of insights. Correspondingly, reflecting on three different perspectives, the overarching research question of this dissertation is threefold:

RQ: *What are OBS offerings, why are they of interest for manufacturers, and how can OBS customer relationships be managed?*

As implied in section 1.1, theoretical gaps remain regarding OBS offerings. First, due to the variety of terms used to depict the business models at hand, a question remains; what is the appropriate term that should be preferred over others? Consistent terminology is an important goal not only for the OBS scholars, but also for the broader servitization community at large, because it puts forward a cogent argument for servitization as an established field of research. Second, we lack broader empirical evidence on OBS provider profitability, because the external validity of case-specific evidence and analytical models may only stretch so far. Third, because many complex production systems (e.g., power plants) are too heavy to be included in the provider firm's balance sheet for leasing purposes, we lack knowledge of the motives for the customer/financial entity owning the asset to exercise ownership-derived power.

Fourth and last, extant research stresses the importance of several practices that may contribute to the relational assets of OBS relationships (e.g., periodic meetings and follow-ups (Omizzolo Lazzarotto *et al.*, 2014)). The discussion concerning the relational assets is often limited to aspects such as complementarity, relationship learning and trust. However, little attention has been paid to legitimacy, which is an evidently germane concept for the sociology of organizations because *"by entering into exchange relations with another actor or*

by establishing an alliance or partnership, an organization (as a collective actor) renders a judgment about the appropriateness of such a relationship, given the legitimacy of the prospective partner" (Bitektine & Haack, 2015, p. 51). Furthermore, the aforementioned judgment is not a one-off thing, but rather subject to change in the face of legitimation crises. Thus, we lack knowledge of legitimacy struggles regarding OBS offerings, as well as providers' legitimacy management practices. The subquestions presented below were crafted to address the given theoretical gaps:

SQ1: *Why is there such high terminological variety related to OBS offerings? (Article 1)*

SQ2: *How do OBS offerings affect manufacturing firms' profitability? (Article 2)*

SQ3: *How does system ownership regulate OBS relationships? (Article 3)*

SQ4: *How does organizational legitimacy affect OBS relationships? (Article 4)*

1.4 Delimitations and contributions

The subquestions presented above reflect the different perspectives taken to investigate the phenomenon. These perspectives are associated with the actors involved, who also serve as the units of analysis for each article: academics writing about the phenomenon (Article 1), providers of OBS offerings (Article 2), and the relationship between OBS providers and customers (Articles 3 and 4). Although the two latter articles focus on the provider-customer relationship, they take the provider perspective on the given relationship. Notably, the current dissertation focuses on OBS offerings sold by manufacturers to business-to-business (B2B) customers instead of to business-to-consumer (B2C) customers. The appended articles of this dissertation are positioned in the middle ground between the functionalist and interpretive paradigms (Burrell & Morgan, 1979). That is, although all articles share the view of order (as opposed to conflict) with regard to the meta-sociological assumption, the degree of objective/subjective ontology varies. Given this consideration, the contribution of this dissertation as a whole falls into the paradigmatic rubric of structurationism—a paradigmatic bridge between the functionalist and interpretive paradigms of organizational theory (Gioia & Pitre, 1990). In terms of delimitations, the current dissertation does not focus on third parties, such as customers' customers (e.g., end customers) or subsuppliers. Nevertheless, some attention is paid to third-party influences in the analyses. Following the research streams encapsulated by Schaefers *et al.* (2021),

the theoretical contributions of the current dissertation can be mapped as elaborated in Table 1:

Table 1. Article summaries.

OBS contribution	**Article 1**	**Article 2**	**Article 3**	**Article 4**
Concept	√		√	
Consequences		√	√	√
Requirements		√		√
Research approach	Mixed	Quantitative	Qualitative	Qualitative
Method	Systematic literature review	Panel data regression	Explorative single case study	Abductive single case study
Unit of analysis	≥ AJG3-rated OBS articles	OBS provider firms	Provider-customer relationship	Provider-customer relationship
Industry context	Multiple + theoretical	Manufacturers of machinery and equipment	Energy technology	Energy technology
Sample	83 academic articles	Firms = 1 566 Obs. = 14 756	30 executive interviews	31 executive interviews + secondary data

According to Schaefers *et al.* (2021), the concept literature stream constitutes three distinct areas of focus: definitions, types and design elements. The first article (Article 1) of this dissertation concerns the "performance-based vs outcome-based" semantic dispute associated with describing the related contracts and services in the academic literature. Therefore, the first article focuses on definitions in terms of the concept literature stream. The given article contributes by providing some clarity to the diverse lexicon through both quantitative (heuristic and statistical) and qualitative semiotic analyses. The second article (Article 2) investigating the profit impact of OBS offerings naturally pertains to the consequences literature stream, which can be divided into positive and negative consequences (Schaefers *et al.*, 2021). Moreover, as the second article additionally investigates the role of research and development (R&D) investments, it contributes to the requirements literature stream. The third article (Article 3) contributes to both the concept and the consequences literature streams. First, scholars have divided OBCs into two types: those with availability as a basis and those with economic outcomes as a basis (Böhm *et al.*, 2016). By mapping an ecosystem of an OBC in the energy technology sector, the third article demonstrates that although the provider essentially guarantees operational availability as an OBS, the liquidated damages clauses of the contracts practically guarantee economic results for the customers. This finding contrasts with the claims that OBCs that are based on economic

results do not exist (Grubic & Jennions, 2018a) and thus makes a distinct contribution to the concept literature stream. Moreover, a new relational, opportunistic OBS consequence pertaining to system ownership is discovered. Finally, the fourth article (Article 4) contributes to both the consequences and the requirements literature streams by identifying sources of provider legitimacy struggles in the OBS context and the discursive strategies that the provider follows to defend his or her legitimacy.

OBS research has roots in the literature on servitization (see, e.g., Kowalkowski, Gebauer, & Oliva, 2017; Rabetino *et al.*, 2018; Raddats *et al.*, 2019), advanced services (see, e.g., Baines & Lightfoot, 2014; Sjödin, Parida, & Wincent, 2016; Ziaee Bigdeli *et al.*, 2018) and product-service systems (PSSs; see, e.g., Baines *et al.*, 2007; Reim *et al.*, 2014). In effect, beyond the OBS literature streams (Schaefers *et al.*, 2021), the current dissertation offers contributions to the given literature as well. Starting with the first article (Article 1) considering the terminological issues of the OBS literature, a clear connection may be drawn between the given issues and the terminological issues in servitization in general. For instance, Kowalkowski, Gebauer, Kamp *et al.* write that "*Among a plethora of terms, even the central concept of servitization has been variously interpreted and defined by different researchers and audiences. To this extent, the servitization community seems to lack a common lexicon*" (2017, p. 6). In a related vein, Rabetino *et al.* argue that the multidisciplinary nature of the servitization literature and external gatekeepers have also had a role in shaping the terminological grounding of the servitization literature: "*The early community was small and faced opposition from academic gatekeepers external to the servitization domain. Thus, some of the above terminologies are grounded on authors' original theorizing and others simply accommodated to requests from editors and reviewers*" (2021, p. 72). Therefore, specific inquiries into the vocabularies used—such as in Article 1—yield valuable integrative knowledge not only for scholars but also for practitioners who ultimately transform academic sayings into doings in managerial life (Rabetino *et al.*, 2021, p. 81).

The second article (Article 2), on the other hand, specifically contributes to a strand of the servitization literature that has investigated the financial consequences of different service strategies of manufacturing firms (see, e.g., Eggert *et al.*, 2014; Kohtamäki, Parida, *et al.*, 2020; Neely, 2008). Because OBS offerings are considered to be one of the most advanced forms of servitization (Ng *et al.*, 2013; Visnjic *et al.*, 2017), the profit-positive findings of Article 2 emphasize the importance of advanced services (Baines & Lightfoot, 2013; Schroeder *et al.*, 2020; Ziaee Bigdeli *et al.*, 2018) for manufacturers. On the other hand, the results of the given article also show that manufacturers need continuous R&D

investments to mitigate the negative relationship between scale and profitability. Indeed, OBS offerings create not only additional opportunities but also higher capability requirements for manufacturers (Kohtamäki, Parida, *et al.*, 2019). Thus, by suggesting that OBS providers should invest in digital servitization capabilities and service modularization, the article also contributes to the servitization literature discussing the strategic requirements for successful servitization endeavors (see, e.g., Huikkola & Kohtamäki, 2017; Sousa & da Silveira, 2017).

The two latter articles (Articles 3 and 4) contribute to a trending servitization topic, that is, relational aspects pertaining to OBS offerings (Rabetino *et al.*, 2021, p. 80). Article 3 emphasizes that customer ownership of the OBS system operated can result in opportunistic behaviors, in that the service offering is used as a learning opportunity, especially in markets where an educated labor force is in short supply. This finding forces OBS providers who operate systems that are not feasible for leasing purposes (i.e., facilities that are too extensive to be included in their balance sheet) to rethink their OBS strategies: should they become more actively involved as shareholders in these ventures, or should the OBS be offered as a more consultative training service in the first place? Second, Article 4 continues the investigation of providers' legitimate involvement in the value system and shows that providers may also explore other ways to legitimate their involvement. By coupling the interlinked concepts of legitimacy and trust, the article contributes not only to the literature on the relational aspects of servitization (see, e.g., Bastl *et al.*, 2012; Ivens, 2005) but also to the literature on organizational legitimacy (see, e.g., Suchman, 1995; Tost, 2011; Vaara *et al.*, 2006).

1.5 Structure of the dissertation

This dissertation consists of two parts. The remainder of the first part, to which this introductory chapter belongs, is structured accordingly. The next chapter outlines the theoretical background. The overarching servitization literature is reviewed first and is followed by a review of OBS research. Both reviews start by giving some background information on the phenomenon at hand, and then, in accordance with the division of the literature streams by Schaefers *et al.* (2021), they dive more deeply into the concept, consequences and requirements. The division aims to reflect the questions of *what, why* and *how*. The theoretical background chapter is followed by the methodology section, article summaries and, finally, a discussion and conclusions, which end the first part of the dissertation. The second part consists of the four articles included in this dissertation. Article 1 is a single-authored book chapter. Article 2 is coauthored with Kohtamäki and Parida. Articles 3 and 4 are coauthored with Kohtamäki. The

researcher is the corresponding author of all the appended articles and had a leading role in managing the research (and revision) processes, such as design, analysis and writing.

2 THEORETICAL BACKGROUND

2.1 Servitization

Servitization originally appeared (in academic terms) in a paper by Wandemerwe and Rada (1988) and was a term used to refer to a process of combining tangible (e.g., products, software) and intangible (e.g., expertise) assets into coherent packages to be offered to customers. Much of service science in general is inspired by the contributions of Vargo and Lusch (2004, 2008). Service-dominant logic distinguishes between operant resources (i.e., skills, knowledge) and operand resources (i.e., products). Value-in-use is created when operant resources operate on each other or on operand resources (Smith *et al.*, 2014, p. 247). Thus, a provider firm cannot create value by itself; it merely offers value propositions. The realization of value (value-in-use) may occur only in collaboration with the customer (e.g., cocreation). Grönroos and Voima (2013) argue that a joint sphere is what connects the value-in-use facilitation processes of the provider with the value-in-use creation of the customer. This joint sphere of cocreation can be seen as the crux of servitization since it represents the medium through which providers aim to cocreate value for their customers by becoming more involved in the value-in-use creation processes of customers[3]. Not coincidently, both public interest and academic interest in servitization have coevolved, especially along with the leaps in information technology made in the last decades of the 20th century and the first decades of the 21st century: technologies that make it possible to monitor, optimize and connect products and services have created novel data-driven opportunities for manufacturers to create and capture value (Chesbrough & Rosenbloom, 2002).

Saliently, compared to transactional product sales, services unlock a passage to the development of better relationships with customers due to the closer proximity and involvement in the processes that are critical for customers (Ulaga & Reinartz, 2011; Windahl & Lakemond, 2010). Naturally, services have been emphasized as an escape valve for the ever-increasing pressure of manufacturing competition and the commoditization trap (Cohen *et al.*, 2006). The aforementioned strong motivations for service growth have given rise to servitization as a research field, and the number of papers published on the topic has experienced a respective increase in recent decades (Kowalkowski, Gebauer, & Oliva, 2017). Given this "critical mass", servitization has for a while now been considered to be an established field with identifiable communities (Rabetino *et al.*, 2018) and

[3] The given movement has also been described as "going downstream" (Wise & Baumgartner, 1999).

dedicated conferences (e.g., the Spring Servitization Conference (SSC) and the International Conference on Business Servitization (ICBS)). In addition, multiple other conferences offer specialized tracks and sessions on servitization (Kowalkowski, Gebauer, Kamp *et al.*, 2017). Examples include the International Quality in Service Symposium (QUIS) and Frontiers in Service.

Due to the established footing in academia, scholars have structured servitization research in different ways. For instance, Raddats *et al.* (2019) suggest that servitization research falls under four major research streams: general management, marketing, operations, and service management. Rabetino *et al.* (2018), on the other hand, distinguish between three communities, namely, the service science, PSS, and solution business communities. In addition to the discipline- and theme-driven views, higher-order theory-driven enquiries exist. For example, Eloranta and Turunen (2015) investigate the service infusion (a closely related concept discussed more in section 2.1.1) literature from the strategic management perspective (competitive forces, the resource-based view, dynamic capabilities, and the relational view) and find that theory-laden discussions are often clouded in the given literature due to the focus on contextually bound aspects, such as technology. Indeed, a particularly prominent and growing theme in the servitization field of research seems to be "digital servitization" (Gebauer *et al.*, 2020; Paschou *et al.*, 2020; Sjödin, Parida, Kohtamäki, *et al.*, 2020; Tronvoll *et al.*, 2020), something that has been found to be paramount for the delivery of extreme service offerings such as OBS offerings (Kohtamäki, Parida, *et al.*, 2019).

2.1.1 Concept

Servitization (or servicization, see, e.g., Santamaría *et al.*, 2012) has also been synonymously coined service transformation (Adrodegari & Saccani, 2017; Ulaga & Loveland, 2014) or service transition (Josephson *et al.*, 2015; Martinez *et al.*, 2017). The related terms servitization and service infusion, on the other hand, can be distinguished from each other. Servitization refers to a transformation in which a service-centric approach (as opposed to the preceding product-centric approach) is taken by a firm, while service infusion refers to the relative decline in importance of a firm's product business, as opposed to a firm's service business (Kowalkowski, Gebauer, Kamp, *et al.*, 2017; Raddats *et al.*, 2019). The two concepts are closely related and often appear together. For instance, Peter Johnston, a vice president for marketing at Rolls-Royce, noted that "*The overall health of the business is fundamentally dependent upon service revenues* [service infusion], *so engine manufacturers such as Rolls-Royce have invested heavily in innovative service concepts such as TotalCare, which create value for airlines while reducing the*

risk and volatility of revenues for the manufacturer [servitization]. *At Rolls-Royce, services now [2015] account for 53 % of revenue in the airline market—but a much higher proportion of profit* [service infusion]" (Johnston, 2017, p. 242). Indeed, service infusion often naturally motivates manufacturing firms' expansion of their service portfolios. However, studies have found that amid ever-intensifying product business competition, mere service additions may be insufficient to mitigate negative effects, such as bankruptcies (Benedettini *et al.*, 2017). Furthermore, services supporting products have been found to be inadequate for yielding service returns if they are not accompanied by services that support clients' actions (Eggert *et al.*, 2014). Therefore, instead of simply adding services to offerings (that is, increasing the relative share of services to protect the traditional product business), the process view of servitization posits that manufacturers should change their business models and mission (Raddats *et al.*, 2019) to make services the main driver of growth.

In terms of the conceptual framework of servitization, its respective counterpart has been coined deservitization (Kowalkowski, Gebauer, & Oliva, 2017; Valtakoski, 2017). The opposite of service infusion, on the other hand, is called service dilution (Jovanovic *et al.*, 2019; Kowalkowski, Gebauer, Kamp, *et al.*, 2017). Certainly, not all servitization efforts succeed. In fact, a "service paradox" has been found to plague numerous firms; compared to products, services should theoretically contain a better profit potential, but many service providers struggle to generate profits (Brax, 2005; Gebauer *et al.*, 2005). Furthermore, some service business models may even be at odds with the more traditional product business models of manufacturers. For example, manufacturers must balance the tensions between offering increasingly complex and customized solutions while simultaneously maintaining economies of scale in manufacturing operations (Kohtamäki, Einola, *et al.*, 2020). The oxymoron mass customization (da Silveira, 2011; Qi *et al.*, 2020; Sjödin, Parida, & Kohtamäki, 2016) reflects the difficulty of managing a service transition. Lastly, it is worth noting that as a complicated phenomenon, servitization is characterized by equifinality (Forkmann *et al.*, 2017; Kohtamäki, Henneberg, *et al.*, 2019). Therefore, it is not a one-size-fits-all panacea for eroding the product business; rather, it is a long-term direction taken by a firm that must be accompanied by an appropriate strategy.

2.1.2 Consequences

As noted earlier, servitization is often motivated by financial arguments, such as recurring revenues balancing a cyclical product business (Brax, 2005; Gebauer & Friedli, 2005) and profit prominence (Oliva & Kallenberg, 2003; Ulaga & Reinartz,

2011). Accordingly, servitization-themed studies initially emphasized the benefits of adding services (see, e.g., Davies, 2004) but later began to note exceptions. For example, larger firms have a hard time generating gains from services (Neely, 2008). In terms of small and medium-sized enterprises (SMEs), however, it has been found that even base-level services (Baines & Lightfoot, 2013) may positively contribute not only to financial performance but also to nonfinancial performance (Queiroz *et al.*, 2020). Distinguishing between services that support products and services that support clients' actions, Eggert *et al.* found that the former directly increase profitability for firms exhibiting high product innovation activity, while the latter do the same for firms with low product innovation activity (2011). With regard to firm value (as in Tobin's q), it has been found that services require a certain critical mass (20-30% of sales revenue), after which there is an accelerated positive effect (Fang *et al.*, 2008).

More recently, many studies have reported nonlinear relationships between services and financial results. For example, a cubic relationship between service scale and profitability has been found; although the increases in service scale initially result in steep profitability improvements, there is also a profitability hurdle (a range of service scale increases that does not correspondingly translate into higher profits), which must be overcome for the positive relationship between services and profitability to reappear (Visnjic Kastalli & Van Looy, 2013). Furthermore, Kohtamäki, Partanen, Parida *et al.* report a nonlinear effect of service offerings and sales growth and that network capabilities moderate the given relationship (2013). In the case of knowledge-intensive services, on the other hand, it has been found that relational capital is needed to moderate the link between R&D services and the provider's profit performance (Kohtamäki, Partanen, & Möller, 2013). Recently, it has also been found that there is a nonlinear, U-shaped effect between digitalization and servitization on firm financial performance (Kohtamäki, Parida, *et al.*, 2020).

The varying results reflect the heterogeneity of services (Ziaee Bigdeli *et al.*, 2017) and warrant further research on the consequences of different services. The relational moderators, on the other hand, speak volumes about the importance of interacting not only with the customer but also with other ecosystem members (e.g., component or software suppliers). Indeed, "born solution providers" are deemed an anomaly rather than a commonality (Saul & Gebauer, 2018), and it is recognized that more typically, manufacturers learn how to develop services over time (Ulaga & Reinartz, 2011). Consequently, the required capabilities and their configurations for different service strategies in various settings have been a popular topic in regard to servitization, especially during the latest decade.

2.1.3 Requirements

Many studies focusing on the transition from products to services take the resource-based view and emphasize how servitization entails a change in terms of resources and skills (Eloranta & Turunen, 2015). The importance of the resources and capabilities perspective (Huikkola *et al.*, 2016; Sousa & da Silveira, 2017) is clear for servitizing manufacturers hoping to escape the commoditization trap. Because service business is conducted in closer contact with the customer (Tuli *et al.*, 2007), customer capabilities, such as the ability to react quickly to provider demands, have also been emphasized (Elgeti *et al.*, 2020). Beyond capabilities, other requirements for servitization have also been detected. In the product-centric business tradition, innovativeness is often associated with technological development and manufacturing process innovation (Kindström *et al.*, 2013). In the service business context, however, innovativeness may pertain to numerous other dimensions, such as service culture (Ambroise *et al.*, 2018) or service orientation (Gebauer *et al.*, 2010). Moreover, an installed base of equipment is an indispensable asset for servitizing manufacturers since it greatly enables service opportunities (Stormi *et al.*, 2018). The importance of an installed base as an after-sales service business enabler has also been recognized outside business markets. Apple, for instance, started reporting installed base metrics instead of the number of new iPhones sold in 2019 to inform investors of the service business potential as the device market is becoming saturated. Nevertheless, for B2B manufacturers, the installed base offers few opportunities if it is not accompanied by effective information management (Brax, 2005), meaning that the manufacturer should be continuously informed of system and component conditions (Auramo & Ala-risku, 2005). However, it is necessary to not only monitor operations but also optimize (Porter & Heppelmann, 2014) and preempt outages (Grubic, 2014; Poppe *et al.*, 2018). Indeed, the farther downstream a manufacturer goes and the more accountability it assumes, the higher the strategic requirements will be (Kohtamäki, Parida, *et al.*, 2019).

2.2 Outcome-based service offerings

As argued in the preceding section, for manufacturers, servitization entails business model change (Kindström, 2010; Raddats *et al.*, 2019). In broad terms, a business model refers to the manner in which a firm creates, delivers and captures value (Teece, 2010). A case in point servitization-driven business model change is the OBM, in which the basis of exchange is altered to consider predetermined outcomes, in contrast to the transactional basis (i.e., activities and resources devoted to achieving outcomes; Schaefers *et al.*, 2021). Returning to the case of

Rolls-Royce, the change in focus towards client activities is precisely what effectively reflects the given business model change from a product- to service-centered approach, as illustrated in Figure 1:

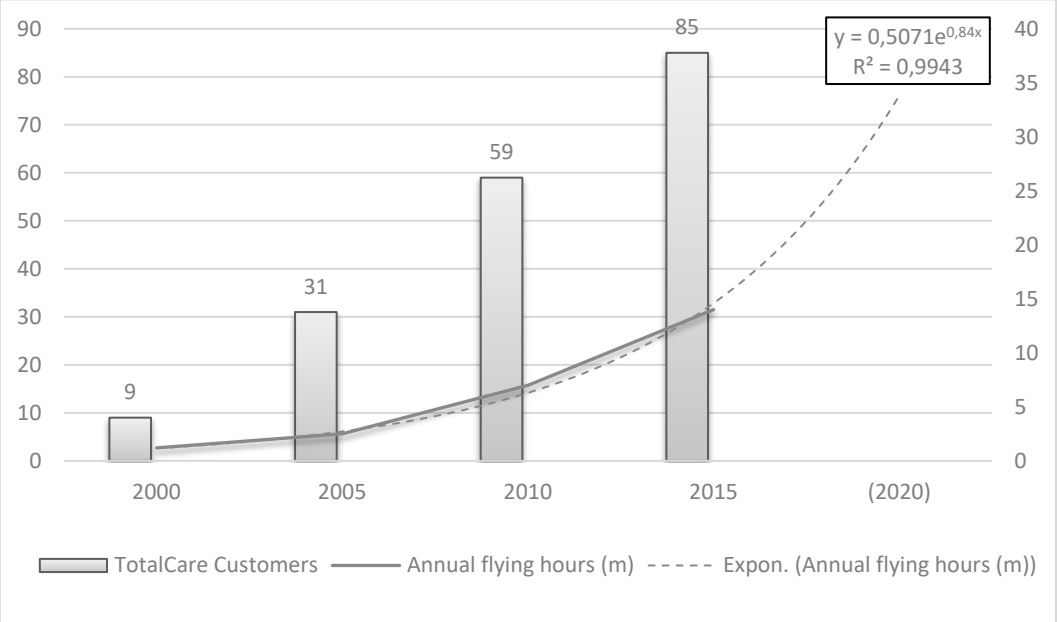


Figure 1. The journey of TotalCare offerings, adapted and modified from Rolls-Royce plc, services marketing material (2016) in Johnston (2017).

As demonstrated above, the customer activity of flying (and not the number of jet engines sold) is the core of Rolls-Royce's business model. The TotalCare offerings form the basis of Rolls-Royce's iconic Power by the Hour package, that is, essentially a "flying hours-as-a-service" offering. As seen in Figure 1, since their launch in 1997, Rolls-Royce's OBS offerings have been increasingly popular. In fact, over 90% of the customers buying Rolls-Royce Trent engines have opt for the given service (Johnston, 2017, p. 239). On the heels of the COVID-19 pandemic, however, it should be noted that the exponentially predicted annual flying hours—which in this case provider revenues are based on—may unfold as being much grimmer than what is presented in Figure 1. Nevertheless, the given types of service examples display the shift in focus from products to services.

Based on their comprehensive literature review, Hypko *et al.* argue that interest in OBSs is not new and can be tracked back to defense contracting in the 1960s (2010b). As a specific branch of the servitization literature, the roots of the OBS literature may be backtracked to the works of two intertwined servitization communities (Rabetino *et al.*, 2018): the PSS and the solution business. Since the 1990s, a quintessential driver of PSS research has been sustainability and the circular economy, in that a PSS should ideally be designed so that its consequent

environmental burden will be as light as possible (Tukker, 2015). In this respect, OBS offerings offer many advantageous considerations, as Ng and Nudurupati demonstrate: "*Outcome-based service capability can potentially be a significant contribution to the sustainability agenda as the longer assets are kept working and equipment kept operational, the less there is the need for production and consumption of new equipment, cutting carbon emissions overall*" (2010, p. 670). Furthermore, many OBS offerings center on environmental performance indicators, such as curtailing carbon emissions (Selviaridis & Spring, 2018, p. 744), saving energy (Li *et al.*, 2014; Tan, 2020) and responding to environmental emergencies (Kim *et al.*, 2010, p. 1552). Moreover, given the long-term nature of OBS contract relationships (Visnjic *et al.*, 2017), OBS offerings have clear implications for provider service business growth and sustainability (Öner *et al.*, 2015, p. 867). Thus, OBS offerings' link to the sustainability agenda is evident.

In terms of the solution business community (Rabetino *et al.*, 2018), the OBS literature connects to the advanced services movement (Baines & Lightfoot, 2013). Baines and Lightfoot (2013) divide services into three categories: base services, intermediate services and advanced services (more granular service typologies can be found in, e.g., Partanen *et al.*, 2017; Rabetino *et al.*, 2015). OBS offerings naturally land on the advanced end, and it has been argued that they represent the most progressive form of servitization (Grubic & Jennions, 2018a; Ng *et al.*, 2013; Visnjic *et al.*, 2017). In fact, as products and systems have become more complex, the movement towards the advanced end of the spectrum has been demanded by industrial customers due to their willingness to focus on their core business rather than equipment-technical operations (Hypko *et al.*, 2010a). Some authors argue that manufacturers were initially reluctant to become accountable for operating and maintaining customers' assets (Oliva & Kallenberg, 2003); nevertheless, they have gradually become involved in these relationships (Brax & Jonsson, 2009). However, certain barriers may also inhibit customers' interest in advanced services (Vaittinen & Martinsuo, 2019), such as OBSs. Knowledge leakage and the loss of operational competence have been described as inertias potentially obstructing the given transition of interest (Sjödin *et al.*, 2017). A practical example is provided by Metso, a Finnish industrial machinery firm that launched the Metso Future Care service concept at the beginning of the current century. The concept garnered a great deal of interest in the press, as demonstrated in "Paperi ja Puu" journal: "*The new Metso is seeking the profile of a high-tech partner operating a sophisticated service concept and is keen to play an increasing role – and take a greater share of the risk – in its customers' businesses. The time could hardly be better for such a transition*" (Lindberg, 2001). Ironically, a couple years later, customer skepticism towards the given concept was named as one of the reasons for Metso's catastrophically deteriorated financial results in another journal: "*Among others,*

Metso has given up the high-flown Future Care concept. It has been replaced by more regular life-cycle thinking" (freely translated by the researcher, from Koskinen, 2004). Customers may indeed be wary of newly developed product-service concepts (Bakshi *et al.*, 2015, p. 1825). Additionally, at the time of Metso's Future Care mentioned above, little research-based knowledge of the OBS concept was available (for notable exceptions in different industries, see, e.g., Brown & Burke, 2000; Chapin & Fetter, 2002; Larbi, 2001).

2.2.1 Concept

In the concept literature stream identified by Schaefers *et al.* (2020), there are three distinct subareas of focus: OBS types, design elements and definitions. An alternative conceptual model in manufacturing industries is provided by Hypko *et al.* (2010b). In their model, the criteria characterizing PBCs consist of eight dimensions: (1) the provider background, (2) ownership during the contract period, (3) ownership after the contract period, (4) responsibility for maintenance personnel, (5) responsibility for operation personnel, (6) the payment model, (7) the location of operation, and (8) the exclusiveness of operation (Hypko *et al.*, 2010b). Regarding each criterion, there are two to three options[4], which are presented in Table 2. For example, the payment model can be based on availability, the units produced (e.g., output) or customers' economic results. Concurringly, Böhm *et al.* (2016) discern between availability OBCs (aOBCs) and economic OBCs (eOBCs). From this line of thought, it may be concluded that contracts based on output/units produced (e.g., contract manufacturing; see also Selviaridis and Wynstra (2015), who discern outputs and outcomes) are in fact different from OBCs and should perhaps be coined output-based contracts (oBCs).

Grubic and Jennions (2018a) use the aOBC/eOBC distinction and argue against the existence of eOBCs. This claim may be contested since contrasting evidence exists. For example, a common practice in compensating marketing/media agencies is a fee based on the media spend (e.g., 5% of the media budget). Given that advertisers (i.e., customers of the agency) commonly decide their media budgets based on their revenues (e.g., 10% of the past year's revenue is allocated to marketing), this should incentivize agencies to generate as much revenue for the customer as possible since their compensation depends on it (Spake *et al.*, 1999). Additionally, to mitigate the perverse interest to increase media consumption, advertisers may incentivize media agencies by sharing cost savings if the agencies

[4] In the original model, the authors argued that the provider would always be the party responsible for maintenance, but this responsibility would exclude consultative relationships, where the provider agrees to train the customer's personnel to maintain the asset accordingly.

are able to purchase media placements at a lower cost than in the agreed-upon media plans. These arrangements surely have their basis in economic results, and thus, they validate the existence of eOBCs. Discussions such as those above characterize the "types"-focused contributions in the concept stream of the OBS literature (Schaefers *et al.*, 2021).

Table 2. Conceptual box for OBS offerings in manufacturing industries, adapted from and modified based on Hypko *et al.* (2010b).

		Options		
Criteria	(1) Performance provider's background	Independent service provider (i.e., nonmanufacturer)	Machinery and equipment manufacturer (e.g., NACE Rev. 2: 28)	
	(2) Ownership during the contract period	Leasing company (e.g., Hilti Fleet Management)	Special purpose vehicle (e.g., an independent power producer)	
Criteria	(3) Ownership after the contract period	Leasing company	Special purpose vehicle	
	(4) Responsibility for maintenance personnel	Outcome customer	Outcome provider	
	(5) Responsibility for operation personnel	Outcome customer	Outcome provider	
	(6) Payment model	aOBC	oBC	eOBC
	(7) Location of operation	Customer's in-house	Fence-to-fence	Outcome provider's in-house
	(8) Exclusiveness of operation	Single customer	Multiple customers	

The morphological box (Table 2) through which Hypko *et al.* (2010b) characterize OBS offerings in manufacturing industries also pertains to the "design elements" needed to be specified as an OBS, which is another substream of the OBS literature (Schaefers *et al.*, 2021). For example, Selviaridis and van der Valk (2019), Selviaridis and Spring (2018), Tan (2020), Sumo *et al.*, (2016), Liang and Atkins (2013) and Liinamaa *et al.*, (2016) perform rather particular work in terms of contract design, term specificity and legal technical issues in general. Lastly, Schaefers *et al.* (2021) identify contributions that focus on the "definitions" pertaining to the OBS concept. One question characterizing the definition of OBS offerings is as follows: what passes as an OBS? The authors define an OBC as "*a contract that incentivizes outcomes related to customer's business processes instead of the resources required for the process itself*" (Schaefers *et al.*, 2021, p. 467). This definition is in alignment with other studies that define OBS offerings (or PBL contracts/PBCs/OBCs, depending on the term preferred) as a method of exchange in which at least some of the provider's revenue is tied to the functional

outcomes achieved instead of the activities achieved and resources utilized (Ng *et al.*, 2009; Ng *et al.*, 2012; Selviaridis & Wynstra, 2015). The given general definition is encompassing in the sense that it also covers hybrid models of remuneration (e.g., one part fixed, one part outcome based), which often better reflect reality. Indeed, citing Professor Netessine once again, "*the optimal contract is really a combination of three things: fixed payment or fixed price, cost-sharing and performance-based compensation*" (Knowledge@Wharton, 2007, para. 5).

2.2.2 Consequences

Schaefers *et al.* (2020) divide the consequences stream of the OBS literature dichotomously into two specific areas of focus: positive and negative consequences. Although the divide is intuitive, the stream could alternatively be divided into commercial and operational consequences in a manner similar to the paper on the risks of the given services from the provider perspective by Hou and Neely (Hou & Neely, 2018). Correspondingly, the following OBS consequences review follows a given kind of divide. According to Patra *et al.* (2019), a distinct subdivision of OBS research focuses on commercial consequences, that is, maximizing provider profits (or, interchangeably, minimizing provider costs). They contribute to the same vein by developing single- and multiperiod models to maximize provider profit based on operational availability. Other similar contributions concerned with the optimization of providers' net profit functions include Nowicki *et al.* (2008), Öner *et al.* (2015), Mirzahosseinian and Piplani (2011), Jin and Wang (2012), and Jin and Tian (2012). Compared to services based on time and materials, OBS offerings offer incentives for providers to invest in reliability improvements instead of spare inventory (Kim *et al.*, 2017; Kim *et al.*, 2010). The reasons for this are clear: the less frequent and the shorter the system downtimes (i.e., the more reliable the system is) are, the fewer the resources that will be needed for repairs. Moreover, because the downtimes of mission critical systems are costly for customers (Qin *et al.*, 2020), the associated contracts usually involve significant penalties such as liquidated damages (Datta & Roy, 2013; Roels *et al.*, 2010). Indeed, numerous studies compare OBS offerings to time-and-materials-type services using real case data and argue that the former are an economically advantageous model for both providers and customers (see, e.g., Huang *et al.*, 2020; Jain *et al.*, 2013; Roels *et al.*, 2010).

Moreover, numerous qualitative case studies emphasize operational (and relational) consequences. For example, studies show that the value-capturing format in the context of OBS offerings is a relational process where both the customer and the provider learn about each other's businesses (see, e.g., Ng *et al.*,

2013; Sjödin, Parida, Jovanovic, *et al.*, 2020). In alignment with the strategy literature that posits that partners should together become "mutual hostages" to outcomes (Teece *et al.*, 1997), these studies highlight that "*firms benefit collectively from their efforts to reduce costs using innovation throughout the project*" (Caldwell & Howard, 2014, p. 281). Indeed, as long-termism is endemic to the character of OBS offerings (Li *et al.*, 2013; Mouzas, 2016), it accommodates efforts to innovate and conduct trial and error during the contract period (Randall *et al.*, 2011; Visnjic *et al.*, 2017). This aspect drives value by offering a way to not only "share the pie" but also "extend the pie". However, OBS offerings also increase the customer's dependency on the provider (Holmbom *et al.*, 2014). From the provider perspective, on the other hand, OBS offerings are inherently complex and customized to meet the varying individual needs of customers (Batista *et al.*, 2017; Hou & Neely, 2018). This makes scalable sales of OBSs a challenging endeavor. Furthermore, providers are exposed to significantly higher risks when providing OBSs (Datta & Roy, 2013; Qin *et al.*, 2020), which in turn necessitates due attention to the numerous requirements needed for the effective delivery of OBSs.

2.2.3 Requirements

Based on findings pertaining to when OBSs are more likely to be effective (see, e.g., Homburg & Stebel, 2009; Kim *et al.*, 2007; Kreye *et al.*, 2015; Omizzolo Lazzarotto *et al.*, 2014), Schaefers *et al.* (2021) characterize the requirements literature stream through environmental, supplier-, customer-, relationship-, and governance-related dimensions. For example, OBSs are more likely to be effective when the uncertainty of achieving the outcome is low (environmental), when outcomes can be measured unambiguously (governance related), when suppliers have strong investment cultures (supplier related), when customers possess relational capabilities (customer related), and when the relationship between the partners is of high quality (relationship related; Schaefers *et al.*, 2021, pp. 468–469). Note that what is referred to as a "supplier" in the above examples translates to a "provider" in the current dissertation because the term "supplier" is a remnant of the product-centric legacy and the term "service provider" better reflects the new role of the manufacturer. Interestingly, the relationship quality requirements are restricted to trust and regular exchanges in the framework. The marketing literature argues that relationship quality is a construct that consists of multiple other things as well, such as conflict, commitment, the inclination to invest in the relationship and expectations of continuity (Kumar *et al.*, 1995). Thus, OBS relationship-oriented issues seem to warrant further research.

As providers assume responsibility for generating outcomes, they must be able to remotely monitor the system being operated (Grubic & Jennions, 2018b). However, monitoring alone is not sufficient to prevent occurrences such as equipment breakdowns, and it should be supported by condition-based monitoring and preventive maintenance or upgrade activities (Öner *et al.*, 2015; Yang *et al.*, 2019). As reported by Öhman *et al.* (2015), service providers can prolong service intervals by 5-10%, on average, without significant effects on outcomes if they complement condition-based maintenance with adaptive preventive maintenance. Doing so helps avoid overservicing, which can contribute to the service provider's margins. The given examples demonstrate OBS offerings' tightly knitted connection to the digital servitization literature (Kohtamäki, Parida, *et al.*, 2019, 2020). Despite the prominence of OBSs as a new business model, the separate product manufacturing business of an OBS provider rarely ceases to exist, forcing the provider to balance efficient product manufacturing operations and the customized service business (Kohtamäki, Einola, *et al.*, 2020). Recently, researchers have emphasized investments in solution modularity (Cenamor *et al.*, 2015; Rajala *et al.*, 2019) since it makes it possible to configure service elements into coherent wholes in a more scalable manner. Perhaps we will see more OBS elements configured into service offerings in the future.

3 METHODOLOGY

The current chapter describes the research methodologies of the current study. The chapter is structured as follows. First, the philosophical assumptions made are discussed in terms of the paradigmatic position of the dissertation as a whole. Second, details on the ontological, epistemological and methodological choices of the dissertation are discussed. Third, aspects related to the research design, namely, research process, data collection, reliability and validity, are presented.

3.1 Philosophical assumptions

According to the Kuhnian (1962) tradition, a paradigm consists of scientific contributions universally accepted among a community of scientists for a particular period of time. Therefore, paradigms greatly determine the philosophical and methodological choices in their respective domains. In 1979, Burrell and Morgan argued that organizational theories fall into four distinct paradigmatic slots: functionalist, interpretive, radical humanist and radical structuralist. Two dimensions set these paradigms apart: the *subjective vs objective* spectrum in terms of ontology and a *regulation vs radical change* divide in terms of the nature of sociology (Burrell & Morgan, 1979). The authors emphasize that the underlying assumptions (regarding, e.g., ontology and epistemology) of each paradigm differ to an extent that effectively renders the four paradigms mutually exclusive. In contrast, Gioia and Pitre (1990) propose the idea of multiparadigm approaches to theorizing by demonstrating ways in which bridging across paradigm boundaries is possible and encouraged. Given that the main objective of the current study is to generate a multiperspectival contribution to the OBS literature—an endeavor that assuredly necessitates exploring and accounting for the work of alternative paradigms (Gioia & Pitre, 1990, p. 591)—the current study adopts a structurationist (Giddens, 1979) standpoint towards theorizing.

Structurationism considers social structures to be dualistic by nature. That is, one cannot truly understand an activity without understanding its structure, and vice versa. For example, "*the analysis of strategy activity is incomplete without a thorough understanding of institutional context, of which strategy as a field must necessarily be an important part*" (Whittington, 2015, pp. 161–162). Thus, as a paradigm, structurationism can be placed in the middle of the interpretive and functional paradigms in the 2x2 framework by Burrell and Morgan (1979), as presented in Figure 2. The paradigms in **boldface** in Figure 2 denote the paradigms represented by the enclosed articles included in the current

dissertation, while the highlighted structurationism represents the paradigmatic position of the dissertation as whole.

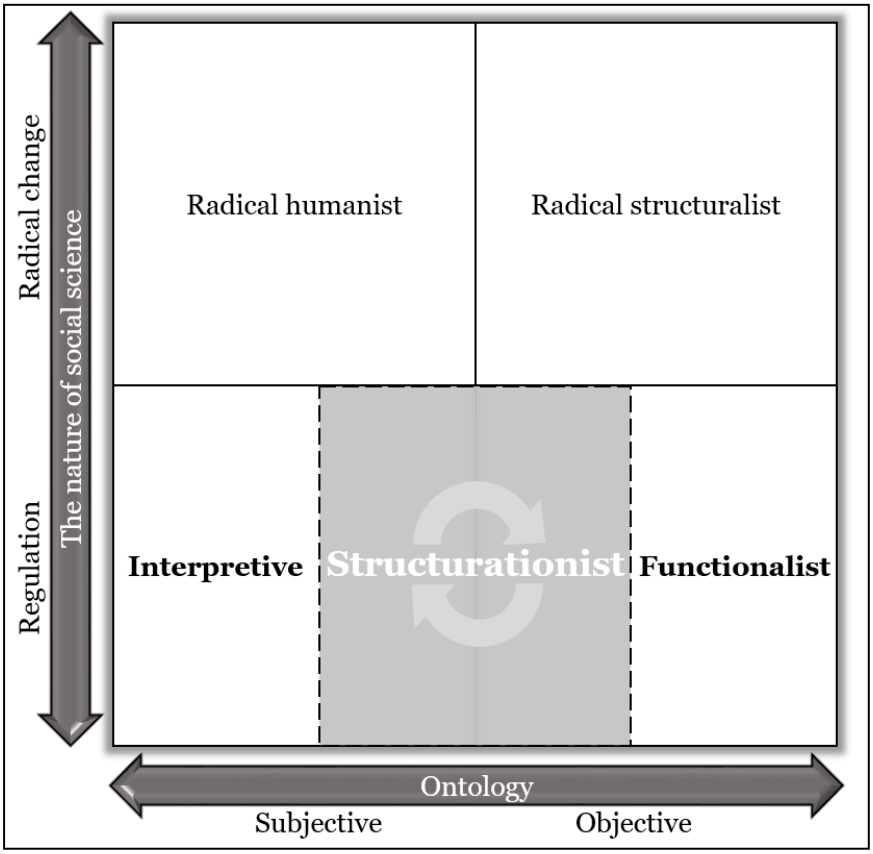


Figure 2. Paradigmatic position of the dissertation. Adapted from Burrell & Morgan (1979) and modified based on Gioia & Pitre (1990).

As demonstrated above, the structurationist paradigm (or structuration theory) sits between the functionalist and interpretive paradigms, and therefore, it shares with the given paradigms the concern for maintaining or unchanging the social order (Gioia & Pitre, 1990, p. 592). What sets structurationism apart is that within its realm, social construction (Edvardsson *et al.*, 2011) is not considered a separate process from the objective properties of the social world (Gioia & Pitre, 1990, p. 592). Rather, structurationists consider structure to be not only the medium but also the outcome of interactions at the same time (Giddens, 1979, 1984). For example, culture provides traditions and customs that guide individuals' social behavior. On the flipside of that coin, individuals' choices with regard to how they act will in turn contest and reshape the aforementioned social structures. Therefore, the strength of the structurationist approach can be attributed to multiperspectivity—a feature that is well aligned with the objectives of the current dissertation. The circle of arrows in Figure 2 depicts the given interplay between the active nature of objective (such as financial indicators and ownership

structures) and subjective characteristics (such as socially constructed (il)legitimacy) of the social reality under scrutiny, namely, the OBS relationship.

3.1.1 Ontological choices

According to Burrell and Morgan (1979), ontology is a strand of debate between realist and nominalist positions. The realist argument presumes that a tangible and structured social world exists outside individual cognition. To realists, this world is empirically explorable regardless of the labeling conventions followed to describe these structures (Burrell & Morgan, 1979, p. 4). Conversely, the nominalist argument postulates that the world outside individual cognition is nothing but labels and concepts used to organize reality (Burrell & Morgan, 1979, p. 4). Burrell and Morgan argue that oscillating between the two ontologies is problematic (Burrell & Morgan, 1979, p. 266), but others have argued that ontological purism is an unnecessary and unrealistic expectation (Weick, 1995). Thus, in an integrative manner, structuration posits not only that structures "provide the rules and resources individuals must draw on to interact meaningfully" but also that they "have no reality independent of the social practices they constitute" (Riley, 1983, p. 415). Therefore, this dissertation's structurationist standpoint towards ontology fits into the middle ground between the realist and nominalist positions.

3.1.2 Epistemological choices

Epistemology is concerned with the nature of knowledge. In other words, it can be expressed as what we think can be known about the world (Fleetwood, 2005). Together with the notions on matters ontological and methodological, the epistemology of structurationism posits that phenomena are better viewed as structural occasions triggering social dynamics that reciprocally affect structure (Barley, 1986). In the case of this dissertation, this means that we cannot understand a multifaceted phenomenon such as OBS offerings without research strategies that are sensitive to both the objective and subjective properties of structure, as well as their relation to time and context. With regard to contextual comprehensiveness, the third article (Article 3) goes to great depths by using intensive provider interview data, while the fourth article (Article 4) further builds upon the same dataset and additionally uses thorough secondary data to validate the customer perspective. Moreover, the single case company of choice was selected because of its longstanding history with the given customer segment served. Article 1, on the other hand, touches upon terminological differences in the academic literature by accounting for field- or discipline-induced differences. With

respect to temporal development, Article 1 also places emphasis on the path dependency and history of the terminology researched. Despite the nomothetic approach, Article 2 also accounts for contextual differences by controlling for subindustries, nationalities and firm size. Of the four, Article 2 obviously accounts for the time dimension in the clearest way due to the time series design. In conclusion, despite the differences in research approaches, all enclosed articles are congruent in the manner in which they account for time and context—only the approach with regard to the objective-subjective axioms differs with respect to the subphenomenon in question. Regardless of the objective qualities of the current dissertation, the researcher acknowledges that his own experience and accumulated knowledge on the topic and methods have most likely had their influence on the interpretations made as well as the research strategies followed.

3.1.3 Methodological choices

The middle ground position on the subjective-objective axis (Burrell & Morgan, 1979) warrants a variety of research methods to choose from, depending on the level of analysis (Riley, 1983, p. 416). Accordingly, the articles included in the dissertation adopt different methodologies based on the subphenomenon being studied. For instance, as Article 2 longitudinally investigates the profitability effects due to OBS offerings for manufacturing firms, statistical panel data analysis (or time-series analysis, as it is commonly known in sciences other than economics) is arguably a suitable method of choice. As profit performance is a standardized and objective indicator in economics and business research, a nomothetic approach to theorizing (Burrell & Morgan, 1979) seems appropriate. Furthermore, because Article 3 intends to explore how system ownership regulates an OBS relationship in which ownership is known to be a central feature (i.e., a key case), the exploratory single case study approach (Gerring, 2004, pp. 348–349) is arguably justified. However, given the interest in the ecosystem (i.e., structure) endemic to the given industrial relationship, Article 3 is not entirely interpretivist; rather, it stresses the influence of structure.

Moreover, as Article 4 continues using the same level of analysis but also adopts discursive legitimation as a theoretical lens with regard to the relationship, the endorsed abductive single case study approach (Dubois & Gadde, 2002) follows a natural continuum. Because Article 4 aims to generate a subjective understanding of a specific relationship, the ideographic approach well suits this purpose. Lastly, Article 1 perhaps best manifests the interplay between subjective and objective. This is due to the unit of analysis, that is, the terminology of the top-tier OBS literature. There are clear objective characteristics to written language, such as

term frequency or sentence structure. These characteristics are clearly measurable and therefore applicable subjects for quantitative analyses. On the other hand, as terms, by definition, are words with meaning attached to them (Merriam-Webster, n.d.), the given meaning may vary subjectively. Hence, the terminology also deserves qualitative treatment. In conclusion, both nomothetic and ideographic properties (as well as their interplay) characterize not only Article 1 but also the whole dissertation. In particular, the idiosyncratic methodological positions (ideographic-nomothetic) of the articles included in this dissertation may be outlined as in Figure 3 based on the paradigmatic framework introduced earlier.

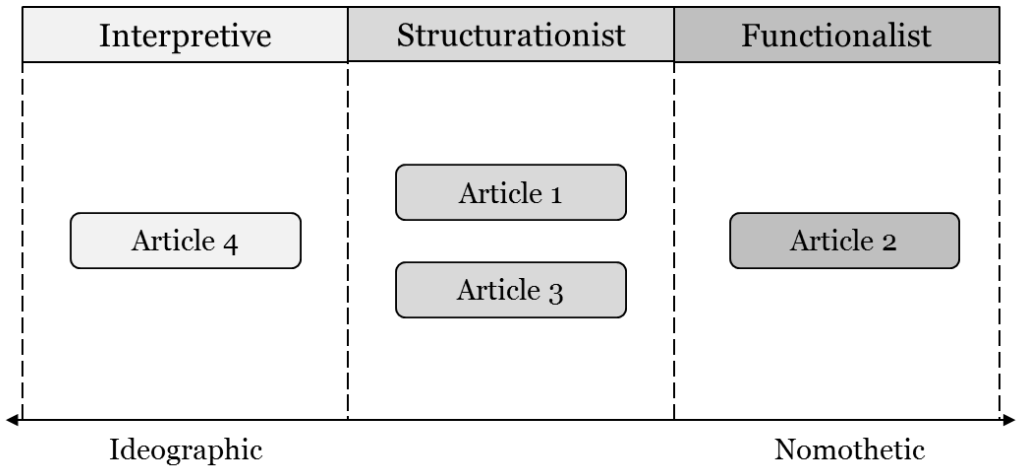


Figure 3. Paradigm-based methodological positions of the articles included in the dissertation. Adapted from Burrell & Morgan (1979) and modified based on Gioia & Pitre (1990).

3.2 Research design

The process in which the research questions and the data are bridged is the research design (Edmondson & Mcmanus, 2007). Therefore, as a process, the research design includes planning, data collection and analysis. The overarching research question of the current dissertation is as follows: *What are OBS offerings, why are they of interest for manufacturers, and how can OBS customer relationships be managed?* The given question was deconstructed into four subquestions, each of which was addressed separately in the appended research articles. A bridge used for linking the subquestions (and the respective research designs of each article) and the primary research question is the classification of OBS literature streams recently introduced by Schaefers *et al.* (2021). That is, the concept, consequences and requirements divide provides a solid framework that researchers and practitioners alike may use to contribute to knowledge and to

better understand OBSs. Furthermore, from the organization theoretical paradigm perspective (Burrell & Morgan, 1979; Gioia & Pitre, 1990), the literature streams do not exclude multiparadigm theorizing. For instance, one may need an interpretive standpoint to research the relationship-related requirements of OBSs and, in turn, a functionalist standpoint to investigate the environmental requirements. When integrated, the contributions generated via different paradigmatic standpoints essentially subscribe to structurationism because OBS offerings spur a unique social structure that not only determines specific interactions but also is constructed by the given interactions. For instance, it has been found that as an operational model (i.e., structure), an OBM requires a strong relationship between the customer and the provider (Sjödin, Parida, Jovanovic, *et al.*, 2020, p. 180). Establishing such a relationship, however, is a more subjective, socially constructed process. Thus, while planning the current study, it was clear that the design would have to follow mixed method research strategies to highlight both subjective and objective aspects that are theoretically relevant to OBS offerings as a phenomenon. Before going into further details regarding data collection, data analysis and research design elements, let us first outline the research process of this dissertation more generally.

3.2.1 Research process

The cornerstones of this dissertation were laid already during my Master's thesis work in 2018. In the summer of 2018 while I was working as a research assistant for the School of Management, I collected interview data from three manufacturing firms that offer OBS. My thesis supervisor pointed out that the research group's database to which we were adding interviews at the time, could be used for further research as well. In the end of the year 2018, I chose to continue directly to a Doctoral programme and got the access to the research group's interview database. Given that my Master's thesis had also concerned OBS offerings, I was equipped with sufficient preliminary knowledge on the topic to conduct further exploratory analysis with the provided interview data. In the early stages of my dissertation process, plausibly due to the predominantly functionalist nature of the OBS literature, I was drawn to critical realist and interpretative perspectives as alternatives. Consequently, it was clear early on that I was going to include a study in my dissertation that would utilize critical discursive analysis. I began familiarizing myself with the interview data by systematically searching for discussions that contained keywords such as "outcome" and "guarantee" to isolate the relevant interviews (between 2012 and 2018) to be further scrutinized (see the section 3.2.2 for more details regarding the interview data). All the interviews shared a common theme of servitization and service value creation but they were

collected as parts of different research projects. Thus, the interview questions varied. However, given that I had chosen the critical discourse analysis as the approach towards the data, I aimed not to seek answers for the specific questions asked in the given interviews, but to explore the subconscious discursive practices (Jarzabkowski *et al.*, 2016) of the interviewed managers instead. The same level of analysis also applied to the three interviews that I had collected in 2018 with the case firm and that I chose to include also in my dissertation research. The first draft of this exploratory analysis was submitted to the CIRP IPS2 conference by the end of January 2019 and it was based on some early observations regarding the OBS offerings of a focal firm.

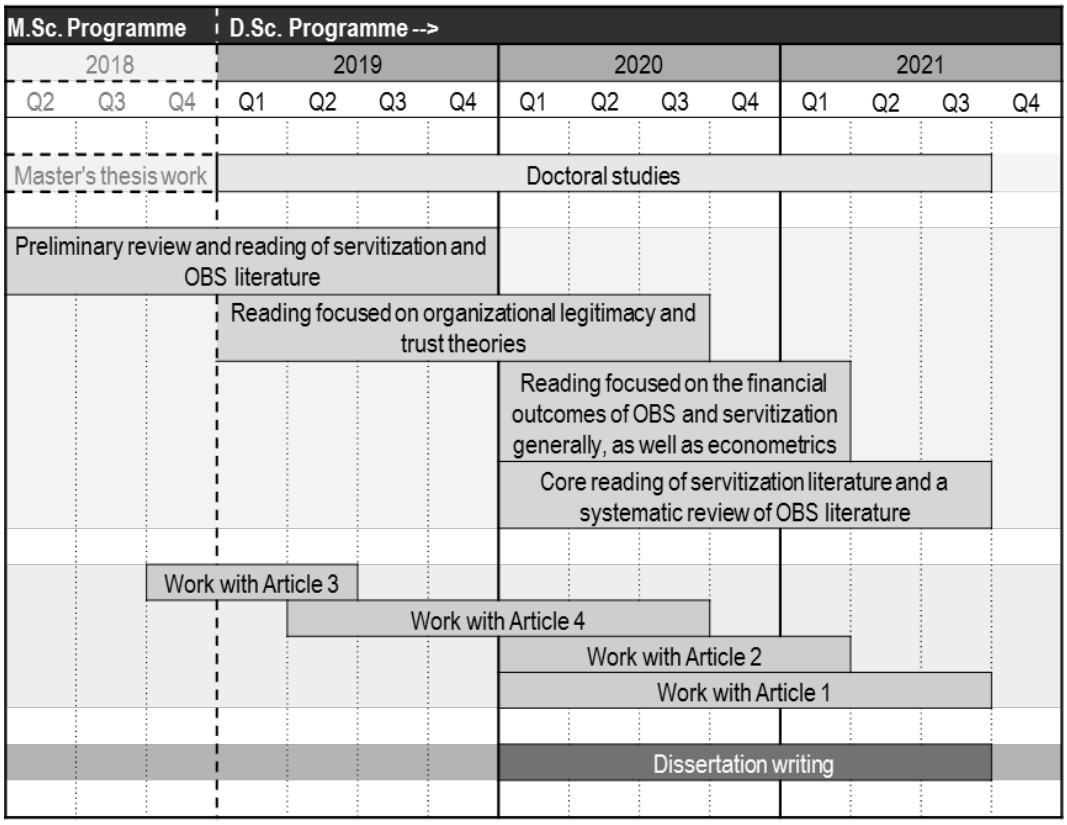


Figure 4. The research process.

As can be seen from the Figure 4 above, soon after the submission of Article 3 I started working on Article 4. The exploratory findings generated while writing Article 3 paved the way for this next paper in a sense that from the outset, it was clear that the paper would focus on the sources of legitimacy struggles and the respective discursive legitimation strategies. An extensive set of secondary data was also collected for Article 4. Since Article 4 was my first paper aimed to be published an academic journal, I attended courses on academic writing and qualitative research methods while writing it. Simultaneously, I also began

working on Articles 1 and 2. The idea for Article 1 emerged from my readings of the extant OBS research. Namely, an aspect that significantly complicated the search of extant OBS research in the early stages of the dissertation process was that the given offerings go by numerous different names in academic papers. Thus, I wanted to investigate the reasons behind the observed inconsistency and to participate in the recent debate concerning what the given offerings should actually be called. Article 2 was also motivated by my readings of extant OBS research. Although scenario- and case-based evidence of OBS offerings' profit prominence exists, I found the lack of broader empirical evidence surprising. Building on my previous occupational skills and Master's level experience with statistics, I attended further courses regarding panel data analysis and Stata software tutorials during the summer of 2020. Moreover, making use of the time in lockdown, I read multiple books and methodological articles concerning econometrics during the year 2020. The data for Article 2 was collected in the spring of 2020 and analyses were conducted during the summer. Later in the autumn Professors Kohtamäki and Parida, the latter of whom had kindly invited me for a research visit to Luleå University of Technology in February 2020, joined me as coauthors of the paper and contributed to the theoretical framework of the paper especially.

While Article 4 was in review in the Industrial Marketing Management and I had begun working on Articles 1 and 2, the paper by Schaefers *et al.* (2021) first appeared online. Inspired by their OBS literature stream divide, the current dissertation began to take shape. The overarching idea was to contribute to each of the three OBS literature streams and to show that different aspects (i.e., the concept, consequences and requirements) of complex socioeconomic phenomena can (and should) be researched differently. Although the idea gained body after the publication of the mentioned paper, it was originally inspired by Henry Mintzberg's famous metaphor: strategy scholars are much like blind men who try to vision a whole picture of an elephant (Mintzberg, 1977). One lays their hand on a tusk and thinks aloud, it is definitely like a spear. Another one touching the trunk disagrees, for she would describe it as a snake. The lesson of the fable can be useful for service scientists as well: if we close our eyes to touchpoints other than our own, we will never be able to envision whole beasts, such as OBS offerings. Thus, when I began writing the current dissertation in 2020, I had an initial picture of what the end-product would look like. In the spring of 2021, I attended a few doctoral courses focusing on the philosophical underpinnings of organization theory. These courses helped me to settle upon the structurationist stance of the dissertation. Articles 1, 2 and 3 went through two rounds of double-blind reviews, whereas Article 4 went through three. During the review processes, all of the papers developed substantially. I was in a leading role regarding the revision work of all

papers. The given role included, for example, revising the theoretical frameworks, methodology sections and writing the response letters to the reviewers.

3.2.2 Data collection

For the first two articles (Articles 1 and 2), data collection was conducted in two databases in a systematic manner. The sample used in Article 1 was collected from Elsevier's Scopus database of peer-reviewed literature. The sampling followed the guidelines for systematic literature reviews (Kohtamäki *et al.*, 2018; Tranfield *et al.*, 2003) and included defining search terms, deciding on article relevance criteria and setting a quality threshold for the journals included in the analysis (i.e., ≥ AJG3). The data for the second article (Article 2) were collected from the Orbis financial information database (by Bureau Van Dijk). The keywords used to gather the first half of the sample (containing OBS providers) using the database's activity search function were based on the content of the top-tier literature gathered for Article 1. To ensure objectivity, the other half of the sample (containing non-OBS firms) was generated using the "create a random sample" feature provided by the database[5]. In total, the dataset consisted of 15 495 observations of 1 674 manufacturing firms, but the autoregressive specification used in the primary estimation method omitted 739 observations and 108 firms from the sample because gaps existed in the panels' time series. Thus, the final sample used in the first-stage primary estimation of the given study included 14 756 observations of 1 566 firms (49.62% OBS providers, 50.38% non-OBS providers). The second-stage analysis of Article 2 used a subsample consisting of only OBS providers reporting R&D investments (n = 336, N = 2 250).

In the latter two qualitative articles (Articles 3 and 4), the 31 semistructured interviews conducted (of which 30 were used in Article 3) contained both data collected by the researcher himself (3 interviews) and data that were collected by the research group that the researcher was a member of (28 interviews). The details of the interview data can be found from the Table 3. From the reliability point of view, the use of data where the majority were physically gathered by other individuals is valuable since it distances the researcher (the interpreter) from the interpersonal biases caused by interview situations (see, e.g., Lillis, 2006). A total of 1 806 minutes of interviews were recorded with permission and transcribed into 455 pages of text (Times New Roman 12, single space, 2.54 margins all around) shortly after the interviews. All the interview material is accessible in a cloud-based

[5] Like the first half, the second half of the sample was also restricted to companies that belonged to the NACE Rev.2 28 industry code and that had consistent profitability reporting records.

database where it is stored. All the interviews covered topics of servitization, and because the case company, Alpha, is a prominent OBS provider, matters pertaining to the topic were frequently underlined by the respondents. This made the given interview data a prominent target for OBS-themed enquiries. In addition, secondary data consisting of the annual reports of the case company and five customer firms was collected (1 065 pages of corporate texts in total).

Table 3. The interview data used in Articles 3 and 4.

Interviewee title	**Interview durations (hrs:mins)**	**Included in Article 3?**	**Included in Article 4?**
Vice President, Technology	0:46	Yes	Yes
General Manager, Services	1:20	Yes	Yes
Health, Safety and Environmental Manager	0:50	Yes	Yes
Director, Solutions	0:50	Yes	Yes
Project Manager	1:00	Yes	Yes
Director, Service Sales	1:01	Yes	Yes
Managing Director, Projects	0:35	Yes	Yes
General Manager, Services	0:56	Yes	Yes
Director, Services	0:58	Yes	Yes
Director, Services	1:20	Yes	Yes
Pricing Manager, Services	1:45	Yes	Yes
Director, Business Development	1:45 0:52	Yes	Yes
Executive Director, Technology	0:57	Yes	Yes
Vice President, Finance and Control	0:55	Yes	Yes
Vice President, Operations	**0:47** 0:51	Yes	Yes
Digital Marketing Manager	**0:55**	Yes	Yes
Senior Project Manager	**1:06**	Yes	Yes
General Manager, Services	0:58	Yes	Yes
Director, Services	0:49	Yes	Yes
Director, Services	0:42	Yes	Yes
Director, Marketing and Business Development	1:08	Yes	Yes
Director, Global Sales and Marketing	0:51	Yes	Yes
Director, Services	0:46	Yes	Yes
Director, Finance and Control	1:10	Yes	Yes
Manager, Business Intelligence	1:00	Yes	Yes
General Manager, Services	0:33	Yes	Yes
Managing Director, Services	0:56	Yes	Yes
Director, Services	0:52	Yes	Yes
Vice President, Solutions	0:52	No	Yes

NB! The interviews in **Boldface** *were conducted by the researcher.*

3.2.3 Reliability

Reliability concerns the replicability of research findings (Eriksson & Kovalainen, 2008). If a study is not reliable, it cannot be valid either. In both quantitative and qualitative approaches, careful documentation of the research process is an essential step for assuring readers that reliable data collection and interpretation processes took place (Ihantola & Kihn, 2011, p. 44). In quantitative research where instruments are of the essence, measures such as Cronbach's alpha are commonly adopted to test the consistency of the scales used (Peterson & Kim, 2013). The internal inconsistency of the instruments calls into question reliability because inconsistency deteriorates the repeatability of the findings. Because the quantitative parts of the current dissertation use unambiguous and systematically collected financial and count data, internal inconsistency is not a major concern. The repeatability of the modeling processes, however, can be addressed instead.

Article 1 followed a forward selection of variables (Hocking, 1983, p. 220), which was conducted manually. In other words, starting from an empty model, the variables included were added one by one based on improvements to the selection criterion, which was goodness of fit (adjusted R^2). In addition, an influential data point, that is, the year 2019, was located using the DFFITS (Belsley *et al.*, 1980) and Cook's distance (Cook, 1977) diagnostics. The given year had a high number of publications related to OBS offerings and subsequently had an influential effect in terms of the variables (i.e., annual sums of the "outcome", "performance", "business model" and "innovation" term frequencies). Article 2 also followed a forward selection of the variables, but the selection criterion not only focused on model fit (i.e., R^2 within, between and overall) but also improvements to Rho, which in the case of random effects (RE) refers to the fraction of variance due to the error term varying over time and firms (Bălă & Prada, 2014, p. 145). To decide between the most appropriate estimation methods, a series of numerical tests were conducted (e.g., a Breusch-Pagan Lagrangian multiplier test; Breusch & Pagan, 1980). The results and details of these tests are described in Article 2.

In qualitative research, on the other hand, reliability is often addressed in terms of procedures (procedural reliability; Eriksson & Kovalainen, 2008), meaning that another researcher following the same procedures consistently—and equipped with the same data and information—should be able to reach similar conclusions (Ihantola & Kihn, 2011). More detailed accounts of the research processes for the separate articles can be found in Articles 3 and 4, but a general reliability overview can be summarized as follows. The interview data utilized covered 7 years (from 2012 to 2018) and were collected as part of a broader servitization-related research stream, making the interviews consistently themed. The interviews were recorded

and transcribed shortly after they took place, and they are accessible through a cloud-based database. The researcher followed the analysis procedures outlined in the Gioia methodology (Gioia *et al.*, 2013) by starting from pattern identification in terms of common words and phrases, then proceeding to cluster the interlinked first-order observations into second-order themes and finally third-order, overarching dimensions (Nag *et al.*, 2007, p. 828). The findings of Article 3, for instance, mainly build on first-order analysis, and they were further refined in the abductive analysis of Article 4. In each stage, the researcher proofed his interpretations with the second author and made adjustments accordingly. Additionally, the analysis was further informed by using extensive secondary data consisting of corporate reports from both the case firm and customer firms.

With regard to the reliability of the current dissertation as a whole, the respective assessments of the research outlets of the appended articles may be used as a point of reference. First, Article 2 and Article 4 were published in international academic journals titled the Journal of Business Research and Industrial Marketing Management, respectively. In the most recent Academic Journal Guide (AJG) by the Chartered Association of Business Schools, both journals are rated at level 3 on a scale from 1 to 4* (the asterisk denotes journals with distinction). Out of the 84 journals in the fields of general management, ethics, gender and social responsibility to which the Journal of Business Research belongs, only 20 are rated 3 or above. In the marketing field, to which Industrial Marketing Management belongs, 20 out of 70 journals are rated 3 or above. The journals rated at the given level are described accordingly: "*3 rated journals publish original and well executed research papers and are highly regarded. These journals typically have good submission rates and are very selective in what they publish. Papers are heavily refereed. These highly regarded journals generally have good to excellent journal metrics relative to others in their field, although at present not all journals in this category carry a citation impact factor*" (AJG, 2018, p. 9).

Second, Article 1 is a chapter in an academic book published by Springer Nature under the imprint Palgrave Macmillan (a subsidiary of this publisher). Naturally, as book publishers are not rated in the academic journal guide, one may refer to the Granada Rankings (2014). According to the given ranking, based on the publisher profile, output and citations, Springer (prior to its 2015 merger) and Palgrave Macmillan were the top-ranked and second-ranked publishing companies, respectively (Torres-Salinas *et al.*, 2014). Finally, following a Finnish Publication Forum classification (JUFO), which not only includes journals and publishers but also conference proceedings for engineering sciences (to which Article 3 belongs), all the research outlets of the appended articles may be ranked based on Figure 5:

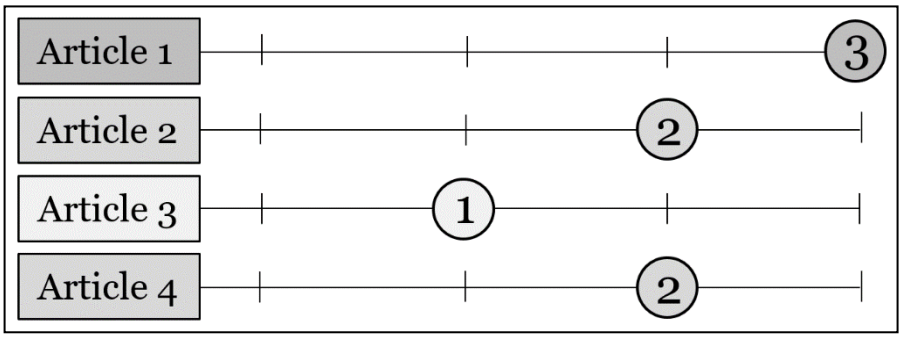


Figure 5. Ratings of the appended articles (scale: 0 to 3), in accordance with the latest Publication Forum (JUFO) classification from 2019.

3.2.4 Validity

Although a study may be repeatable and produce similar results each time it is carried out (i.e., reliability), the results may not be valid. A classical example is provided by a positive correlation between ice cream sales and shark attacks; it is not to be inferred that ice cream sales increase shark attacks, although the finding may be reproduced with accuracy. This is because the reasons for the attacks are more likely to be rooted in factors such as warm weather (leading to more water sports and ice cream consumption). Thus, validity is concerned with how well grounded the findings and conclusions of a study are and how accurately they represent the real-world concept of interest (Hair *et al.*, 2010). As argued before, assumptions about the "real world" may vary depending on the paradigmatic stance (i.e., nominalist vs realist ontology). Thus, because validity assessments of qualitative and quantitative research approaches differ, the validity considerations for both approaches are presented separately in this mixed methodology dissertation. The validity statements of the quantitative components of the current dissertation are outlined next, followed by the qualitative validity statements.

3.2.4.1 Validity of the quantitative results

In the appended articles using quantitative methods (i.e., Articles 1 and 2), the content or construct validity of the measures was not a crucial issue of concern because neither of the studies used latent constructs; rather, they used financial reports and count data. Thus, there was no need for analyses such as exploratory or confirmatory factor analysis (McDonald, 1985) because measures such as the gross margin (that is, operating turnover minus the costs of goods sold (COGS)) consistently measure the metrics they are supposed to. In contrast, if the response variable of interest had been "successfulness", for instance, confirmatory factor

analyses would have been in order since the given construct could arguably consist of multiple interrelated factors (e.g., customer satisfaction, retention or share of wallet). Despite the inherent validity of the measures used, one can investigate the validity of the results in terms of internal and external validity. In quantitative research, internal validity can be seen as the degree to which valid conclusions can be drawn with respect to the research design and controlled factors (Ryan *et al.*, 2002). Thus, in hypothetico-deductive reasoning, it also reflects the extant research on the phenomena (i.e., hypotheses should reflect theory). External validity, on the other hand, refers to the extent to which more general conclusions may be drawn based on the data, model(s), timeframe and setting (Ihantola & Kihn, 2011). The internal and external validity of Articles 1 and 2 are reviewed next.

In Article 1, internal validity was addressed systematically. First, the OBS literature that served as the unit of analysis in the given study was collected systematically using Elsevier's Scopus database and its advanced search function operated with Boolean operators. Second, to ensure the high quality of the literature to be reviewed, papers in journals below the AJG3 rating were removed from the sample. The term frequencies modeled in Article 1 were calculated using the search functions provided by either the publisher or the browser. Repeated nonbody text terms (e.g., in the titles or lists of references) were counted manually and deducted from the individual paper's frequency counts. Thus, the term frequencies consider only valid term usage in papers in high-quality journals. The analysis started by first conducting heuristic data mining practices to visualize trends in the frequency data. Doing so worked not only in favor of the quantitative part of the analysis (i.e., hypothesizing) but also in favor of the qualitative (interpretive) parts of the analysis. Indeed, in mixed methodology studies, quantitative methods may facilitate the qualitative parts of research, or vice versa (Bryman, 1988), to yield more convincing and significant findings and conclusions. In terms of external validity, which pertains to the generalizability of the findings and conclusions, Article 1 is understandably more limited. The reason is that one should not make generalizations beyond the very specific setting of the given study because the lexicon of central interest in the study is specifically endemic with regard to the literature being investigated. Some limited extrapolation arguments can be made, however. For instance, because research-conceived concepts often find their way into corporate discourse (e.g., value cocreation, servitization), it can be argued that as shown in Article 1, relative to the "performance-based" prefix, the "outcome-based" prefix is becoming more popular outside academia in parallel with the increasing popularity inside academia—at least according to Google Trends.

Multiple measures were also taken to consider both the internal and external validity of the findings in Article 2. Four alternative estimation methods were

reported in Article 2 to increase its empirical validity; that is, the primary estimation technique was decided based on the data rather than assumed a priori (Owusu-Gyapong, 1986, p. 531). Furthermore, reporting the results of the alternative estimation methods increased the validity of the primary method results, given that they did not yield contrasting evidence. In addition to the primary estimation method, that is, a population averaged (PA) model, Article 2 reports the results from two alternative models and four alternative estimators. Starting with pooled ordinary least squares (POLS), the properties of the alternative estimation methods are summarized next. A POLS model essentially fits a regular regression model to a panel dataset. To allow for aggregate time effects, the researcher can include year dummies in the model (Wooldridge, 2002, p. 170). Year dummies were included in the POLS model in Article 2. The POLS method could be preferred if there was no variance across entities, but a Breusch-Pagan Lagrangian multiplier test (Breusch & Pagan, 1980) that was performed generated statistically significant evidence against this null hypothesis. An RE model and three different estimators subsequently used allowed the researcher to control for the unobserved heterogeneity in the cross sections. A basic unobserved effects model (Wooldridge, 2002, p. 251) can be written as follows:

$$y_{it} = x_{it}\beta + c_i + u_{it}, \qquad t = 1,2, \dots, T \tag{1}$$

In the above equation, c_i denotes the unobserved effect, which was treated as a random effect in Article 2. A feature distinguishing RE from fixed effects (FE) is that RE use partial pooling techniques to produce estimates (Gelman & Hill, 2007), while FE estimate an effect separately for each cross-sectional observation i (Wooldridge, 2002, p. 251). The latter may result in inferior estimates for smaller sample groups (Gelman & Hill, 2007). Another strength of RE over FE is that RE allow for modeling time-invariant categorical indicator variables (Kohler & Frauke, 2009, p. 245). Moreover, the partial pooling approach sets RE apart from POLS, which completely pools all groups to estimate the effect and ignores group-level variation. The different estimators used in the RE model were the between estimator (BE), maximum likelihood estimation (MLE) and generalized least squares (GLS). The BE averages out the time component (Cameron & Trivedi, 2009) and focuses on the variance between (rather than within) entities. MLE, on the other hand, focuses on maximizing likelihood (Myung, 2003) instead of minimizing the sum of squares (e.g., GLS). Despite the strengths of RE, there are strong assumptions that must be met for the estimations to be consistent. Crucially, it is assumed that the independent variables and the unobserved heterogeneity and individual errors are uncorrelated (Joshi & Wooldridge, 2019). A Hausman specification test (Hausman, 1978) proved that this was not the case. Therefore, the primary estimation method for both first- and second-stage

analyses in Article 2 was a PA model that accommodated correlated data (Zeger *et al.*, 1988).

In simple terms, a PA model models marginal expectations (Ghisletta & Spini, 2004). In contrast to conditional estimates (e.g., RE), the PA model used in the first-stage analysis compared an average OBS provider to an average non-OBS provider (whereas RE compared the outcome for the same provider, should he or she become/stop being an OBS provider). In the second-stage analysis with data consisting of OBS providers only, the marginal estimates represented the entire population (that is, if every firm's covariant changed by one unit) instead of particular firms. In conclusion, regardless of the model and estimator used, the results posited that OBS offerings have a linear positive effect on manufacturer profitability and that the negative relationship between scale and profitability is moderated by the R&D investments of manufacturers. Thus, the validity of the primary estimation results is supported by the similar results of the alternative estimation methods. For instance, the alternative methods minimizing the sum of squares (i.e., POLS, BE, RE GLS) explained approximately 50% of the between-firm variation and one-third of the overall variation (R^2) in the dependent variable. Because the theoretical background (and thus hypotheses) and the empirical results converged, the study yielded valid conclusions. In terms of external validity, one should keep in mind that the study encompassed only firms in the NACE Rev. 2 category 28, restricting the external validity to cover only machinery and equipment manufacturers.

3.2.4.2 Validity of the qualitative results

According to Ryan *et al.* (2002), the respective counterpart to internal validity is contextual validity. In the case study context, contextual validity pertains to the credibility of the theoretical knowledge base, evidence and conclusions, in that they should be convincing enough to show that the researcher profoundly understands the case (Ihantola & Kihn, 2011, p. 42). The steps taken by the researcher to ensure the contextual validity of the qualitative studies included in the current dissertation were as follows. The initial motivation for Article 3 was sparked by a recent paper arguing against the existence of eOBCs in practice (i.e., Grubic & Jennions, 2018a). Based on the researcher's prior professional and academic experiences (i.e., thesis work), the claims of the paper seemed arguable in the context of the energy sector. Consequently, an ecosystem figure was produced (Article 3) using interview data from the research group's repository—a procedure that ensured that the researcher did not collect data purposefully to support his argumentation (i.e., reduced researcher bias).

The results and ecosystem figure of Article 3 were subjected to expert criticism by the scientific committee and the participants at the 11th CIRP conference on industrial PSSs. Already in the process of writing Article 3, notes on plausible legitimacy struggles emerged from the data. This in turn directed the researcher towards organizational legitimacy theories and motivated the use of an abductive research approach in Article 4. The abductive approach emphasizes an active interplay between theory and observations, which is called systematic combining (Dubois & Gadde, 2002). In Article 4, the descriptive validity of the setting and events (Ihantola & Kihn, 2011) was further ensured by using extensive secondary data (a total of 1065 pages of corporate reports) from both the provider and customer perspectives and by drafting an even more fine-grained ecosystem figure (see appended Article 4, Fig. 2) featuring more ecosystem actors. Thus, the collection and utilization of multiple data sources also worked as a triangulation practice adding to the study's validity. Furthermore, the early results of Article 4 were scrutinized by three anonymous reviewers and the participants at the 80th annual meeting of the Academy of Management. Later, three anonymous reviewers of Industrial Marketing Management provided not only constructive criticism but also valuable suggestions.

Because generalizability has evident roots in the quantitative research tradition, authors have argued that generalizability in qualitative research should be conceptualized as transferability (Eriksson & Kovalainen, 2008; Lincoln & Guba, 1985). It is worth noting that some authors claim that generalizability (e.g., external validity) can be achieved through replication and cross-case analysis in qualitative multiple-case studies (Eisenhardt, 1989). However, because the qualitative case studies included in the current dissertation consider only a single case, it is more appropriate to address transferability instead. Transferability unfolds differently in the qualitative studies appended to this dissertation. The transferable accounts of Article 3 are related to the findings concerning system ownership in OBSs. For example, one could argue that ownership-derived power and opportunistic "gaming behavior" may manifest in other contexts as well. On the other hand, the given findings are of particular importance for the OBS literature since, as Hypko *et al.* (2010b) argue, system ownership during and after the contract period (i.e., the distinction between leasing and customer ownership models) is a critical conceptual component of OBSs. In Article 4, in contrast, the theoretical generalizability (Ryan *et al.*, 2002) is greater because the discursive legitimation strategies identified have been detected in other contexts. Moreover, the new-found discursive legitimation strategy of trustification is acknowledged to be a product of synthesis between extant moralization strategy and policy research discussing the connection between trust and legitimacy. Thus, the discovery of the trustification strategy is not something that had already been demonstrated by

earlier studies (regarding the threat of selective plausibility, see Ihantola and Kihn (2011)); rather, it is a result of combining new empirical findings with two distinct yet related theories.

4 ARTICLE SUMMARIES

The current dissertation is composed of four independent articles investigating different aspects of OBSs. The first article (Article 1) is a chapter in an academic book and has gone through a review process prior to acceptance. Articles 2 and 4 were published in international refereed journals. An earlier version of Article 4 was also presented and published in the conference proceedings of the 80th (and the first virtual) annual meeting of the Academy of Management in 2020. Lastly, Article 3 was presented and published in the conference proceedings of the 11th CIRP conference on industrial PSSs held in Zhuhai and Hong Kong in the spring of 2019.

4.1 Further semiotic perspectives on the outcome-based vs performance-based semantic dispute

Article 1, titled "Further semiotic perspectives on the outcome-based vs performance-based semantic dispute", focused on the terminological incoherency pertaining to the terminology used in the OBS-related academic literature. Specifically, the article addressed the debate concerning which is the more appropriate prefix ("outcome" or "performance") for the "-based contract" suffix. The analysis of the 83 systematically collected top-tier (≥ AJG3 rated) articles on the topic started with a pragmatic inspection, i.e., accounting for how context and practices influence meaning. Using the field divide provided by the AJG2018, the average term frequency per paper in each of the fields was computed. This heuristic data mining practice elaborated that the term "outcome" was most frequently used in the fields of innovation (INNOV), marketing (MKT), and general management, ethics, gender and social responsibility (ETHICS-CSR-MAN). The term "performance" was most frequently used in the three fields of accounting (ACCOUNT), strategy (STRAT), and the public sector and health care (PUB-SEC). The two most active OBS publication fields were operations and technology management (OPS-TECH) and operations research and management science (OR-MANSCI), which represented 59% of the total publications (OPS-TECH: 29 papers, OR-MANSCI, 20 papers). The single journal with the highest number of publications on the topic was Industrial Marketing Management (10 papers), which is mainly due to a dedicated special issue in 2016. Next, because extant research has pointed out that the expressions PBC and OBC are often used interchangeably, the relation between the prefix terms (syntax) was given due attention. First, the annual %-balance between the frequencies of the terms (except for 2004, for which there were no publication data in the sample) was stacked and

overlaid with a line representing the number of publications per year. The results are presented in Figure 6.

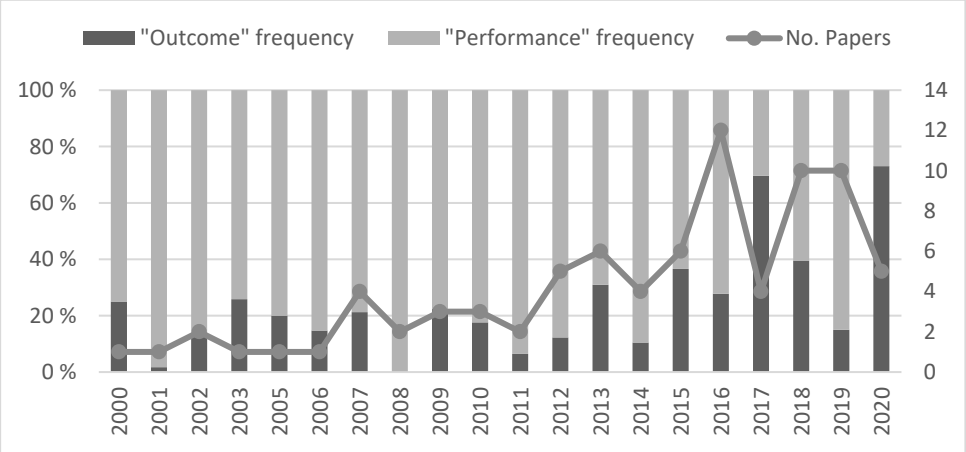
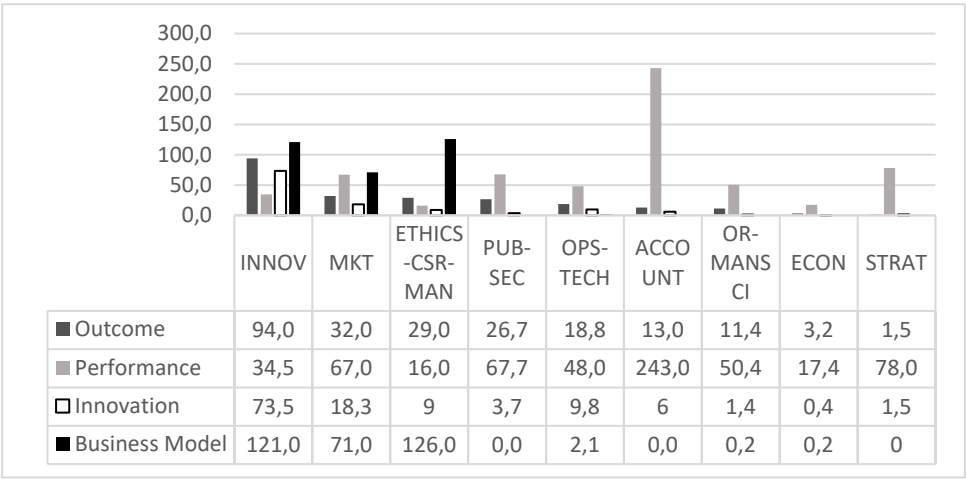


Figure 6. The annual balance between the use of the terms "outcome" and "performance".

Two major trends characterize Figure 6. First, although "performance" has historically been the more dominant term of the two, "outcome" was gaining in share towards the latter half of the latest decade. Second, the number of publications on the topic in top-tier journals is clearly on the rise. Next, based on the researcher's subjective experiences, it was hypothesized that there is a connection between the term "outcome" and the term "business model" (because the associated business models are coined OBMs and not performance business models) and that innovation-oriented scholars would prefer the term "outcome". The grounds for the hypotheses are summarized in Figure 7, which presents the average frequency (per paper) of these terms by field.



	INNOV	MKT	ETHICS -CSR- MAN	PUB- SEC	OPS- TECH	ACCO UNT	OR- MANS CI	ECON	STRAT
Outcome	94,0	32,0	29,0	26,7	18,8	13,0	11,4	3,2	1,5
Performance	34,5	67,0	16,0	67,7	48,0	243,0	50,4	17,4	78,0
Innovation	73,5	18,3	9	3,7	9,8	6	1,4	0,4	1,5
Business Model	121,0	71,0	126,0	0,0	2,1	0,0	0,2	0,2	0

Figure 7. Average frequency (per paper) of the terms used by field.

Table 4. Regression results.

"outcome"	Coef.	Robust Std. Err.	t	P > | t |	[95% Conf. Interval]	
"business model"	.8273419	.351236	2.36	0.032	.0827548	1.571929
"innovation"	.39374	.1660052	2.37	0.031	.0418248	.7456552
"performance"	.1799559	.0825943	2.18	0.045	.0048639	.3550479
constant	5.957126	15.38481	0.39	0.704	-26.6572	38.57146

The given hypotheses were tested using multiple regression analysis, the results of which are presented in Table 3 above. As seen from the output, statistically significant evidence in favor of the hypotheses was found. In other words, there is a direct linear relationship between the annual frequency of the term "outcome" and that of the terms "business model" and "innovation". Curiously, none of the terms were significant predictors when the term "performance" was used as the regressand. Regardless, the given analysis is rudimentary due to the space available, and methods such as Poisson regression, multivariate analysis and dynamic topic modeling should be explored for future reference.

Finally, a semantic analysis was conducted. Semantics is concerned with the meanings attached to words. The term "performance" is in fact a model example of the meaning of semantics: according to Merriam-Webster, performance can be defined as "the fulfillment of a claim, promise, or request" or as "the manner in which a mechanism performs". This is a polysemic feature. Making matters worse, "performance" can also refer to an actor's performance in a play, for example. This, on the other hand, is a homonymic feature, meaning that a term may carry multiple unrelated meanings despite an identical spelling. Moreover, in a legal sense, it was found that there is a need to distinguish performance as a contractual term from other outcome metrics, such as availability. Anecdotal evidence from the solar energy context pointed out that although a mechanical system might be available for operation, it may perform in a degraded state. This corresponds with the logic of overall equipment effectiveness (OEE), a measure commonly known in production contexts, which distinguishes between performance and availability. As OBS offerings are often found in capital-intensive and complex engineering contexts, the researcher argues that the term "performance" should be reserved for describing "the manner in which a mechanism performs". Thus, Article 1 concludes by advocating the use of the term "OBC" due to polysemic, homonymic and legal-technical reasons. With regard to subquestion 1 (*Why is there such a high terminological variety related to OBS offerings?*), it is found that the reasons

are mostly related to pragmatic aspects (e.g., fields of research) but also to meaningful relations with other terms.

4.2 Worth the risk? The profit impact of outcome-based service offerings for manufacturing firms

Evidence of the profit potential of OBS offerings leans on provider net-profit models (usually as a function of operational availability), which have been validated through case data in specific industries. Alternatively, self-reported performance measures (e.g., Likert scales) have been used. Moreover, the findings of numerous case studies underline the prominence of OBS profit. Nevertheless, to date, comprehensive empirical attempts to investigate the OBS profit impact have been conspicuously absent. Furthermore, because OBS offerings are inherently complex and often customized based on idiosyncratic customer needs, they may be hard to scale up. Indeed, extant servitization research emphasizes the need to invest in value-adding digital technologies and modular solution design to cope with the diseconomies of scale related to highly customized advanced services. Departing from these premises, Article 2 attempts to add to the external validity of the pro-OBS profitability arguments through a longitudinal analysis of manufacturer financial data, thus aiming to answer subquestion 2 (*How do OBS offerings affect manufacturing firms' profitability?*). The analysis was conducted in two stages using Stata software (16) by Stata Corporation.

In the first stage, the profitability effects of OBS offerings were tested by comparing OBS providers to non-OBS providers. In the second-stage analysis, the focus was reframed to consider OBS providers only. This was done to investigate the negative effect of scale on OBS provider profitability as well as the moderating effect of R&D investments on this relationship. With respect to the globalization goal of the study, an extensive panel dataset consisting of 14 756 observations from 1 566 firms was used in the first-stage analysis. The second-stage analysis used a subset of the data consisting of only OBS providers (n = 336, N = 2 250). All the firms analyzed fell under the NACE Rev. 2 industry classification code 28, which denotes machinery and equipment manufacturers. A population averaged (i.e., a generalized estimation equation) panel data model was chosen as the primary estimation method. Among the multiple benefits of using the given method, the most frequently cited are those related to the ability to accommodate correlated data using different working correlation specifications. Indeed, the problem of correlated panel data is common in the social sciences. For example, pupils in the same class are likely to exhibit correlated test results over the years. In terms of financial data, the problem is also evident since a firm's financial results are likely

to correlate over time. Consequently, in the first-stage analysis, an autocorrelated working correlation structure was used. The second-stage analysis, on the other hand, utilized an exchangeable correlation structure to reflect the correlation between the discrete variables R&D investments and scale (as in turnover). To add to the transparency and validity of the first-stage analysis results, the alternative estimation method results were also reported.

Regardless of the estimation method used in the first-stage analysis, the results uniformly revealed that there is a significant difference in the gross margin percentage between OBS providers and non-OBS providers. Specifically, it was found that compared to an average non-OBS provider firm, an OBS provider firm has an approximately 4.40 percentage point higher gross margin percentage. This finding is germane for manufacturers coping with the pressures of global competition and commoditization. For instance, using the mean of scale (that is, turnover after inverting the natural logarithmic transformation) and the percentage point coefficient, one can argue that for an average size (~20.5 m turnover) manufacturer in the dataset, OBS offerings can bring nearly an additional 1 million (~0.9 m) in terms of the annual gross margin, ceteris paribus. However, it should be noted that due to the database sampling utilized, it was not possible to account for how much of the manufacturer revenues consisted of OBS sales or whether the manufacturer had just recently become an OBS provider. Nevertheless, the results prove that there is in fact an extremely significant relationship (p-value: 0.000) between OBS offerings and manufacturer profits.

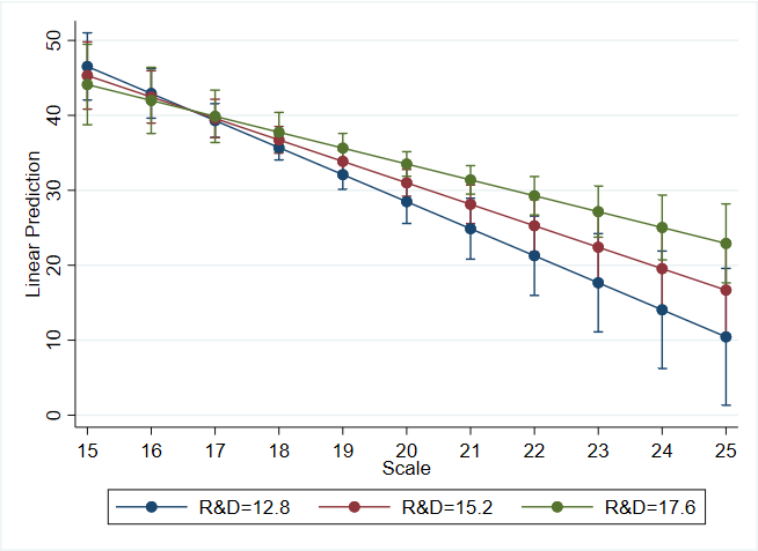


Figure 8. Linear moderation effect of R&D investments on the relationship between OBS provider profitability and scale (95% confidence intervals).

Moreover, as hypothesized, a negative relationship between scale and profitability was found in the second-stage analysis pertaining only to OBS firms. As shown in Figure 8 above, the second-stage analysis of Article 2 also revealed that for OBS provider firms, investments in R&D mitigate the negative effect of scale on profitability. This finding emphasizes the need for OBS providers to invest in digital servitization capabilities and solution modularization. In terms of OBS research streams, Article 2 contributes to both the consequences and requirements streams. With regard to the servitization literature, the article contributes to understanding the financial consequences of servitization and advocates the shift towards advanced services, given the positive findings.

4.3 Ecosystem of outcome-based contracts: A complex of financial outcomes, availability and performance

Article 3 was motivated by claims made against the existence of OBCs that are based on economic outcomes (eOBCs). By mapping an ecosystem of an OBC relationship between independent power producers (IPPs) and a service provider, confirmatory evidence of the existence of eOBCs was found. The core ecosystem members can be summarized accordingly. The service provider (alternatively, the operator) is a servitized manufacturer in the field of energy technology. An IPP (i.e., the customer) is a nonpublic utility whose core business is generating and selling power to utilities. Put differently, IPPs invest in power generation facilities

and sell the generated electric power (through a power purchase agreement (PPA)) to public utilities. Public utilities, on the other hand, are distributors providing electricity to consumers, for example. In many developing countries, governments greatly benefit from the private capital of IPPs since their resources may be insufficient to build and provide electricity infrastructures. Because IPPs are essentially investors, they expect a certain return on investment and may lack the technical and operational capabilities required for the construction, operation and maintenance of a facility. For this reason, IPPs require operations and maintenance (O&M) services from the service provider. The given triad of actors (Figure 9) forms the central structure of the given ecosystem and displays the hierarchy of the customer-provider relationship.

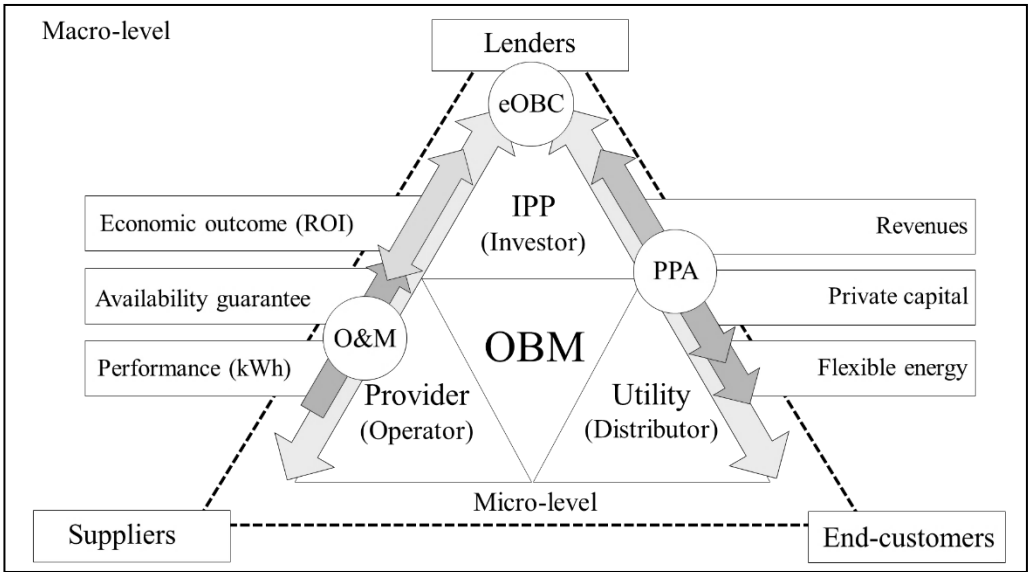


Figure 9. The ecosystem of an economic outcome-based contract.

Through an interpretive, first-order qualitative analysis of 30 executive interviews, some patterns in the data emerged. Much of the discourse considered the risks and rewards of OBCs from the provider perspective. For instance, because the durations of power purchasing agreements and the lifecycle of facilities are inherently long, IPP projects entail long-term service revenues for providers. Furthermore, the solution scopes were considered broader than other service relationships with more technically oriented customers. The risks, on the other hand, reflected complexity and dynamicity. For example, the uninterrupted generation of electricity may depend on actors beyond the dyadic relationship between the customer and the provider (e.g., component or software suppliers). Furthermore, in energy markets such as the United States, IPPs usually invest in flexible energy production that makes it possible to react to the changes in electricity spot prices every five minutes with renewable generation as the new

"baseload". For Alpha, this means that its engine power plants accompanying wind farms, for example, need to have a quick ramp-up time for periods that are not windy.

With regard to the nonexistence of the eOBC argument, our data revealed contradictory evidence. That is, although the technical guarantees of the facility operated by the provider center on operational availability (e.g., aOBC), the liquidated damages clauses inherent in the given agreements make the contracts primarily based on economic outcomes. Liquidated damages clauses are a standard legal feature for safeguarding against various production-related interruptions. For example, an ecommerce software outage may result in significant liquidated damages to a merchant, which is why it is in the merchant's interest to contractually safeguard against such interruptions. Therefore, although possible interruptions will manifest as a "lack of availability", the respective penalty will be based on the lost economic results. Moreover, the respondents pointed out that availability as a concept subsumes mechanical performance because the performance of engines has no relevance if it is unavailable.

An important consideration concerning subquestion 3 (*How does system ownership regulate OBS relationships?*) also emerged. It was found that because including the facilities operated in their own balance sheet would be a terrible burden for the publicly traded Alpha, the IPP usually remains the primary owner of facilities. The given arrangement appears to be the next best thing and the only realistically feasible option for "leasing" a power plant. Notably, this aspect of ownership seems to have paved the way for relational opportunism. In essence, the respondents revealed that some customers may leverage their ownership over the facility and data to monitor and learn the operational capabilities of the provider—a feature for which IPPs hire providers such as Alpha in the first place. This makes a serious claim against the service provider as a legitimate member of the business model at hand: why should we, as customers, keep you involved if we are able to learn the capabilities we currently pay you for? This is both the motivation for and the premise from which the next article (Article 4) continues.

4.4 To outcomes and beyond: Discursively managing legitimacy struggles in outcome business models

Departing from the first-order insights exploratively generated in Article 3, Article 4 adopts the theoretical lens of discursive legitimation to investigate the role of legitimacy in the OBS relationship between a service provider (Alpha) and IPP customers. Thus, through an abductive single case study, Article 4 aims to answer

subquestion 4 (*How does organizational legitimacy affect OBS relationships?*). There are four main reasons why organizational legitimacy was chosen as the theoretical lens. First, the initial exploration of the interview data (i.e., in Article 3) stressed the importance of legitimacy as a relational aspect. Second, although extant OBS research emphasizes aspects such as trust, congruent expectations and regular exchanges as relational assets that are paramount for successful OBS relationships, it offers little guidance on how legitimacy is managed in these unique service business relationships. Third, although policy research clearly distinguishes between the interlinked concepts of trust and legitimacy (e.g., trust in the police and the legitimacy of law enforcement), the relation of the concepts is rarely touched upon in business research. Fourth, the development of the relational aspects during the contract period often passes with little attention because the continuity of the relationship is taken for granted due to the inherent long-termism of the contracts associated with OBS offerings. Therefore, rather than leaning back and enjoying the security of long-term service contracts, OBS providers should think ahead and prepare to manage the emergent legitimacy struggles that may undermine OBS relationship continuity. As mentioned above, Article 4 builds on an abductive approach to theorizing. Thus, rather than developing empirically testable propositions based on extant theories (i.e., a deductive approach) or systematically generating theory from the data (i.e., an inductive approach), the aims were to develop both discursive legitimation theory and theories pertaining to the relational aspects of OBSs, which is in contrast to generating new theories.

The primary data consisted of 31 interviews with executives from a single OBS provider firm. To triangulate and cross-validate the data, two sources of secondary data were used. First, the “strategy”, “service business” and “energy market” sections in the ten most recent annual reports (from 2008 to 2018) of the case company were analyzed. Second, to account for the customer perspective, the five latest annual reports of the five largest IPP firms worldwide were gathered and analyzed. Using QSR International’s NVivo software, the coding procedure was conducted in accordance with the Gioia methodology. The resulting data structure was two-sided, with the left-hand side representing the sources of legitimacy struggles and the right-hand side representing the respective discursive legitimation strategies, as shown in Figure 10 below.

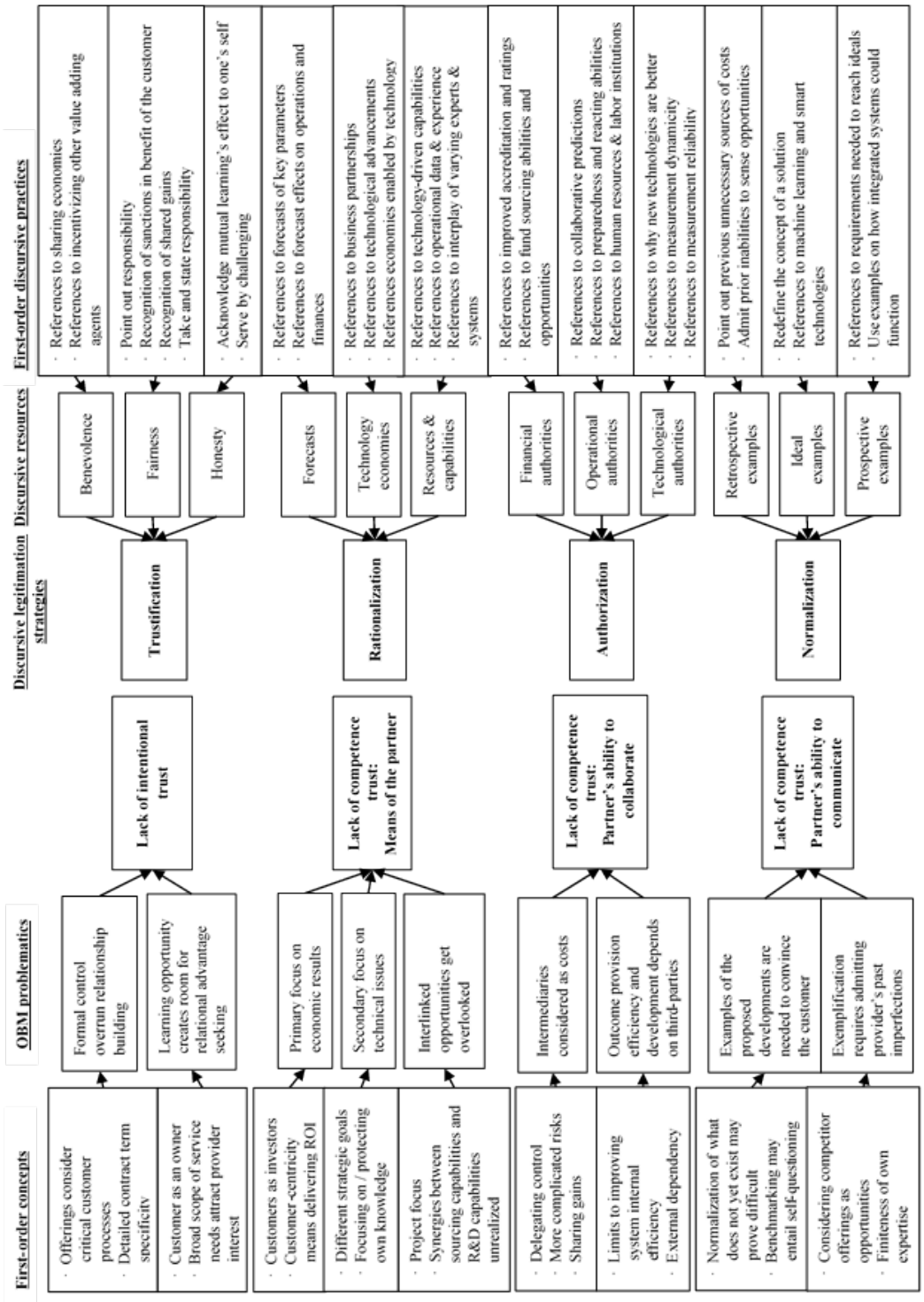


Figure 10. Data structure.

The legitimacy struggles during OBS relationships were related to the absence of trust in the intentions, means, communicative abilities and collaborative abilities of the partner. For example, since the customer may take stock of the ownership

of data and the facility as a learning opportunity, providers must provide alternative justifications for their involvement in the value system. It was found that the provider pursues this legitimacy by rationalizing based on forecasting, technology economies, and his or her resources and capabilities (rationalization strategy). Moreover, the provider may employ a normalization strategy to communicate development ideas through examples or an authorization strategy to convince the customer that he or she is an authority through which network actors, such as financing institutions, can be accessed. These discursive legitimation strategies reflect competence trust. The social construction of the less tangible type of trust—that is, intentional trust—necessitates communicating values pertaining to benevolence, fairness and honesty (see Figure 11). This new-found discursive legitimation strategy was coined trustification strategy, and it acts as a reconceptualization of moralization strategy. Article 4 contributes to the literature streams on OBS consequences and requirements by elaborating the kinds of legitimacy struggles that OBS providers may face and by highlighting some response strategies.

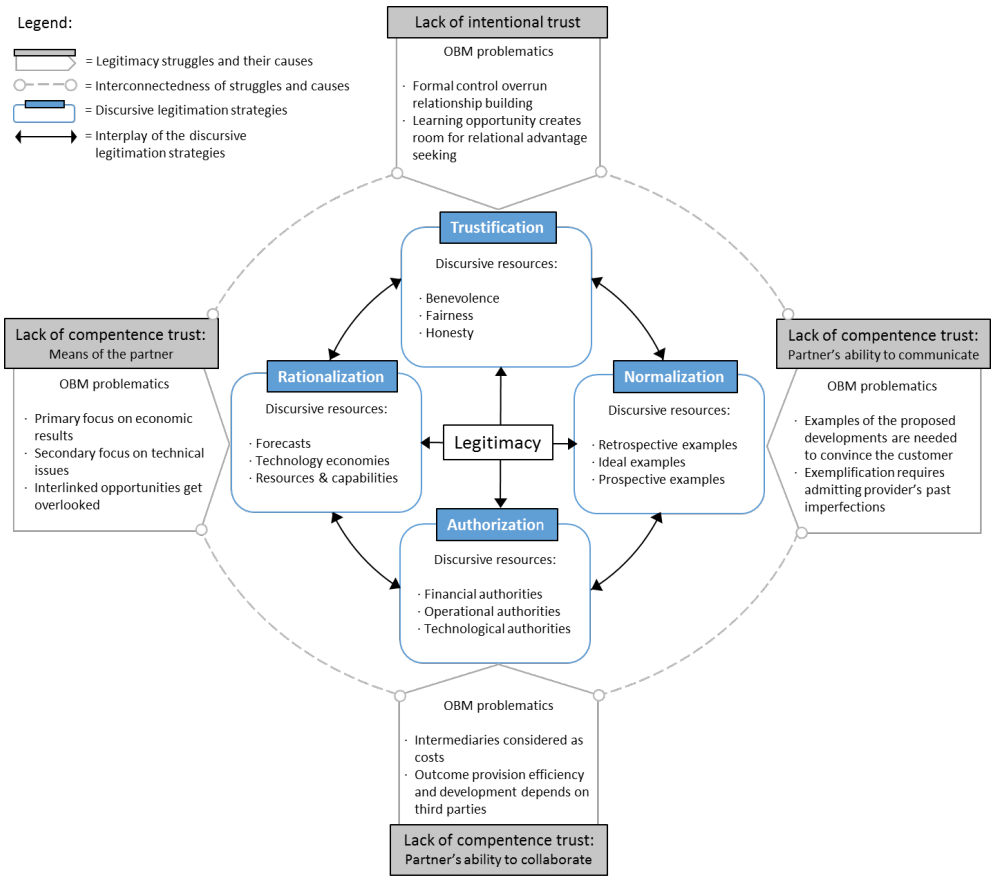


Figure 11. Discursive legitimation of OBM development.

5 DISCUSSION AND CONCLUSIONS

The overarching objective of the current dissertation is to advance our theoretical knowledge of OBS offerings, specifically from the point of view of providers. Rather than aiming to contribute only to one of the literature streams on the topic, this study offers crossover contributions to all three streams (i.e., concept, consequences and requirements) by combining separate yet interrelated traditions of economic and social reasoning. In broader terms, this study contributes to the servitization literature's advanced service end of the spectrum. This broad-gauged contribution was facilitated by the recognition that different aspects of social phenomena should be studied differently: some require inquiries into the subjective accounts constructing that reality, while others exist "out there" for researchers to observe and measure. Guided by the principles outlined in this prologue, the last section of the first half of the current dissertation presents its theoretical and managerial contributions, its main limitations, avenues for future research, and its conclusions.

5.1 Theoretical contributions

The current dissertation aims to advance the knowledge on industrial OBS offerings from the provider point of view. Most of the articles appended to the dissertation contribute to more than one OBS literature stream (with the exception being Article 1, which focuses solely on the semiotics of the OBS concept and definitions). To address the interplay between objective and subjective accounts characterizing the social reality of OBS offerings, a structurationist standpoint (Gioia & Pitre; Giddens) was chosen. The more objective characteristics (e.g., profitability effects) were explored from a functionalist angle, while the more subjective accounts (e.g., legitimacy) were approached interpretively. Bridging the boundaries of the two distinct paradigms also necessitated a mixed methodology research design (Ihantola & Kihn, 2011) for the dissertation as a whole. Paradigmatic flexibility helped the researcher pursue the research objective of a multiperspectival contribution that reflects all three OBS literature streams (i.e., concept, consequences and requirements; Schaefers *et al.*, 2020). On the other hand, the inherent weakness of multiperspectivity is that it restricts the amount of detail that the researcher can go into regarding each perspective (the limitations of the dissertation are discussed more thoroughly in section 5.3). As mentioned earlier, Schaefers *et al.* (2021) divided the literature related to OBS offerings into three streams.

The first stream considers the OBS concept and can be further divided into three areas of focus: definition(s), types and design elements (Schaefers *et al.*, 2021, p. 468). In terms of the OBS concept literature stream, the current dissertation offers two clear contributions. First, Article 1 argues that associated contracts should be termed OBCs instead of PBCs because "outcome" is a more univocal term than "performance" and because the latter term should be reserved for describing the manner in which a mechanism operates in the contract language. Moreover, Article 1 elaborates that the term "performance" is rooted in the PBL tradition and that marketing and innovation scholars use the term "outcome" more frequently. Second, extant research has found that OBS offerings fall under two types: contracts based on availability (aOBCs) and contracts based on economic results (eOBCs; Böhm *et al.*, 2016). The existence of the latter has been called into question (Grubic & Jennions, 2018a). To refute this suggestion, Article 3 maps the ecosystem of an OBS offering in the energy technology sector. The case's findings posit that eOBCs exist: because the customer sells the generated power onwards for a predetermined price (agreed to in the PPA), the OBS provider operating the power generation process practically guarantees sales revenues for the customer. Moreover, since unforeseeable downtimes are penalized by liquidated damages clauses relative to the revenues lost, such contracts are evidently based on economic outcomes.

The second OBS literature stream identified by Schaefers *et al.* (2021) is related to the consequences of OBS offerings. The authors divide the literature into positive and negative consequences. For example, OBS offerings guarantee long-lasting sales revenues for providers (Visnjic *et al.*, 2018) but increase their risk (Caldwell & Howard, 2014). The current dissertation contributes to the given stream by highlighting both positive and negative consequences. First, Article 2 finds that OBS offerings positively affect manufacturer profitability. This extends the external validity of the positive case findings with respect to profits in different industries (e.g., mining; Patra *et al.*, 2019). On the other hand, because industrial OBS offerings are complex wholes customized to suit different customer needs (Kohtamäki, Parida, *et al.*, 2019), they may be cumbersome to scale up. Indeed, Article 2 also found that scale negatively affects OBS provider profitability. Article 3 also contributes to knowledge on the negative consequences of OBS offerings. That is, the findings posit that if the customer remains the owner of the system operated, he or she may leverage the relationship for learning purposes and terminate the OBS relationship once he or she has managed to develop the operational capabilities needed to internalize the outcome production processes. This result contrasts with earlier positive findings pertaining to participant learning in OBS relationships (see, e.g., Visnjic *et al.*, 2017). Lastly, Article 4 reveals some sources of plausible legitimacy struggles emerging during an OBS

relationship. These struggles must be managed; otherwise, the inherently high contract specificity makes dissolving OBS arrangements relatively effortless for a customer who ceases to consider the provider's participation to be legitimate.

The third and final OBS literature stream considers the requirements for successful OBS deliveries (Schaefers *et al.*, 2021). For instance, OBS deliveries are more potentially successful when the relationship between the partners is well grounded and complemented by relational assets (Ng *et al.*, 2013). Building on previous findings suggesting that OBS deliveries are more likely to be effective when providers have a strong investment culture, Article 2 shows that the R&D investments of providers do indeed moderate the previously mentioned negative effect of scale on OBS provider profitability. It is suggested in the article that investments in digital servitization technologies and solution modularization may explain the mitigating effect, as they help manage scale-induced issues. Article 4, on the other hand, stresses the importance of legitimacy as a requirement for OBS relationship continuity. Furthermore, it unpacks four discursive legitimation strategies that a provider may utilize to defend, preserve and redeem legitimacy. Moreover, by combining the concepts of trust and legitimacy, the paper contributes to the discursive legitimation literature (Erkama & Vaara, 2010; Vaara & Monin, 2010; Vaara & Tienari, 2008) by discovering a new strategy named trustification.

Beyond the contributions to the core literature on OBS offerings, the current dissertation also offers multiple contributions to the servitization literature in general. First, Article 1 contributes to the servitization literature aiming to provide terminological clarity in the field (e.g., (Brax & Visintin, 2017; Kowalkowski, Gebauer, Kamp, *et al.*, 2017). This is important because, as Rabetino *et al.* put it, "*the coexistence of multidisciplinary viewpoints, methods, and terminologies has increased complexity, which limits knowledge accumulation*" (2018, p. 351). Moreover, servitization-related terminology has begun to appear in like-minded literature that does not make use of the core term itself (Kamp & Parry, 2017). On the one hand, similar services appear under varying names in different studies, and on the other hand, the same names are used to denote structurally different services (Brax & Visintin, 2017, p. 29). Therefore, there is a clear demand for contributions that aim to clarify/unify the conceptual and/or terminological base of the servitization literature. Article 1 responds to this demand by arguing that the "outcome-based" prefix should be preferred over the "performance-based" prefix when describing service contracts in which provider remuneration is primarily based not on the required time and materials but on the consequent results of activities. In conclusion, it is in the common interest of the servitization community to strive towards a unified lexicon because the resulting coherency will

make schools of thought more acceptable among fellow scholars and academic editors (for a good example, one may refer to service-dominant logic; Kohtamäki & Rajala, 2016; Lusch & Vargo, 2014).

Article 2, on the other hand, contributes to a branch of the servitization literature focusing on the financial consequences of servitization (e.g., Eggert *et al.*, 2011, 2014; Fang *et al.*, 2008; Kohtamäki, Partanen, Parida, *et al.*, 2013). While other studies often report nonlinear relationships between different industrial service offerings and manufacturer profits (e.g., R&D services; Kohtamäki *et al.*, 2013), Article 2 shows a direct effect in the case of OBS offerings. On the other hand, the results align with earlier findings that posit that large manufacturers generate lower profits from services than smaller manufacturers (Neely, 2008). The results of Article 2 confirm that this is also the case for OBS provider firms. However, building on the Schumpeterian argument that firm size positively correlates with R&D investments (Shefer & Frenkel, 2005), it is shown that R&D investments do indeed mitigate the negative effect of scale on profitability in the case of OBS provider firms. This contribution also addresses the literature that considers the types of resources and capabilities that firms engaging in servitization in general (Forkmann *et al.*, 2017; Theoharakis *et al.*, 2009) and advanced services in particular (Baines & Lightfoot, 2013; Sjödin, Parida, & Kohtamäki, 2016; Story *et al.*, 2017) need to be successful. Particular notions of digital servitization (Coreynen *et al.*, 2017; Linde *et al.*, 2020; Schroeder *et al.*, 2020; Sklyar *et al.*, 2019) and modular service design (Hellström, 2014; Rajala *et al.*, 2019; Salonen *et al.*, 2018) as potential targets for investment are presented in Article 2.

Lastly, Articles 3 and 4 both contribute to a strand of the servitization literature that focuses on the relational aspects between service providers, customers and other ecosystem actors (Gebauer & Kowalkowski, 2012; Sjödin *et al.*, 2019; Sjödin, Parida, & Wincent, 2016; Tuli *et al.*, 2007). The relational aspects are arguably crucial for service "enthusiastic" firms (Raddats & Kowalkowski, 2014) because active participation in customers' processes will inevitably increase the collaborative interactions with customers, suppliers and even competitors (Raza-Ullah, 2020). By mapping an ecosystem of a specific OBS offering, Article 3 elaborates how system ownership may induce opportunistic customer behaviors and thus cause a legitimation crisis with respect to provider participation in the long term. Thus, the findings explain how the social structure may influence interactions. Article 4, in turn, places more emphasis on social construction. That is, providers are not just spectators in legitimation crises. They can employ discursive legitimation strategies to reconstruct their legitimacy as a value-adding partner. The legitimation discourse not only reflects the current activities of the provider but also contains the potential for innovating them. As legitimacy is a

social factor that, to date, has not received attention in the servitization literature, Article 4 makes a unique contribution to understanding the relational aspects of servitization.

5.2 Managerial contributions

All the studies included in the current dissertation were designed to be of practical relevance for managers. In particular, the practical implications of this dissertation are useful for managers who work in manufacturing industries and are contemplating the opportunities provided by and the strategic role of OBSs. Taking the perspective of this kind of manager, the managerial contributions of the dissertation follow a seemingly straightforward logic.

First, the manager is likely to be naturally interested in the fundamentals; that is, what are OBS offerings? One may refer to the concept literature stream (Schaefers *et al.*, 2021) in regard to aspects such as those above. However, soon after, the manager may become baffled by the terminological variety endemic to the literature. In this respect, Article 1 aims to provide some clarity and explanations. For example, the "performance-based" prefix in PBCs is rooted in PBL services in the defense sector. The given terminology reigned in the associated literature from the early 2000s but was accompanied by an alternative OBC (or OBM) term in the second decade of the current century. The term "outcome" is more prevalent in the literature pertaining to public administration, marketing and business model innovation. An important managerial implication of Article 1 is that from a legal-technical point of view, the term "performance" should be reserved for describing the manner in which a mechanism works to avoid ambiguity. As a prefix to the word "contracts", "outcome-based" should be preferred due to its univocality.

Second, while familiarizing oneself with the OBS concept, one cannot help but come across the notion of increased provider risks (Datta & Roy, 2013). Because taking more risks makes no sense if the respective rewards or risk premiums cannot be expected, the manager is likely to next seek financial rationales for the given service strategy. In this respect, Article 2 provides empirical evidence of the profit disposition of OBS offerings that extends beyond the extant case-specific evidence (e.g., Jain *et al.*, 2013). Not only does Article 2 advocate the profitability of OBSs, but it also warns managers that capitalizing on and scaling up complex and advanced OBS offerings necessitate investments in R&D. Specifically, remote monitoring technology, condition-based monitoring and preventive maintenance are highlighted as potential targets for investments due their ability to forestall shortcomings in outcome production (Grubic & Jennions, 2018b; Öhman *et al.*,

2015). Furthermore, solution modularization has been dubbed the next phase in the servitization journey of industrial manufacturers (Rajala *et al.*, 2019). Platform-based design can also add value for OBS offerings since it enables the provider to configure different service elements into coherent wholes, thus reducing customization-induced issues. Moreover, platforms make it possible to bring together multiple actors such that participants work towards common outcomes. When participating in such ecosystems, the provider must also consider which strategy to follow: will the provider be an orchestrator, a dominator, a complementor or a protector (Kamalaldin *et al.*, 2021)? The different approaches and roles may further guide investment decisions.

Third, after learning about the financial potential of OBS offerings, the manager may become further interested in the requirements of successful OBS deliveries, as suggested above. Because OBS delivery entails closer collaboration between the provider and the customer, the relationship between the partners ought to change compared to transactional exchange relationships. Indeed, extant research has emphasized that a high-quality relationship and the presence of relational assets can contribute to OBS successfulness (Ng *et al.*, 2013; Sjödin, Parida, Jovanovic, *et al.*, 2020). However, the features characterizing relationship quality are often quite limited in OBS research, pertaining to factors such as regular exchanges, congruent expectations and trust. This leaves multiple qualities unexplored, with one of them being legitimacy. Legitimacy is the perception of whether the actions of an actor are desirable, proper, or appropriate (Suchman, 1995). In Article 4, it was found that a customer may cease to regard the provider's involvement as desirable/appropriate if he or she is able to learn the operational capabilities for which he or she initially hired the provider. Moreover, as elaborated in Article 3, the customer may intentionally leverage system ownership to "gain access to the core", as elaborated by one of the interviewees. Thus, to avoid the dissolution of the OBS relationship, OBS providers must find other ways in which they can legitimate their involvement in the customer's processes. In Article 3, it was found that the providers can either accept the consultative nature of the OBS relationship or become active shareholders in the given projects. In article 4, on the other hand, it was found that the provider may follow four discursive legitimation strategies (trustification, rationalization, authorization and normalization) to defend and regain legitimacy. These findings communicate to managers the importance of relational assets in OBS relationships.

On a more general level, the current dissertation suggests that managers should not oversimplify OBS offerings by looking at the phenomenon in question through only one lens, such as transaction cost economics (Williamson, 1981). This is not to say that one should refrain from utilizing certain perspectives; rather, one

should keep an open mind regarding alternative viewpoints that may contribute to a comprehensive understanding of the topic. For example, despite the dominance of functionalism and (to an increasing degree) interpretivism in OBS research, the empirical soil from which all branches of the given literature have grown is rich in critical nutrients, metaphorically speaking. For example, the underlying ideology behind OBS offerings derives from critical perspectives on traditional time-and-materials-type services, thus reflecting the sociology of radical change (Burrell & Morgan, 1979). In time-and-materials-type services, it is in the provider's interest not to avoid breakdowns and to inflate resource consumption because both contribute to the revenues of the provider. OBS offerings, on the other hand, encourage providers to generate service outcomes as resource efficiently as possible. This is in alignment with the circular economy and sustainable PSS movement (Tukker, 2015). Accordingly, the extant structures—that is, the old service contracting models—must be challenged (i.e., radical structuralism) for the sustainable service innovation of OBS offerings to prevail.

However, managers interested in matters pertaining to OBS sustainability should also be reasonably concerned with the Jevons paradox found in environmental economics. In 1865, an economist named William Stanley Jevons proposed that although coal-use efficiency gains should intuitively lower coal consumption, the very opposite was true instead (Alcott, 2005). The reason is that efficiency improvements naturally decrease production costs, which in turn decreases prices and ultimately increases demand. This phenomenon is called the "rebound effect" in modern energy economics (Grubb, 1990), and it is often counterbalanced through tax policies that aim to keep the cost of resource use the same regardless of the efficiency gains (Wackernagel & Rees, 1997). Another perspective, that of the environmental footprint, emphasizes individuals' crucial role (i.e., radical humanism) in initiating radical consumption change (see, e.g., Borrello *et al.*, 2017). In this respect, much remains unexplored in the context of OBS offerings. For example, end customers (such as energy off-takers) rarely have a transparent overview of utility companies' supply chains, at least in terms of the contracting types endorsed. Thus, they may have relatively restricted knowledge to guide their decision-making with regard to the resource efficiency of the seller. Alternatively, ecologically driven consumers may not even be aware that they should be concerned about the differences in contracting types in industrial services. The aspects discussed above not only highlight the broader societal importance of industrial OBS offerings but also show that a profound comprehension of the given multilateral phenomenon requires further multiperspectival approaches.

5.3 Limitations and future research

Like all research, this study has its limitations. Thus, this section outlines the main limitations of the dissertation as a whole. More detailed accounts of the limitations of the individual studies included in the current dissertation may be found in the appended articles. The current dissertation has four main limitations that open appealing pathways for future research. The remainder of this section is structured accordingly. The limitations pertaining to the provider perspective of choice (as opposed to the customer or network perspectives) are discussed first (limitations 1 and 2). Subsequently, the limitations regarding the choice to contribute to multiple OBS literature streams (as opposed to focusing on one specific stream) are discussed (limitation 3). Finally, the limitations related to the study's scope in terms of spatiotemporality conclude the section (limitation 4).

First, this dissertation takes the perspective of OBS providers. This perspective was chosen because providers take significant risks when deciding to offer OBSs; therefore, they require theoretical guidance on how to make sense of this risky service strategy. On the other hand, numerous studies have called for spotlighting the customer perspective (see, e.g., Essig *et al.*, 2016; Schaefers *et al.*, 2020). For instance, studies emphasize that the success of solutions greatly depends on customers' ability to provide and share information (Aarikka-Stenroos & Jaakkola, 2012; Elgeti *et al.*, 2020). Indeed, information sharing (and protection) practices are a particularly intriguing subject for future OBS research because closer collaboration surely necessitates an effective information flow. Nevertheless, although OBS offerings align the business interests of the provider and the customer, both are likely to continue doing business separately from the other. This raises the question of what and how much information can be shared with the partner. The paradoxical tension between knowledge sharing and knowledge protection is an issue that is familiar from the context of coopetition (Bouncken & Kraus, 2013; Raza-Ullah, 2020), for example. Subsequently, aspects pertaining to knowledge sharing in the context of OBS offerings cannot disregard the customer perspective. Thus, the customer perspective remains an aspect of OBSs that particularly warrants further research.

Second, although the provider perspective of choice does not leave third-party actors without attention, more network-driven perspectives have been called for (Sjödin, Parida, Jovanovic, *et al.*, 2020). Thus, future research may take papers such as that by Howard *et al.* (2016) as a point of departure to investigate the triadic dynamics among value system participants. Moreover, the ecosystem or platform (Jovanovic *et al.*, 2021) associated with OBS offerings often extends to cover the triads among not only traditional component suppliers, OBS providers

(often referred to as principal contractors) and customers but also software providers, for example. Indeed, the Chesbroughian notion of open business models has also been emphasized in the context of OBS offerings (Visnjic *et al.*, 2018). Given the endemic complexity of the PSSs (or product-service-software systems) related to OBSs, the opportunities and entry points for further ecosystem members are arguably plenty. Nevertheless, although opening the business model may allow innovative value creation, due attention must be paid to fair and appropriate value-capturing mechanisms. For example, extending the value cocreation and capturing process model (Sjödin, Parida, Jovanovic, *et al.*, 2020) beyond the dyadic framework might elicit valuable knowledge on the matter.

Third, because this dissertation aims to provide a multiperspectival contribution as whole, it does not attempt investigate each OBS literature stream exhaustively. In other words, the researcher acknowledges that the literature streams to which he aims to contribute consist of multiple other focus areas to which this dissertation does not make direct contributions. Moreover, many theoretical gaps continue to exist in the focus areas to which this dissertation does in fact make contributions. For example, a research design-related choice could have been made to focus only on the financial consequences of OBS offerings and to empirically test their profitability effects in different industries or to test their effect on various other financial indicators, such as sales growth (see, e.g., Kohtamäki, Partanen, Parida, *et al.*, 2013), stock prices or stock price volatility. Alternatively, other commercial outcomes of interest could include installed base growth, growth in terms of new customers or customer retention/satisfaction, to name a few. It should also be mentioned that although providers' R&D investments was used as a proxy for digital servitization and solution modularity development in this study (Article 2), more delicate instruments enabled by approaches other than database sampling (e.g., surveys) are needed to provide further support for our interpretation of the results. By taking a more interpretive approach, one could have focused solely on relationship development between the customer and the OBS provider (or, more broadly, other ecosystem members). For example, since advanced services, such as OBS offerings, often bring together the human resources of both the customer and the provider, organizational boundaries blur (Huikkola *et al.*, 2020). Furthermore, microlevel interpersonal relationships are prone to develop, and they are likely to influence the interactions that constitute organizational phenomena. As Felin and Foss argue, "*In fact, to fully explicate organizational anything—whether identity, learning, knowledge or capabilities—one must fundamentally begin with and understand the individuals that compose the whole*" (2005, p. 441). In this respect, the predominantly functionalist OBS literature lacks insights. In terms of synthesizing the extant OBS research, one could argue that multiple plausible perspectives and literature

review methods remain. For example, to take stock of the critical mass of OBS literature accumulated throughout the years, one could employ methods such as bibliometric analysis (see, e.g., Khanra *et al.*, 2021) or dynamic topic modeling (see, e.g., Rabetino *et al.*, 2021).

Fourth, this dissertation's contributions are embedded in their respective time and context. For example, Article 1 draws insights from a set of OBS-related papers collected in early 2020 and uses papers indexed in Elsevier's Scopus database at the time. Had the data been collected later and/or from another database (e.g., Google Scholar), the results could have varied. On the other hand, Article 2 attempted to take the time dimension into consideration by building on an unbalanced panel dataset spanning 10 years (the most recent financial report varied between 2016 and 2019). Nevertheless, the given study focused on machinery and equipment manufacturers, which is why the findings are restricted to this industry segment. Additionally, the case company (Alpha) of interest in Articles 3 and 4 belonged to this industry segment, while the interview timeframes spanned from 2012 to 2018. Although time and context place restrictions on the generalizability of the results, the decisions made regarding them were not random. For example, during the current century, it has been exactly manufacturers that have vividly experienced the pressures of intensifying global competition. Regarding manufacturers, on the other hand, those operating in business markets have particularly been exploring service-led growth strategies in the 21st century, making them an intriguing research subject from the perspective of service scientists. However, given the rising interest in leasing or "as-a-service" models in B2C markets, OBS offerings for consumers are an explicitly interesting avenue for future research. For example, European car lessors recently found themselves facing a critical need for innovation, as COVID-19 caused a 68% drop in profitability (%) between Q2 2019 and Q2 2020 (KPMG, 2020). How will the industry recuperate?

5.4 Conclusions

This dissertation considered OBS offerings from the provider perspective. The threefold research question to which this study sought answers was as follows: *What are OBS offerings, why are they of interest for manufacturers, and how can OBS customer relationships be managed?* Extant studies have argued that the term OBS denotes service offerings, in which at least some of the provider's revenue is tied to the outcomes that the service activities yield (Selviaridis & Wynstra, 2015). However, this conservative definition covers a broad set of services, since the notion of "at least some" dictates that a service is considered an

OBS regardless of whether 1% or 100% of the provider's revenues are tied to the outcomes achieved. Thus, an improved definition could be rephrased as "service offerings, in which a significant part of the provider's revenues is tied to the outcomes of service activities". The "significant" amendment would allow for industry and context differences since what is considered a significant amount can vary in different settings. For example, according to General Electric (2016), unplanned downtime of just 1% can cost 5.037 million dollars each year for offshore oil and gas organizations. In such industries, customers are willing to pay rather generously for an uninterrupted power supply, for example—against the risk of liquidated damages, of course. Most OBSs are widely regarded as being based on availability (aOBCs; Grubic & Jennions, 2018a). For example, service level agreements are a widely used method that can guarantee that a technical support service will handle helpdesk tickets within a certain timeframe. In settings where delays in the response do not cause significant business interruptions, production loss-related sanctions are usually absent. Instead, penalties may appear in the form of agreed-upon malus payments and/or the loss of bonuses. However, given that many of the associated penalties are proportional to the revenues lost in more capital-intensive contexts, many OBS offerings are in fact based on economic results (eOBCs; Böhm *et al.*, 2016). This corresponds with going downstream (Wise & Baumgartner, 1999), which denotes the process of becoming involved with customer activities and sharing customers' business risks. To answer the primary research question, this dissertation turns to the division of the OBS literature streams (i.e., the concept, consequences, and requirements) introduced by Schaefers *et al.* (2021). Through four subquestions and four appended articles, the current dissertation offers multiple contributions to each of the literature streams and improves the understanding of the concept, financial consequences and relational requirements regarding the provision of OBS offerings.

Starting from subquestion 1 (*Why is there such high terminological variety related to OBS?*), Article 1 sheds light on the reasons for the terminological variety in OBS research. The reasons were mainly related to the practitioner history of the phenomenon and disciplinary histories of the phenomenon in academia. For example, PBL is a term used in the aerospace and defense sectors that found its way into academic language in the 1990s and early 2000s (Howard *et al.*, 2016; Selviaridis & Wynstra, 2015). Operations and management scholars have in turn popularized the term PBC in business studies[6], while the increasing interest in the topic among public administration, innovation- and marketing-oriented scholars has brought the alternative terms OBC, OBM and OBS into the academic discourse

[6] According to Selviaridis and Wynstra (2015), health care and public sector researchers were already actively using the terms PBC/OBC in the late 1980s.

on the topic after 2010. In alignment with recent arguments, it is also concluded that the term "outcome-based" is a more appropriate prefix than "performance-based" due to the univocality of the term "outcome" and because the term "performance" has a legally important meaning elsewhere (i.e., mechanical performance).

Subquestion 2 (*How do OBS offerings affect manufacturing firms' profitability?*) was related to the consequences stream of the OBS literature (Schaefers *et al.*, 2021). To answer the question and to extend the external validity of the earlier case-specific contributions on the topic, an empirical and longitudinal quantitative analysis was conducted based on an extensive dataset consisting of machinery and equipment manufacturers. The results show that OBS offerings positively affect manufacturing firms' profitability but that scale sets limitations to this linear effect. Consequently, it is suggested that the scale-induced issues can be managed through investments in digital servitization (Coreynen *et al.*, 2017; Kohtamäki, Parida, *et al.*, 2020; Vendrell-Herrero *et al.*, 2017) and solution modularization (Cenamor *et al.*, 2017; Salonen *et al.*, 2018).

The subquestions 3 and 4 are closely related. An answer to subquestion 3 (*How does system ownership regulate OBS relationships?*) was sought for in Article 3. It was found that if the customer owns the system operated through the OBS, he or she can leverage the relationship to develop his or her internal operations capabilities, which can undermine the provider's justified role as a value cocreator in the long term. Thus, providers may choose to either become shareholders in the projects themselves or accept the more temporary consultative relationship with these kinds of customers. Because the provider's justified role in the value system essentially deals with legitimacy (with illegitimacy leading to dissolution of the OBS relationship), answers to subquestion 4 (*How does organizational legitimacy affect OBS relationships?*) were sought in Article 4. The results show that the provider is not a mere passenger in the face of emerging legitimacy struggles; rather, the provider can "take the wheel" by applying discursive legitimation strategies to defend his or her legitimacy. The findings do not make inferences regarding the successfulness of each strategy, but they emphasize that relational ties can be built upon when aiming to sustain and develop OBS relationships. These findings are in alignment with contributions pertaining to the relational aspects of OBS offerings (see, e.g., Ng *et al.*, 2013; Sjödin, Parida, Jovanovic, *et al.*, 2020) and are contrast to those of more technical requirement-related studies concerning, e.g., inventory management (Hur *et al.*, 2018; Tan *et al.*, 2017) and reliability optimization (Bakshi *et al.*, 2015; Ge *et al.*, 2018).

Returning to the primary research question, one can infer that the division of the literature streams (i.e., concept/consequences/requirements; Schaefers *et al.*, 2021) used in this dissertation offers a useful heuristic for understanding OBS offerings. The reason is that it makes it possible to approach the subject by asking the quintessential questions of *what, why and how*. With respect to the question of "w*hat are OBS offerings*", the current dissertation aims to propose the idea that although the answer to the given question may be expressed using different terminologies depending on the discipline, scholars should seriously consider unifying the terminology. The reason is that the fragmented terminology contributes to complexity, which may hinder knowledge accumulation. The current dissertation advocates the use of "outcome-based" terminologies due to their univocality.

In regard to the question of "*why are they of interest for manufacturers*", this dissertation provides multiple answers from the provider perspective. First, obviously, this dissertation provides evidence of the profit potential of the given services for manufacturers. Second, it highlights many sustainability-related benefits associated with OBS offerings (e.g., resource efficiency, contracts that incentivize emission reductions). Third, it identifies that becoming involved with and responsible for customers' activities is a challenging but appealing strategic position for manufacturers. There are many subreasons for the third point, but the most common are as follows. By assuming more accountability (and risk) for their customers' operations, manufacturers gain power over their competitors because of exclusive, broad-scope and long-term contracts (Visnjic *et al.*, 2017). Furthermore, because OBSs provide manufacturers an opportunity to deeply familiarize themselves with customer operations, innovations driven by customer knowledge development (Johansson *et al.*, 2019) may follow. Closer interactions with the customer may also contribute to the creation of relational assets that add value to the relationship (Ng *et al.*, 2013).

Finally, this dissertation also provides some crucial insights regarding the "*how can OBS customer relationships be managed?*" question. Although the closer relationship between the contracting partners has its benefits, as argued above, it also has its downsides. For example, as the businesses of both the customer and the provider become increasingly dependent on each other via OBS offerings (Visnjic *et al.*, 2017), the relational risks grow. Features amplifying this effect include the fact that OBS offerings usually center on critical customer activities (Ulaga & Reinartz, 2011) and the fact that OBS customers are typically key customers for the providers (due to long-termism, scope, exclusivity, etc.). Thus, this dissertation attempts to highlight that OBS providers should not merely sit back and enjoy the long-termism secured by the associated contracts. Rather, they

should actively focus on managing legitimacy to sustain and prolong the partnership. Furthermore, because OBS offerings are inherently complex, involve complicated systems and are thus highly customized, significant scaling challenges are likely to occur. The current dissertation provides empirical evidence of such challenges and suggests that the tradeoff between customization and efficiency can be managed by investing in digital servitization development and modular solution design. Drawing the first part of this dissertation to a close, the researcher concludes that the research objective of making a multiperspectival contribution to the OBS body of literature has been achieved.

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FURTHER SEMIOTIC PERSPECTIVES ON THE OUTCOME-BASED VS PERFORMANCE-BASED SEMANTIC DISPUTE

ABSTRACT

The current book chapter addresses the result-oriented servitization business models coined in the academic literature as outcome-based contracts or performance-based contracts. Indeed, the given polarization in terms of academic terminology certainly does not serve to decrease the conceptual complexity of these business models. As extant arguments with the pro "outcome" prefix have built on its unambiguousness compared to "performance", I intend to provide further insights into the debate by offering pragmatics- and syntax-based perspectives on the topic. In this effort, I draw upon a systematic literature review of over 80 top-tier academic journal papers (AJG3, AJG4 and AJG4*). Thus, the current chapter contributes to the definition stream of the outcome-based service literature. For managers, the chapter synthesizes research trends, offers an outlook of the eminent research facets that publish on the topic and provides some contextualized explanations and antecedents of the differences in academic terminology.

Keywords – Servitization, Outcome-based contracts, Performance-based contracts

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1 INTRODUCTION

To ensure the added value of their services, providers use performance- and outcome-based contracts (PBCs & OBCs) instead of billing based on the time and materials dedicated to the service activity. The interchangeable use of the terms "outcome" and "performance", however, has often caused confusion (Datta & Roy, 2011; Grubic & Jennions, 2018; Hou & Neely, 2018; Hypko, Tilebein, & Gleich, 2010b, 2010a) Recently, however, arguments have been made in favor of "outcome" as the preferred prefix (Schaefers, Ruffer, & Böhm, 2020) to be used when discussing what the associated contracts are based on. The reasoning behind the given arguments has leaned much on semantics, that is, the meaning(s) attached to these terms. For example, "performance" can refer to an artist's presentation of artwork, the manner in which a mechanism operates, or the action of performing a task. Given this semantic ambiguity (Rodd, Gaskell, & Marslen-Wilson, 2004), the term "performance-based contract" has been accompanied by an alternative term, "outcome-based contract", in academic discourse. However, because semantics constitutes only a part of the entire semiotics of the topic, this chapter contributes by systematically reviewing over 80 top-tier journal articles considering the topic from the perspectives of pragmatics and syntax as well.

With regard to the chicken-or-the-egg dilemma, it seems clear that "performance" was the first to emerge in the late 1980s and early 1990s (Selviaridis & Wynstra, 2015). From the syntax perspective, however, simultaneously with the surfacing of the terms "business model" and "innovation", the term "outcome" has started to capture shares in the academic discourse. Furthermore, in terms of pragmatics, the more innovation- and marketing-oriented research outlets

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tend to emphasize the term “outcome”. To summarize the contributions of the current paper, it provides further understanding of the antecedents of the “outcome-based vs. performance-based” debate in the related leading level literature, resulting in a fuller description of the semiotics at play in the recent pro-outcome arguments. Thus, the current chapter contributes to the definition stream of the literature concerning outcome-based contracts (Schaefers et al., 2020).

2 THEORY DEVELOPMENT

The literature to be reviewed was collected following the guidelines for systematic literature reviews (Kohtamäki, Rabetino, & Möller, 2018; Tranfield, Denyer, & Smart, 2003). I began by *defining the keywords* to collect the studies of interest. The choice of keywords was guided by prior literature reviews (Grubic & Jennions, 2018; Hypko et al., 2010b; Selviaridis & Wynstra, 2015) concerning outcome-based business arrangements. Studies were collected from the *Scopus* database using the advanced search function. The search string used was as follows: TITLE-ABS-KEY ("outcome-based contract*" OR "performance-based contract*" OR "outcome business model*" OR "performance-based logistic*" OR "performance contract*") AND (LIMIT-TO (DOCTYPE, "ar")). The query produced 853 hits (in January 2020). To address the requirement of *deciding target journals*, the search results were further refined by limiting them to journals with *Academic Journal Guide 2018 ranking 3, 4 or 4** to guarantee the high quality of the publications. The given ranks indicate highly regarded, top tier and distinguished research quality, respectively (Academic Journal Guide, 2018).

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After application of the second-stage criteria, 81 articles were left. Next, to assess the suitability of the studies, I scrutinized the abstracts of the papers. I excluded studies that focused on employee/manager performance-rewarding contracts (7 in total, e.g., Fehrenbacher, Kaplan, & Pedell, 2017). As a result, 74 studies remained to be reviewed, to which I added 9 articles published/indexed after the initial search (e.g., Huang, Chen, Sun, Zhang, & Yao, 2020; Korkeamäki & Kohtamäki, 2020; Sjödin, Parida, Jovanovic, & Visnjic, 2020) or deemed relevant based the references of the reviewed papers (e.g., Datta & Roy, 2011; Jain, Hasija, & Popescu, 2013; Selviaridis & Van der Valk, 2019; Visnjic, Neely, & Jovanovic, 2018). The outlets and the number of publications are compiled in Table 1. In addition to reviewing the collected literature, I scanned the lists of references of the collected articles for further insights and supplemented these secondary data with conference proceedings, academic book articles and anecdotal evidence (such as industry and working group reports). These insights and data were not included in the following analyses but rather worked as a data triangulation practice grounding the analytical work.

Table 1. OBS publications by journal

Journal	AJG2018	No. Papers
Management Science	4*	6
Operations Research	4*	2
Strategic Management Journal	4*	2
European Journal of Operational Research	4	8
International Journal of Operations and Production Management	4	7
Journal of Product Innovation Management	4	1
Production and Operations Management	4	5
American Journal of Agricultural Economics	3	2
American Review of Public Administration	3	2
Energy Economics	3	2
European Economic Review	3	1
Health Services Research	3	2
Industrial Marketing Management	3	10
International Journal of Production Economics	3	8
International Journal of Production Research	3	7
International Review of Administrative Sciences	3	3
Journal of the Operational Research Society	3	4
Management Accounting Research	3	2
Milbank Quarterly	3	2
Public Management Review	3	4
Technovation	3	1
Journal of Business Research	3	1
Production Planning and Control	3	1
Grand Total		83

2.1 Pragmatics

Pragmatics is concerned with how context and practices influence meanings (Levinson, 1983). Thus, as in the literature review by Selviaridis and Wynstra (2015), the articles reviewed were categorized by the AJG 2018 fields. The fields included in the sample were Innovation (INNOV), Marketing (MKT), General Management, Ethics, Gender and Social Responsibility (ETHICS-CSR-MAN), Public Sector and Health Care (PUB-SEC), Operations and Technology Management

(OPS-TECH), Accounting (ACCOUNT), Operations Research and Management Science (OR-MANSCI), Economics, Econometrics and Statistics (ECON) and Strategy (STRAT). The number of papers by field was INN = 2, MKT = 10, ETHICS-CSR-MAN = 1, PUB-SEC = 13, OPS-TECH = 29, ACCOUNT = 1, OR-MANSCI = 20, ECON = 5 and STRAT = 2. In particular, related research in the OPS-TECH and MKT fields has been published at a growing pace, especially in the latter decade of the century.

To investigate how the academic field influences the frequency of use of the terms "outcome" and "performance", the publications were searched using the find function provided by either the publisher or the browser. The papers were scrutinized one by one, and the search hits in the affiliations, repeated titles, lists of references, acknowledgments and direct quotations were excluded from the count. In other words, "outcome" and "performance" hits were counted only if they belonged to the original body text. The average frequencies of the terms "outcome" and "performance" per paper were used to compare the fields. The resulting chart (Figure 1) shows that "outcome" as a term is endorsed more in the innovation and marketing-oriented fields, while the term "performance" is emphasized in the more technical fields. In alignment with prior literature reviews (see, e.g., Selviaridis and Wynstra, 2015; Grubic and Jennions, 2018), the terms often seem to go hand in hand. Earlier research has also pinpointed that the terms are often used interchangeably (Grubic & Jennions, 2018). What is worth noting is that I conducted the search using the words "outcome" and "performance" per se, not variants including them (e.g., performance-based logistics, outcome business models). This is to create a general overview.

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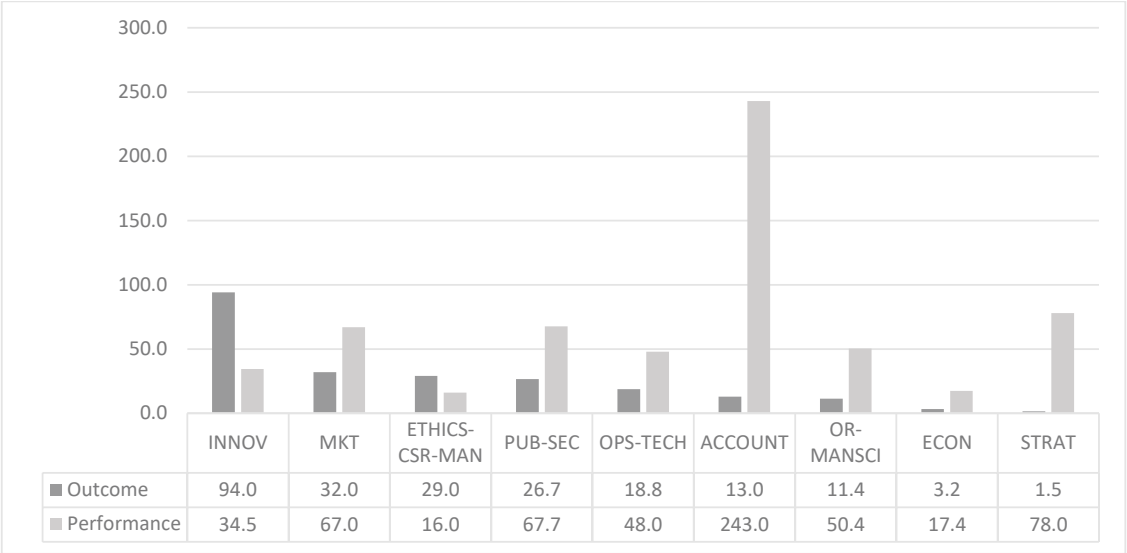


	INNOV	MKT	ETHICS-CSR-MAN	PUB-SEC	OPS-TECH	ACCOUNT	OR-MANSCI	ECON	STRAT
Outcome	94.0	32.0	29.0	26.7	18.8	13.0	11.4	3.2	1.5
Performance	34.5	67.0	16.0	67.7	48.0	243.0	50.4	17.4	78.0

Figure 1. Average frequency (per paper) of "outcome" and "performance" terms by field.

2.2 Syntax

Syntax is a study of relations between expressions in language (Carnie, 2006). To illustrate the balance between the terms "outcome" and "performance", the annual sums of the frequencies were rendered into stacked yearly percentage columns and overlaid with the respective number of publications per year. Figure 2 illustrates two trends in the given literature during the first decades of the twenty-first century (excluding 2004 with no publication data). First, the number of publications per year concerning the topic has rapidly increased in top-tier journals, especially in the latter decade. Second, although the term "performance" has historically been the dominant of the two, there seems to be a trend towards "outcome" capturing shares as an alternative term, especially in the latter decade of the current century.

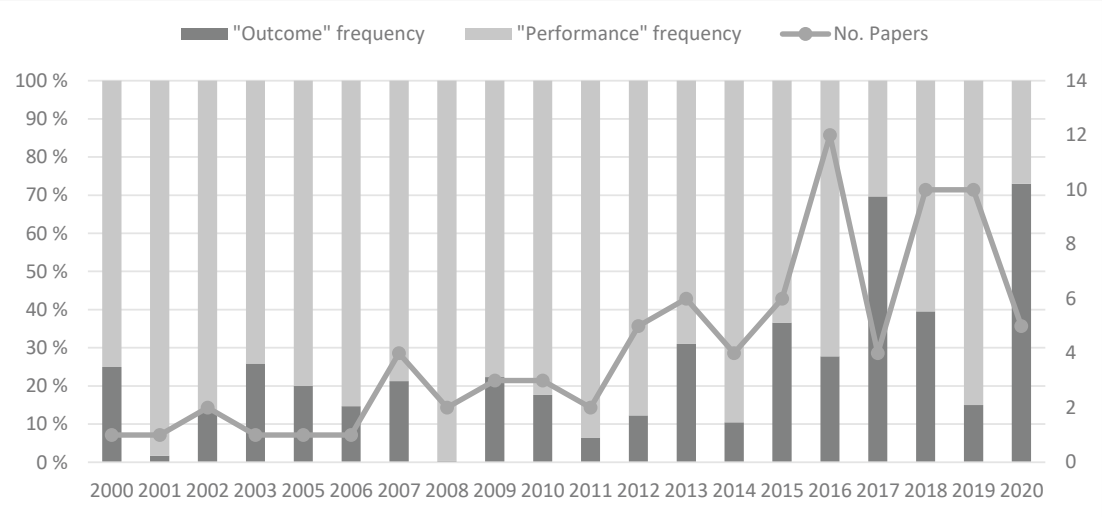
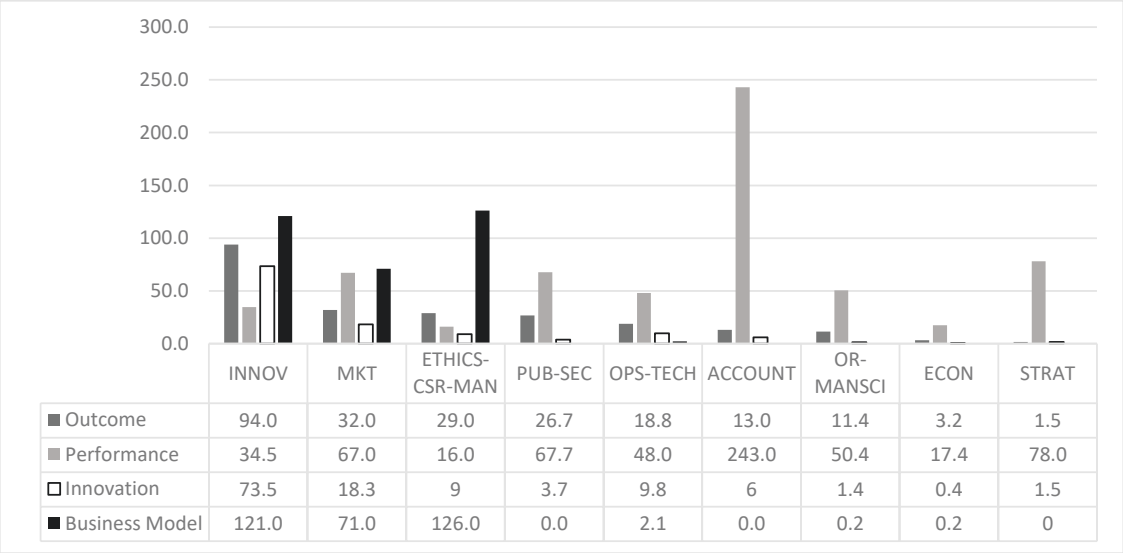


Figure 2. The annual balance between the use of the terms "Outcome" and "Performance".

To retrace antecedents of this shift, I first turned to Google Trends. For instance, Google Trends' index (0-100) on topic popularity shows that from February 2004 to October 2020 (the longest available timeframe), the popularity of the topic "performance-based logistics" peaked at the beginning of the century. On the other hand, the popularity index for the keyword "outcome business model" began generating continuing monthly interest only around the year 2010. Furthermore, referring to the discussions I have shared with fellow scholars, it appears that the term "performance" is preferred in more operational and purchasing-related journals, while innovation- and marketing-related facets endorse "outcomes". Indeed, innovation and marketing scholars use the expression "outcome business model" (Ng, Ding, & Yip, 2013; Sjödin et al., 2020; Visnjic, Jovanovic, Neely, & Engwall, 2017), but rarely is the business model referred to as a "performance business model". To explore these premises, complementary data on the frequency of the terms related to innovation ("innovat" was used to capture alternative endings, such as

"innovative"), and "business model" was collected using the search functions once again. The frequency of each term was again divided by the number of papers in each of the fields to derive the average frequencies. The results are presented in Figure 3, which is essentially a further refined version of Figure 1. Veritably, not only did the use of innovation- and business model-related terms increase over time, but there was also a reason to suspect that syntax-wise, the use of the given terms increased the "outcome" term frequency.



	INNOV	MKT	ETHICS-CSR-MAN	PUB-SEC	OPS-TECH	ACCOUNT	OR-MANSCI	ECON	STRAT
Outcome	94.0	32.0	29.0	26.7	18.8	13.0	11.4	3.2	1.5
Performance	34.5	67.0	16.0	67.7	48.0	243.0	50.4	17.4	78.0
Innovation	73.5	18.3	9	3.7	9.8	6	1.4	0.4	1.5
Business Model	121.0	71.0	126.0	0.0	2.1	0.0	0.2	0.2	0

Figure 3. Average frequency (per paper) of the terms used by field.

To test this hypothesis, a multiple regression analysis was conducted. The analysis started by fitting a simple linear regression with the sum of innovation-related terms (per year) as a predictor of the annual use of the outcome term. The model was significant (prob > F = 0.0013) and produced a positive coefficient for the predictor (p-value = 0.001) and an R^2 of 0.4455 (adjusted R^2 = 0.4146). Next, the annual sum of the term "business model" was added as a predictor. Again, the model was significant (prob > F = 0.0003) and produced positive and significant coefficients for

both regressors. Furthermore, the adjusted R^2 increased to 0.5773. Last, the annual sum of the term "performance" was modeled, and the adjusted R^2 increased to 0.6486 in effect. The normality of the residuals was tested using the skewness/kurtosis test for normality (prob>chi^2 = 0.3304) and the Shapiro-Wilk test (Shapiro & Wilk, 1965) for normality (prob>z = 0.07997). To test whether the model met the assumption of constant variance, a Breusch-Pagan/Cook-Weisberg test (Breusch & Pagan, 1979) for heteroscedasticity (prob>chi^2 = 0.1057) was performed. To inspect influential data points, both DFFITS (Belsley, Kuh, & Welsh, 1980) and Cook's distance (Cook, 1977, 1979) diagnostics were used and plotted. The results showed that 2019 was an outlier in terms of influence. To test the effect of this observation, the model was fitted again without it, and another Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was performed.

The results yielded improvements in the goodness of fit (R^2 = 0.8388 c.f. 0.7041, adj. R^2 = 0.8066 c.f. 0.6486) and indicated that the 2019 observation was a major factor for heteroscedasticity (Breusch-Pagan: prob>chi^2 = 0.8575 c.f. 0.1057). However, as demonstrated in Figure 2, 2019 was among the top three years in terms of published papers. Hence, I chose not to omit it from the analysis and used the model including it with robust standard errors. Thus, the final significant (prob > F = 0.0000) model produced an adjusted R^2 of 0.6486 and positive coefficients for all the predictors (p-values = < 0.05). The results of the analysis are reported in Table 2. For the sake of comparison, using the term "performance" as the dependent variable, the regression results for none of the other terms as predictors were significant (p-value = > 0.05). Although rudimentary, the results of the analysis support the hypothesis that there is a direct positive relationship between the use of business model- and innovation-related terminology and the frequency of the term

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outcome. However, a more detailed analysis should be conducted using dynamic topic modeling (Blei & Lafferty, 2006), for instance.

Table 2. Regression results

"outcome"	Coef.	Robust Std. Error	t	P > | t |	[95% Conf. Interval]	
"business model"	.8273419	.351236	2.36	0.032	.0827548	1.571929
"innovation"	.39374	.1660052	2.37	0.031	.0418248	.7456552
"performance"	.1799559	.0825943	2.18	0.045	.0048639	.3550479
constant	5.957126	15.38481	0.39	0.704	-26.6572	38.57146

2.3 Semantics

Finally, semantics is interested in the meaningful relations between expressions in language (Jackendoff, 1990). Thus, as semantics centers on the meanings attached to terms, it is a vital part of understanding language, which is defined as a tool of expression that reflects and constructs its surroundings (Samra-Fredericks, 2005). The semantic analysis started by looking for the dictionary definitions of the words "performance" and "outcome". The Merriam-Webster definition for "performance" can be understood as "*the fulfillment of a claim, promise, or request*" or as "*the manner in which a mechanism performs*", the latter of which is often an appropriate meaning in manufacturing contexts. An outcome, on the other hand, is defined more univocally as "*something that follows as a result or consequence*" (Merriam-Webster.com). Thus, the word "performance" as a term[1] is considerably more polysemic (Cruse, 2000, pp. 103–124). Moreover,

[1] The distinction between "word" and "term" is that while a word is only component of language, a term is a word that has meaning(s) attached to it.

and importantly, the term "performance" can refer to multiple other things, such as the performance of an actor in a play. This makes "performance" also homonymic (Rice, Beekhuizen, Dubrovsky, Stevenson, & Armstrong, 2019), meaning that despite the identical spelling (or pronunciation), the word carries multiple unrelated meanings. For example, the word "mean" can *mean* unkind or average.

Due to the polysemic nature of the term "performance", I argue that it is necessary to define the scope of its usage in academic discourse. Both arguments presented next are also strongly related to pragmatism. First, the given result-oriented service offerings have been found to be particularly important for capital-intensive (Grubic & Jennions, 2018; Hypko et al., 2010b, 2010a) and complex systems (Essig, Glas, Selviaridis, & Roehrich, 2016; Ng & Nudurupati, 2010) that are driven by life cycle logic (Grubic & Jennions, 2018; Kleemann & Essig, 2013). Thus, the term "performance" as a central signal attached to industrial objects (thus also reflecting pragmatics), such as machines or systems (i.e., extralinguistic objects), should be used to describe *the manner in which a mechanism operates*. For example, Li, Qiu and Wang (2014) investigated 140 energy performance contracts in China, where the providers intended to improve *energy performance* together with their clients. Adapted from Nowicki, Kumar, Steudel and Verma (2008), a step function (Equation 1) representing such revenue functions was formulated accordingly:

$$R(P_i) = \begin{cases} R^f & \text{if } P_i \leq P_{min} \\ R^f + R^v \times (P_i - P_{min}) & \text{if } P_i > P_{min} \end{cases} \quad (1)$$

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where R^f is the fixed part of the revenue function and R^v is the variable part of the revenue that is conditionally tied to the improved performance (P_i) over the agreed minimum performance (P_{min}). In addition to the design in the Equation (1), the variable revenue logic can be designed as an exponential, a polynomial or a step function (Brown & Burke, 2000; Nowicki et al., 2008). The second important argument in favor of separate definitions is legal-technical. In advanced technical systems, such as power plants, manufacturing systems and e-commerce computer systems, the liquidated damages due to downtime are often measured in millions per hour, which is why investments in extensive maintenance efforts usually account for a major share of the total cost of ownership of the system (Öner, Kiesmüller, & Van Houtum, 2015). Following Patra, Kumar, Nowicki and Randall's work (2019), the operational availability (A_o) of a machine can be defined as presented in Equation (2):

$$A_o = \frac{H^{Max} - H^{Sched} - H^{DT}}{H^{Max} - H^{Sched}} \quad (2)$$

where H^{Max} is the maximum operating hours of the machine during a specified timeframe, H^{Sched} is the scheduled maintenance time and H^{DT} is the downtime of the machine during the timeframe (Patra et al., 2019). Alternatively, availability can be based on the sample average of downtimes (Grubic & Jennions, 2018; Kim, Cohen, Netessine, & Veeraraghavan, 2010). These types of contracts have been typified as availability outcome-based contracts (Böhm, Backhaus, Eggert, & Cummins, 2016). However, customers are not only concerned with availability: "*The movement towards a service-based economy has led many manufacturing firms to recognize the strategic importance of after-sales product support services that enable the availability of* ***properly***

functioning products" (Guajardo, Cohen, Kim, & Netessine, 2012, p. 961). Especially concerning machinery-focused OEMs, calculations based on mere equipment availability (measured in, e.g., operating hours) may disregard important performance specifications, according to anecdotal evidence (Klise & Balfour, 2015, p. 25). In a legal sense, the machine/system could be operational and thus considered available, although it would operate in a degraded state (e.g., produce less energy). The conclusion follows that it is in the interest of both the provider and the customer to have separate definitions for performance and availability. Thus, in these types of contracts, the aforementioned mechanical performance is an integrated part of the offering. The underlying subordination argument is as follows: availability is more important than performance because the level of performance has no significance if it is not available. The two, however, have a reciprocal influence. Correspondingly, the level of availability has lower importance if performance decreases.

3 DISCUSSION

3.1 Theoretical contributions

In the current chapter, I briefly synthesized the semiotics of top-tier literature concerning outcome- and performance-based contracts. Thus, this chapter contributes to the debate (Grubic & Jennions, 2018; Hypko et al., 2010b; Schaefers et al., 2020) regarding which term is the more appropriate prefix for describing the given advanced services. By doing so, the current chapter contributes to the definition stream of literature concerning the topic (Schaefers et al., 2020). The pragmatics analysis showed that although the terms "performance" and "outcome" seem to go hand in hand

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and are even used interchangeably (as noted by Grubic & Jennions, 2018, see, e.g., Selviaridis & Wynstra, 2015), the term "outcome" is used more frequently in journals in the fields of innovation, marketing, general management, ethics, gender and social responsibility, and the public sector and health care. Diving deeper into the syntax between the words, it was found that over time, the use of the term "outcome" has increased. Furthermore, given the premises of a higher frequency of "outcome" in the field of innovation and the fact that the related business models seem to be referred to as "outcome business models" rather than "performance business models", further analysis confirmed that both "business model" and "innovation" are directly related to the frequency of "outcome". Last, in support of recent research on the topic (Schaefers et al., 2020), semantic analysis argued that the term/prefix "outcome" should be preferred over "performance" in academic literature discussing the associated contracts because the latter term is more polysemic and homonymic. Linking the argument back to pragmatics, it was found that due to the ambiguity of the term "performance", its use may cause legal technical issues if it is not sufficiently distinguished from outcome-related metrics, such as availability. In conclusion, I argue that "outcome-based" is the more appropriate phrase due to its univocal nature and provide further insights into pragmatics- and syntax-wise antecedents of terminological practices in related high-quality research.

3.2 Managerial contributions

The current chapter offers managers multiple contributions. First, it offers managers some contextualized explanations and causes of the terminological differences present in the top-tier journal papers concerning the topic. This is important, because the variance of the terms used may

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not only confuse the readers, but also cause the readers to give preference to the studies endorsing one term and disregard the theoretical insights in studies using the other. Second, it summarizes current research trends and provides a catalog of the research outlets publishing papers on the topic. Furthermore, managers can rest assured of the high quality of the given facets because they represent the top level of business research regardless of the discipline. Third, although the current chapter is focused on academic discourse, it highlights some important managerial considerations, such as aspects of contract language and basic formulas for revenue functions or outcome metrics.

3.3 Limitations and suggestions for future research

Like all research, the current study also has limitations. First, as the goal of the study was to look into and contribute to the debate on "outcome/performance" terminology specifically, the choice was made to focus on research endorsing the given terms. Alternative and closely related concepts include but are not limited to result-oriented product service systems (Van Ostaeyen, Van Horenbeek, Pintelon, & Duflou, 2013), advanced services (Baines & Lightfoot, Howard, 2014), smart operations and maintenance (Huang et al., 2020) and value-based selling (Töytäri & Rajala, 2015). Thus, future research could examine the semiotics of the wider body of related research as well. Second, despite the evolution in academic discourse, the *in situ* practical names used for the given type of services vary by firm. For instance, Wärtsilä speaks about "lifecycle solutions" (Wärtsilä.com), and Rolls-Royce coins its business models based on flight hours TotalCare® or CorporateCare® (Rolls-Royce.com), while Hilti calls its power tools as-a-service as Fleet Management (Hilti.com). Understandably, the practical terminology used to describe the given type of services is even more scattered and nuanced than the theoretical terminology. Therefore,

Korkeamäki, L. (2021). Further semiotic perspectives on the outcome-based VS performance-based semantic dispute. In M. Kohtamäki, T. Baines, R. Rabetino, A. Z. Bigdeli, C. Kowalkowski, R. Oliva & V. Parida (Eds.) The Palgrave Handbook in servitization. Palgrave Macmillan. *Forthcoming*. Reproduced with permission from Springer Nature.

future research could map the various outcome-based offerings aggregately to spot differences, similarities and patterns and yield more granular typologies to accompany the extant availability/economic outcome-based contract typology (Böhm et al., 2016).

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Worth the risk? The profit impact of outcome-based service offerings for manufacturing firms

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ABSTRACT

Because research on outcome-based service offerings (OBS) is very case study oriented, we lack empirical knowledge of OBS provider profitability in general. Drawing upon an unbalanced panel dataset (n = 1566, N = 14,756), we found that an average OBS provider manufacturer has a 4.40-percentage-point higher gross margin than an average non-OBS manufacturer. In addition, we found that large OBS providers generate lower profits. Since OBS offerings are complex and highly customized, scaling them is a challenge that requires investments in digital technologies and solution modularity. Thus, we tested the moderating role of R&D investments on the scale-profitability relationship and found that for OBS firms, R&D investments moderate the negative relationship between scale and profitability. For managers, these results highlight the profit potential of OBS but also that large OBS providers in particular must be prepared to invest in digital servitization to ensure profitability.

1. Introduction

Many original equipment manufacturers (OEMs) have turned to outcome-based service offerings (OBS; Sjödin et al., 2020) in which providers are paid based on the outcome of activities rather than the time and resources used to conduct those activities (Ng et al., 2013). In the contracting type based on time and materials, manufacturers have no contractual incentives to decrease the demand for spare parts and repair activities (Ng et al., 2013). In OBS offerings, however, the logic is reversed because the provider assumes a role that bears close resemblance to that of the customer. For example, the inputs and service activities the provider previously deemed as their profit drivers will now have to be considered costs (Sjödin et al., 2020, p. 159), as higher customer gains will entail higher provider gains (Sumo et al., 2016). The contracts involved in OBS offerings are inherently complex (Hou & Neely, 2018) and include features such as liquidated damages (Korkeamäki & Kohtamäki, 2020), performance targets/bands (Mouzas, 2016; Nowicki et al., 2008), and review period specifications (Tan et al., 2017).

However, the increased accountability also enables the provider to optimize its outcome production processes to yield marginal gains (Visnjic et al., 2017). Additionally, the customer may offer the provider additional incentives to seek improvements in, for example, energy savings (Li et al., 2014) or carbon emission reductions (Selviaridis & Spring, 2018). Subsequently, the underlying profit generation logic of OBS offerings for providers is to sustainably operate and maintain the systems offered (Ng & Nudurupati, 2010, p. 670) and thus extend the useful lifecycle of equipment (Tan & Yavuz, 2015). The OBS literature has therefore focused on ways in which OBS can be delivered successfully and profitably. The given studies have shed light on, for instance, incentive management (Kim et al., 2010; Selviaridis & Van der Valk, 2019; Sjödin et al., 2020), network management (Kleemann & Essig, 2013), system/component reliability considerations (Bakshi et al., 2015; Guajardo et al., 2012) and inventory-related factors (Liang & Atkins, 2013; Tan et al., 2017) in OBS offerings. However, given the case- and scenario-specificity of these inquiries, we still lack broader empirical knowledge on OBS firm profitability in general.

Prior servitization research, from which the OBS literature stems (Batista et al., 2017), suggests that larger manufacturers especially struggle to yield service returns (Neely, 2009). OBS offerings, as a specific case of servitization, may also be difficult to scale up due to their complex and highly customized nature (Kohtamäki et al., 2019). For example, manufacturing firms often limit offering OBS to pilot projects with key account customers. Hence, there is a need to test whether large

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OBS providers (and not just servitizing manufacturers in general) also face difficulties in generating profits through services. At the same time, studies suggest that OBS offerings are more likely to be successful when providers have a strong investment climate (Randall et al., 2011; Schaefers et al., 2020) and that the long-term nature of OBS offerings both encourages and compels providers to actively invest in digital servitization technologies (Kohtamäki et al., 2019; Visnjic et al., 2017). For instance, to be able to effectively deliver outcomes, providers need not only monitoring technologies (Grubic & Jennions, 2018a) but also resources that enable preventive actions (Öhman et al., 2015). Furthermore, digitalization may also enable new forms of service innovations, such as modular solution designs (Cenamor et al., 2015; Rajala et al., 2019). Arguably, these considerations should theoretically decrease the tradeoff between offering complex/customized solutions and scale advantages (Salonen et al., 2018). Therefore, to advance the understanding of the profit impact of OBS offerings for manufacturing firms, there is a clear need to assess the role of R&D investments.

To address the gaps outline above, we conducted a longitudinal panel data analysis in two stages. First, we compared OBS provider firms to non-OBS provider firms among manufacturers in the machinery and equipment industry segment and found that there is indeed a linear relationship between OBS offerings and firm profitability. The results highlight the linear profit potential of OBS beyond case-specific and scenario-based studies, thus adding to the external validity of those studies. The results are also in contrast to the findings of studies suggesting that the path to profits through services is at least nonlinear (Kohtamäki et al., 2013; Visnjic Kastalli & Van Looy, 2013). In terms of the OBS literature, the results of the first-stage analysis specifically contribute to the OBS consequences stream of literature (Schaefers et al., 2020). More generally, the given contribution is positioned in the literature on the financial consequences of servitization (Eggert et al., 2011; 2014; Kohtamäki et al., 2015; Neely, 2009) and on advanced services (Baines & Lightfoot, 2014; Story et al., 2017; Ziaee Bigdeli et al., 2018).

Second, to fill in the gap related to the relationship between OBS firm size (scale) and profitability, we conducted another panel data analysis on a subset of our data containing only OBS firms. In alignment with earlier servitization research (Neely, 2009), we found that large OBS providers in particular face challenges in achieving profits. To address the gap related to the role of R&D investments for OBS providers, we subsequently tested a moderation effect. The findings revealed that R&D investments of OBS provider firms moderate the negative relationship between scale and profitability. Although the findings of the second-stage analysis also pertain to OBS profitability, its main contributions are related to the OBS requirements stream of literature (Schaefers et al., 2020). We argue that digital servitization technologies and digitally enabled service innovations are paramount for coping with the scale-induced issues of OBS. Therefore, our second-stage analyses also contribute to the digital servitization literature (Coreynen et al., 2017b; Kamalaldin et al., 2020; Kohtamäki et al., 2020b). For managers, we empirically elaborate the profit potential of OBS offerings, emphasize the need for caution on scale-induced issues and highlight the importance of R&D investments in digital technologies and modular solution development.

2. Theoretical background

2.1. Profit potential of outcome-based service offerings

After-sales services such as OBS offerings contain significant profit potential for manufacturers (Kim et al., 2007). In brief, OBS offerings are defined as a service business model (Ng et al., 2013) in which at least a part of provider payment (Selviaridis & Wynstra, 2015) is dictated by functional results (Grubic & Jennions, 2018b). Typically, OBS is positioned in the servitization (Baines et al., 2017; Rabetino et al., 2018; Raddats et al., 2019) and digital servitization literatures (Kohtamäki et al., 2019; Paiola & Gebauer, 2020; Parida et al., 2019). Following Schaefers et al. (2020), we prefer the prefix 'outcome' because 'performance' is a more ambiguous term that varies by use context (e.g., engine performance or performing an act). Examples of OBS offerings include Rolls-Royce's Power by the Hour and Total Care packages, through which the company sells flying hours of jet engines (Grubic & Jennions, 2018b; Ng et al., 2012), and Caterpillar's offering of guaranteed availability and cost per operating hour of their products, such as mining equipment (Visnjic et al., 2017).

In traditional services based on time and materials (Roels et al., 2010), in which the industrial customer pays after the agreed activities are performed, there are no contractual incentives for the provider to keep the systems operating and maintained in a sustainable way since breakdowns actually feed into the profitable spare parts and repair business (Ng et al., 2013, p. 733). In the OBS relationship, the business models of the provider and the customer become closely intertwined (Visnjic et al., 2018). That is, higher customer gains will entail higher provider gains—a premise that will induce the provider to engage in activities that improve efficiency (Sumo et al., 2016, p. 1486). For example, as the majority of the total cost of ownership (TCO) of related PSS constitutes operations, maintenance and disposal-related costs (Kim et al., 2017), it is in the interest of the provider to cut the consumption of resources needed for outcome delivery to yield service returns. Accordingly, a specific branch of the OBS literature has focused on factors to minimize OBS providers' costs (or, alternatively, maximize profits; Patra et al., 2019, p. 370). For instance, since equipment/system reliability will affect the contractually penalized downtimes and/or output shortcomings (Mirzahosseinian & Piplani, 2011; Patra et al., 2019), optimizing reliability is of prime financial importance for OBS providers (Jin & Tian, 2012; Jin & Wang, 2012; Öner et al., 2015). Extant provider profit-centric models provide valuable operational frameworks that have often been validated through case or scenario applications (e.g., Patra et al., 2019; Jin & Tian, 2012; Brown & Burke, 2000; Huang, Liu, Parker, Tan, & Xu, 2019). In addition, beyond the agreed outcome guarantees, the OBS customer often incentivizes the provider to pursue energy savings, the gains of which are then shared (Li et al., 2014; Tan & Yavuz, 2015). Given the aforementioned case-specific evidence and extant knowledge, we propose Hypothesis 1:

H1. OBS offerings have a direct positive impact on manufacturing firm profitability.

2.2. Challenges of outcome-based service offerings

Prior research on servitization has found that large manufacturers in particular struggle to yield service returns (Neely, 2009). Among many plausible reasons for this result, the diseconomies of scale theory may offer one explanation. In the given theory, when the scale in terms of organizational size and/or output increases, management problems such as complexity (Waddock et al., 2015), increased transaction costs (Riordan & Williamson, 1985) and bureaucracy (Child, 1973) emerge. This arguably especially true in the case of OBS, since such advanced services are endemically plagued with complexity (Hou & Neely, 2018; Schroeder et al., 2020). For example, as successful outcome delivery often depends on the activities of external parties such as suppliers (Kleemann & Essig, 2013), the provider must also manage these upstream third-party risks. Furthermore, industrial OBS are often highly customized to suit the idiosyncratic and complicated needs of customers (Kohtamäki et al., 2019). In other words, the same OBS offering may not meet the requirements of all customers and market areas. This is in contrast to equipment sales, where standardized products are marketed and manufacturing larger quantities may result in lower unit costs. Interrelatedly, literature has found that servitizing manufacturers struggle to cope with the paradoxical pressure of maintaining manufacturing efficiency while pursuing growth through the delivery of increasingly customized services (Kohtamäki et al., 2020a).

Accordingly, we hypothesize that larger OBS providers will be less profitable:

H2. Scale has a direct negative impact on OBS provider firms' profitability.

On the other hand, studies propose that OBS offerings are more likely to be effective when providers have a strong investment culture (Randall et al., 2011; Schaefers et al., 2020). In the context of OBS, investment culture has been defined as "*the inclination of the organization to invest in reliability or process improvements*" (Randall et al., 2011, p. 331), which reflects process innovation and improving existing processes. The long-term contract periods (Brax & Visintin, 2017; Öhman et al., 2015) associated with the business model at hand seem to encourage the providers themselves to commit to continuous investments: "*Caterpillar, for instance, uses long-haul security to invest in prognostic and diagnostic technologies because the data it collects through remote monitoring allows it to optimize production in its customer operations and thereby to create value*" (Visnjic et al., 2017, p. 172). For instance, innovations such as reliability signaling (Bakshi et al., 2015) and adaptive preventive maintenance (Öhman et al., 2015) not only collect valuable data to preempt the occurrence of financially penalized downtimes but also enable flexibility in terms of manufacturing systems and supply chain adaptivity (Jin & Tian, 2012). Thus, technologies such as those above may help deal with increased complexity. Moreover, studies have found that service providers may benefit from developing a modular solution design since service modules are more configurable (Cenamor et al., 2015), thus lowering the scaling barrier of customer-specific customization. These digitally enabled examples arguably entail dedicated investments in R&D activities but have the potential to reduce the tradeoff between high customization and scale advantages (Cenamor et al., 2015; Coreynen et al., 2017a; Salonen et al., 2018). Consequently, we propose Hypothesis 3:

H3. OBS provider firms' R&D investments have a moderating effect on the relationship between scale and profitability.

3. Methodology

3.1. Sample

Data on the manufacturers of machinery and equipment (NACE Rev. 2: 2800–2899) came from Bureau Van Dijk's Orbis database. The Orbis database contains information on 375 million companies, out which 40 million report detailed financial information (Bureau Van Dijk, 2020). The sampling timeframe was the ten most recent available years (relative, latest available year varied from 2016 to 2019). Two rounds of sampling were conducted: the first to obtain a sample of the firms that state they are offering OBS and the second to obtain a referent group of firms not offering OBS. The search steps for the first round of sampling were as follows. First, the sample was limited to firms that had NACE Rev. 2 classification 28 (manufacture of machinery and equipment) as their primary industry code and had consistent profitability reporting. Last, using the activity text search function provided by the database, the first sample was limited to manufacturing firms using OBS-related terminology in their main activities, primary business lines, products and services, secondary activities, secondary business lines or strategy, organization and planning descriptions. The choice of terms was guided by extant research, as demonstrated in Table 1.

The second round of sampling followed the same procedure (industry code, consistent profitability reporting) except for the OBS keyword search step. To ensure objectivity in reference group sampling, the "Generate a random sample" function was used to generate a non-OBS sample. Subsequently, to ensure that the second export did not contain OBS companies, duplicates with regard to the first export were removed. The firms in the two exports were labeled 1 (OBS firms) and 0 (non-OBS firms), and the lists were combined into one file and converted from a wide format to longitudinal format. In total, the panel data used in the alternative estimations contained 1674 companies, among which 810 were OBS firms (N = 7637) and 864 were non-OBS firms (N = 7858). The autocorrelation specification used for the primary estimation, on the other hand, caused an omission of 108 groups and 739 observations due to existing gaps in the given panels' time series. Out of the remaining 1566 (N = 14,756) groups included in the PA model, 777 were OBS firms (N = 7433) and 789 were non-OBS firms (N = 7323). An approximately even split between the comparison groups of interest can be deemed desirable in comparative research settings such as the current one.

Table 1
OBS-related terminology used in sampling.

Terms	Examples in the literature
"power by the hour"	*"Thus, '**power by the hour**' is not only a product and service contract bundle…"* (Visnjic et al., 2018p. 47) *"The literature **on pay-for-performance** contracting is mainly underpinned by agency theory…"* (Selviaridis & Spring, 2018p. 733)
"pay for performance"	*"In contrast, **pay-for-performance** induces the supplier to behave in the interest of the buyer and to engage in activities that improve performance, as the increased net profits will (partly) accrue to the supplier."* (Sumo et al., 2016p. 1486)
"service-level agreement"	*"In operations management, **service level agreements (SLAs)** are widely used to evaluate and manage supplier performance in long-term business relationships."* (Alamri, Abbasi, Minas, & Zeephongsekul, 2018p. 142) *"**Service level agreements (SLAs)** are widely adopted performance-based contracts in operations management practice…"* (Tan et al., 2017p. 1971)
"as-a-service"	*"…offering energy-saving technologies **as a service** is a win–win–win situation for the service provider, its customer and for the environment."* (Tan & Yavus, 2015p. 7119) *"Besides software companies, manufacturers also move towards "**as-a-Service**" business models. They are able to draw on insights from the **SaaS** transformation. Yet, manufacturing companies generally cope with a more complex environment, which is likely to influence the path towards **XaaS**."* (Classen, Blum, Osterrieder, & Friedli, 2019p. 62)
"operational availability"	*"The outcome in general can be defined by several, individually determined, dimensions, for example, **operational availability**…"* (Glas, Henne, & Essig, 2018p. 2074) *"While there are many potential PBL metrics, **availability** is central to any PBC. The U.K.'s Ministry of Defence (MOD) uses '**operational availability**' as a metric in its PBL procurement contracts…"* (Patra et al., 2019p. 370)
"business interruption insurance"	*"Besides designing better contracting mechanisms, operators have sought other means of mitigating the risk arising from operational failures. In practice, **business interruption (BI) insurance** represents an increasingly important tool to cover tangible income losses…"* (Qin, Shao, & Jiang, 2020p. 177)
"operations and maintenance"	*"To achieve the high demand of smart manufacturing in terms of high productivity with near-zero downtime, many manufacturers introduce the smart **O&M services** to extended their **operations** forward by micro-vertical integration with the help of emerging technologies, to undertake a range of activities such as condition monitoring, maintenance, repair, overhaul and management of their own products on behalf of their customers."* (Huang, Chen, Sun, Zhang, & Yao, 2020 pp. 1271–1272)
"operating services"	*"Managed service solutions* **[operating services]** *are output- or outcome-based solutions in which the customer owns the system. Some studies indicate that the systems can be produced in collaboration with third parties or completely sourced from them. The **provider operates** the system and is responsible for the systems functionality."* (Brax & Visintin, 2017p. 28)

3.2. Measurement

The gross margin is used as the dependent variable because it represents the amount of profit made after subtracting the cost of goods sold (COGS), therefore measuring how efficiently a firm manages the resources that directly contribute to the production of goods and services (Bhimani et al., 2015). Because gross margins should be compared among similar businesses, we not only focused on the NACE Rev. 2 industry code 28 (manufacture of machinery and equipment) firms but also controlled for the differences between the 26 subcodes from 2800 to 2899. Furthermore, to control for the other firm characteristics, scale (turnover), country of origin (51 for the primary estimation, 53 in total, country IDs ranging alphabetically from Arab Emirates to South Africa) and overall profitability (profit margin percent) were introduced as control variables. To account for the time-series structure of the data, a natural logarithmic transformation was applied for the dichotomous variables of scale and R&D investments. Because R&D investments rarely pay off during the same accounting period, the R&D investment variable was lagged by one year. The panel summary is presented in the Table 2.

Although we use a PA model, which accommodates correlated data by using a working correlation specification (Liang & Zeger, 1986), we will discuss correlation next. As the pairwise correlation matrix does not account for the panel structure of the data, it disregards the fact that repeated observations within firms are likely to be correlated. Furthermore, it does not correspond to the working correlation specified by the PA model. Thus, we do not present correlation matrices. In the first-stage analysis, most of the independent variables used were uncorrelated with each other. Only the OBS dummy and scale were moderately correlated (0.4709), and country and scale were weakly correlated (−0.3557). Because the Woolridge test for autocorrelation (Drukker, 2003; Wooldridge, 2002) indicated the presence of autocorrelation, the working correlation used in the first-stage analysis was autoregressive. In the second-stage analysis, none of the control variables were correlated with each other or with the independent variables. Instead, expectedly, the main effects (scale-R&D investments: 0.8381) and their interaction (scale-interaction: 0.9395, R&D investments-interaction: 0.9690) were highly correlated. This is logical for two main reasons discussed below.

First, as both main effects were discrete variables and measured on the same scale (log transformed), one can reasonably expect companies with lower turnover (scale) to not realistically invest as much in R&D (in actual currency) as their larger peers. This is in line with prior studies referencing the Schumpeterian argument of a positive correlation/relationship between firm size and R&D investments (e.g., Fisher & Temin, 1973; Morbey, 1988; Shefer & Frenkel, 2005). Third, it is natural for constitutive terms to be highly correlated with their product, that is, the interaction term (Friedrich, 1982). As long as the confidence intervals remain small enough to generate significant p-values, multicollinearity (or micronumerosity; Goldberger (1991)) has no adverse effects, as it practically violates none of the assumptions of the multiple linear regression (Wooldridge, 2012).

Because research on interaction methods states that to avoid omitted variable bias, one should include not only the interaction but also the terms that constitute the interaction (Brambor, Clark, & Golder, 2005; Greene, 2003), we further specified the model used in the second-stage analysis to account for the correlation structure rather than omitting the variables. Subsequently, we specified in the model that observations are clustered within firms and constrained the PA model with an exchangeable correlation structure (Wang & Carey, 2003). The resulting working correlation (Liang & Zeger, 1986) estimated by the model was 0.8289. Given the statistically significant results and reasonable standard errors presented in Section 4.2, our model successfully isolates the studied effect with the specifications used. Conclusively and in accordance with the above arguments, we do not report the correlation matrices, as they would mislead interpretations by disregarding the panel data structure and because they do not accurately correspond to the model specifications.

3.3. Research approach

Due to the panel structure of the data, three panel data models were used to estimate the gross margin impact of OBS offerings. The statistical

Table 2
Panel summary.

Variable		Mean	Std. Dev.	Min	Max	Observations	
ID	overall	2101.468	1512.082	1	4244	N =	14,756
	between		1506.387	1	4244	n =	1566
	within		0	2101.468	2101.468	T-bar =	9.42273
Year	overall	5.485904	2.873995	1	10	N =	14,756
	between		0.9165155	1.5	9.5	n =	1566
	within		2.824843	0.985904	9.985904	T-bar =	9.42273
Gross Margin	overall	28.54112	17.76427	−85.714	100	N =	14,756
	between		17.7674	−26.47333	100	n =	1566
	within		8.7447	−84.07628	106.163	T-bar =	9.42273
Profit Margin	overall	4.929819	13.18156	−99.201	100	N =	14,756
	between		8.612338	−61.025	41.9285	n =	1566
	within		10.18433	−93.02408	111.2202	T-bar =	9.42273
Scale	overall	16.83568	2.600811	7.113107	25.73101	N =	14,756
	between		2.570632	9.107584	25.48803	n =	1566
	within		0.4559938	12.62773	20.54561	T-bar =	9.42273
OBS Firm	overall	0.5037273	0.500003	0	1	N =	14,756
	between		0.500145	0	1	n =	1566
	within		0	0.5037273	0.5037273	T-bar =	9.42273
NACE Rev2	overall	2856.567	36.95788	2800	2899	N =	14,756
	between		36.95054	2800	2899	n =	1566
	within		0	2856.567	2856.567	T-bar =	9.42273
Country	overall	35.63811	16.57763	1	60	N =	14,756
	between		16.42452	1	60	n =	1566
	within		0	35.63811	35.63811	T-bar =	9.42273
OBS providers only R&D	overall	15.22281	2.402924	5.83703	22.88819	N =	2250
	between		2.586982	5.83703	22.52599	n =	336
	within		0.5522211	11.37089	17.96032	T-bar =	6.69643

software used was Stata (16) by Stata Corporation. The current research constitutes two stages of analysis: the first-stage analysis compares OBS provider firms to non-OBS firms, while the second-stage analysis tests the effects of scale on profitability for only OBS provider firms and the hypothesized moderation effect of R&D investments on the aforementioned relationship. The first model fitted in the first-stage analysis was a pooled ordinary least squares (POLS; Wooldridge, 2002, p. 150) model that does not take the panel structure into account and treats all 15,495 observations as unique. The panel data models accounting for the within- and between-firm variation and the time variation were the random effects model (RE; Wooldridge, 2002, p. 257) and the semi-parametric population-averaged model (PA; Liang & Zeger, 1986; Zeger et al., 1988). The PA model was also used for the second-stage analysis considering a subset of data consisting of only OBS provider firms that reported investments in R&D. In addition, multiplicative interaction including all constitutive terms (i.e., each of the elements that constitute the interaction term; Brambor et al., 2005, p. 66) was used to further specify the second-stage model. Next, the statistical methods and choices applied in the first-stage analysis are presented in detail, followed by the subsequent presentation of the statistical methods and choices applied in the second-stage analysis.

3.3.1. First-stage analysis

To assist in deciding between the POLS and RE, a Breusch-Pagan Lagrangian multiplier test (Breusch & Pagan, 1980) was performed. Based on the significant (p-value = 0.0000) results, the null hypothesis (i.e., no variance across entities) was rejected, and the conclusion follows that RE should be preferred over the POLS. The RE was fitted using three different estimators: the between estimator (BE; Wooldridge, 2002, p. 269), the maximum likelihood estimator (MLE; Wooldridge, 2002, p. 385) and the generalized least squares (GLS; Wooldridge, 2002, p. 257) estimator. The BE uses the cross-sectional data and time averages to produce estimates (Cameron & Trivedi, 2009, p. 251). Bootstrap standard errors (Freedman, 1981) were used for the BE. The MLE, on the other hand, aims not to minimize the least squares but rather to maximize likelihood (Myung, 2003). Observed information matrix (OIM) standard errors were used for MLE, as they are the standard for likelihood-based estimators (Gould et al., 2010). For the GLS estimator, which is the generalization of the ordinary least squares estimator (Kmenta, 1986), clustered standard errors (Liang & Zeger, 1986) were used to adjust for the observations' correlation within firms. To test for the RE assumption of no correlation between the regressor and the unobserved heterogeneity and individual errors, a Hausman specification test (Hausman, 1978) was conducted. In addition, the presence of autocorrelation was tested using a Woolridge test for autocorrelation (Drukker, 2003; Wooldridge, 2002).

In contrast to cluster-specific methods, the PA model is a marginal method and therefore models marginal expectations (Diggle et al., 2002; Ghisletta & Spini, 2004; Zeger et al., 1988). In the first-stage analysis of the current longitudinal study, PA is best understood as a comparison between an average OBS firm and an average non-OBS firm. In contrast, RE, which fully specifies the population distribution (Wooldridge, 2002), compares changes in the dependent variable for a firm offering OBS to the same company if it did not offer them. The PA model was also fitted using clustered standard errors (Liang & Zeger, 1986) and autoregressive specifications (Ballinger, 2004; Diggle et al., 2002) to account for clustering on IDs and the unbalanced panel. Generalized estimating equations (such as the PA) are highly popular in disciplines such as medicine (see, e.g., Gülcan et al., 2016; Hu et al., 1998; Young et al., 2007) and have gained interest in the social sciences (see, e.g., Muth et al., 2016; Park & Pugh, 2018; Yan et al., 2013). This is especially due to PA's ability to accommodate correlated panel data (Ghisletta & Spini, 2004). RE models, in contrast, assume that the independent variables are uncorrelated with unobserved heterogeneity and idiosyncratic errors (Joshi & Wooldridge, 2019). To test whether this assumption holds, a Hausman specification test was conducted for the RE. Because the results were significant (p = 0.0000), it was concluded that the regressors are indeed endogenous, making the RE model inconsistent. Thus, the PA model is used as the primary estimation method.

3.3.2. Second-stage analysis

Because extant research has found that larger manufacturers in particular struggle to yield higher service returns (Neely, 2009), the second-stage analysis focused on testing negative effects of scale for a subset of OBS providers (n = 336, N = 2250). Furthermore, prior studies claim that OBS are more likely to be successful when providers have a strong investment climate (Randall et al., 2011; Schaefers et al., 2020). Indeed, digital technologies are not only a critical prerequisite for offering OBS (Grubic, 2018; Öhman et al., 2015, p. 457), but the associated long-termism in OBS has been shown to encourage providers to invest in prognostic and diagnostic technology (Visnjic et al., 2017, p. 172). Thus, the second-stage analysis of this study uses the PA model with clustered standard errors (Liang & Zeger, 1986) and an exchangeable correlation structure to marginally test the moderating effect of R&D investments of OBS providers on the relationship between scale and gross margins. The moderator variable was R&D investments, lagged one year and log transformed (natural logarithm). Not only was the interaction term (R&D investments * scale) included in the model but also both the independent variable (scale) and the moderator variable (R&D investments) were included to avoid omitted variable bias (Brambor et al., 2005; Greene, 2003). To visualize the results, a spotlight analysis (Aiken & West, 1991) was conducted to estimate the slope of scale using three values of R&D investments. The three values used for R&D investments were at one standard deviation above the mean, at the mean level and one standard deviation below the mean (Aiken & West, 1991). First, the average marginal effects of the three levels of R&D investments on the scale-profitability relationship were computed and plotted. Furthermore, we plotted the interaction between the variables at approximately min and max value of scale using the same above-mentioned values of R&D investments.

4. Findings

4.1. OBS offerings' impact on provider gross margins

Regardless of the models and estimators used, they all have the power to reject H0, which states that there is no direct relationship between OBS offerings and manufacturing firms' gross margins. Indeed, significant evidence was found from all the fitted models to confirm H1, which predicted a direct positive relationship between manufacturing firms' OBS offerings and their gross margin. The primary estimation method, that is, the population averaged model (PA) with the autoregressive specification, estimated that an average manufacturing firm offering OBS has a gross margin that is approximately 4.400481 (p = 0.000) percentage points higher than that of an average manufacturing firm not offering OBS. The alternative panel-specific (RE GLS and MLE), semiparametric (BE) and pooled (POLS) estimators also found significant (p = 0.000) concurring evidence supporting H1, with coefficients ranging from 2.328788 to 4.448881 for the gross margin percentage points, as displayed in Table 3.

In terms of the control variables, profit margin and scale were very significant (p = 0.000) across all the models and estimators. As expected, the general profitability (profit margin) regressor produced a positive coefficient (PA: 0.398792 and the rest between 0.4254773 and 0.457434). The results for scale (log turnover), on the other hand, showed a negative relationship with regard to the dependent variable (PA: −2.404381 and the rest between −1.144911 and −2.728127). Among the country-specific factor variables, only five were statistically insignificant (p = > 0.05) throughout all the estimators. The 26 industry codes (NACE Rev 2. 2800–2899) were all statistically significant (p = < 0.05) in the POLS model, whereas eight codes were insignificant in all of the remaining estimators (2820, 2821, 2822, 2830, 2840, 2849, 2892,

Table 3
First-stage regression results.

Gross Margin	Primary estimation	Alternative estimation methods			
	Model 1	Model 2			Model 3
	PA	RE GLS	RE MLE	BE	POLS
Profit Margin	0.398792***	0.425579***	0.4254773***	0.457434***	0.4458642***
	(0.0233084)	(0.0201843)	(0.0066615)	(0.0444622)	(0.016946)
Scale	−2.404381***	−2.728127***	−2.716501***	−1.144911***	−1.298483***
	(0.2520561)	(0.2622871)	(0.1204628)	(0.3257708)	(0.0838269)
OBS Provider	**4.400481****	**4.448881****	**4.434844****	**2.328788****	**2.697451****
		(0.7780315)			
Yes	(0.7646302)		(0.7722238)	(0.1692739)	(0.2717953)
Constant	66.47135***	73.59333***	73.40207***	44.78469***	53.5101***
	(10.01568)	(11.23483)	(16.17227)	(1.954988)	(3.770813)
Country dummies included?	Yes	Yes	Yes	Yes	Yes
Industry dummies included?	Yes	Yes	Yes	Yes	Yes
10 Year dummies included?	No	No	No	No	Yes
n	1566	1674	1674	1674	15,495
N	14,756	15,495	15,495	15,495	15,495
n for OBS/non-OBS	777/789	810/864	810/864	810/864	7637/7858
N for OBS/non-OBS	7433/7323	7637/7858	7637/7858	7637/7858	7637/7858
SE Robustness	Clustered	Clustered	OIM	Bootstrap	Robust
Rho	N/A	0.69740473	0.6931902	N/A	N/A
R-squared					
within	N/A	0.2276	N/A	0.2120	N/A
between	N/A	0.4830	N/A	0.5038	N/A
overall	N/A	0.3209	N/A	0.3372	0.3404

Standard errors are reported in parentheses.
*, **, and *** indicate significance at 95%, 99%, and 99.9%, respectively.
Results for the 53(51) country dummies and the 26 NACE Rev 2. industry dummies can be provided upon request.

2895). The constant term was very significant (p = 0.000) in all of the models.

With regard to the goodness-of-fit of the models, both Rho and the within, between and overall R^2 can be used. It is worth mentioning that the PA is missing Rho and R^2 because no generally accepted, absolute goodness-of-fit tests exist for marginal models as of yet (for alternatives for binary responses, see, e.g., Barnhart & Williamson, 1998; Horton et al., 1999). The coefficients of the MLE estimator of the RE model, on the other hand, aim to maximize likelihood rather than minimize variance (Myung, 2003). Ergo, the normal take on goodness-of-fit will not apply. For the RE GLS, BE and POLS, however, the value can be inspected. Not surprisingly, the between estimator's R^2 between is higher than that of the RE GLS (0.5038 VS 0.4830), whereas RE GLS outperforms BE in terms of the R^2 within (0.2276 VS 0.2120). Out of the two, BE has a slightly higher overall R^2 (0.3372 VS 0.3209). Should one wish to estimate only the between effects, the between estimator could be used. Interestingly, the POLS model has the highest overall R^2 (0.3404). As already discussed above, in terms of explaining the random effects, the GLS performs slightly better than the MLE (Rho = 0.69740473 VS 0.6931902) and should thus be preferred if one wishes to explain random effects. Should one wish to do so, however, they would have to consider ways to specify the autoregressive structure to account for the detected autocorrelation. Furthermore, because the RE model's assumption that the independent variables are uncorrelated with the unobserved heterogeneity and the idiosyncratic errors (Joshi & Wooldridge, 2019) was violated, the results of the PA model that relaxes this assumption and accommodates correlated data should be preferred as the primary estimation.

4.2. The moderating effect of R&D investments on the scale-profitability relationship

The second-stage analysis provided significant supporting evidence for H2, which posited that there is a direct negative relationship between scale and OBS provider profitability. The subset of data used in the second-stage analysis consisted of 336 OBS providers (N = 2250). As hypothesized, Model 1 (PA), with only the main effects and the controls, produced a positive coefficient for R&D investments (p = 0.032) and a negative coefficient for scale (p = 0.000). The profit margin control was very significant (p = 0.000) and positive. Among the country factors, 18 out of 30 were significant (p = < 0.05), while out of the 22 industry codes, only 6 were significant (p = < 0.05). The constant term was very significant (p = 0.000). H3 predicted that OBS providers' R&D

Table 4
Second-stage regression results.

Dependent Variable Gross Margin	Model 1 PA	Model 2 PA with interaction
Main effects		
R&D Investments	0.5876318*	−5.15264**
	(0.2685678)	(1.934328)
Scale	−2.521434***	−7.575396***
	(0.5527884)	(1.846112)
Moderation effect		
R&D Investments * Scale		**0.3099916****
		(0.104654)
Controls		
Profit Margin	0.3033425***	0.3037369***
	(0.0404368)	(0.0401513)
Country	Provided upon request	Provided upon request
Industry	Provided upon request	Provided upon request
Constant	77.7913***	181.7021***
	(9.556101)	(33.93073)
SE Robustness	Clustered	Clustered
n =	336	336
N =	2,250	2,250

Standard errors are reported in parentheses.
*, **, and *** indicate significance at 95%, 99%, and 99.9%, respectively.

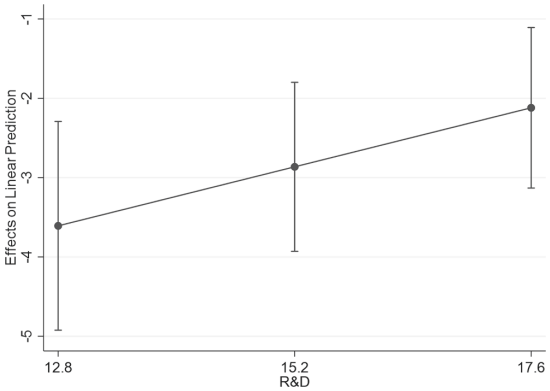

Fig. 1. Average marginal effects of scale * R&D investments (95% confidence intervals).

investments moderate the relationship between scale and OBS provider profitability. Model 2, that is, PA with the continuous interaction term, produced statistically significant ($\beta = 0.3099916$, $p = 0.003$) evidence of the moderation effect, as shown in Table 4. Thus, H3 was also confirmed in the second-stage analysis. Accordingly, there is a direct negative relationship between OBS provider profitability and scale, but R&D investments of the provider mitigate this negative relationship. Again, due to the PA model used, the goodness-of-fit measures are not reported.

Fig. 1 illustrates the moderating effect of R&D investments on the negative relationship between scale and gross margin, using average marginal effects. The mean for R&D investments was 15.22281, and the standard deviation was 2.402924. All of the margins were statistically significant ($p = 0.000$). As demonstrated in Fig. 1, the negative effect of scale on profitability is strongest for the lowest level of R&D investments (mean – standard deviation = ~12.8) and weakest for the highest level of R&D investments (mean + standard deviation = ~17.6). Thus, there is statistically significant evidence that R&D investments linearly moderate the negative relationship between gross margin and scale.

Fig. 2 illustrates R&D investments' moderation effect by showing the estimated slope of scale using the same three values for R&D investments. For the sake of presentation, the range used for the scale is from 15 to 25, incremented by 1 (min scale = 14.61567, max scale = 25.69392). The margins were statistically significant ($p = <$ 0.05) throughout. As seen in the interaction plot, the higher the investments in R&D are, the lower the negative effect of scale on gross

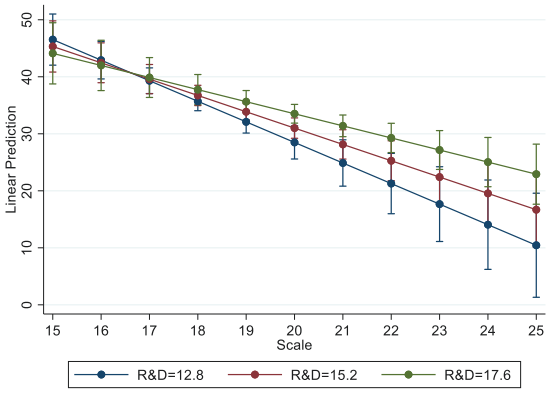

Fig. 2. Linear moderation effect of R&D investments on the relationship between OBS provider profitability and scale (95% confidence intervals).

margins for OBS providers. However, for the smaller OBS providers, the moderation effect is weaker. On the other hand, for average-sized (mean scale = 19.31409) OBS providers, higher investments in R&D seem to pay off. An aspect worth noting is that the slope for low-level R&D investments (blue) is considerably steeper than the flatter slope of high-level R&D investments (green), amplifying the importance of R&D investments for larger OBS providers.

5. Discussion

Prior studies concerning the financial implications of servitization have found that the path to profits through services is nonlinear (Kohtamäki et al., 2020; Visnjic Kastalli & Van Looy, 2013). For instance, the number of service offerings alone is not directly efficient in decreasing the likelihood of bankruptcy for servitizing manufacturing firms (Benedettini et al., 2017). Thus, the difference seems to lie in the service qualities and different service strategies (Gebauer et al., 2010; Sjödin et al., 2019) rather than extensiveness. Additionally, studies have identified that separate financial consequences of services that support products and services that support customer processes depend on the context (Eggert et al., 2011) but have a complementary nature (Eggert et al., 2014). Subsequently, OBS offerings have emerged as an appealing business model for manufacturers (Ng et al., 2013; Visnjic et al., 2017) because they allow the mentioned complementarity to be leveraged by selling outcomes instead of the products and activities leading to them. The inherent long-termism of OBS offerings provides multiple opportunities for both providers and customers. For example, providers are often incentivized to perform better (Nowicki et al., 2008) and thus benefit from, for example, energy savings (Li et al., 2014; Tan & Yavuz, 2015) and cutting carbon emissions (Selviaridis & Spring, 2018). Furthermore, since the crux of OBS offerings is to extend the operational lifetime of assets, equipment and systems, the need for new production decreases (Ng & Nudurupati, 2010). Given these benefits, both customers and manufacturing firms have explored the potential to achieve sustainability through OBS. The same resource efficiency-driven logic works in favor of provider profits as well: since the provider's revenues depend on outcomes achieved instead of resources used, the less resources are used (or the more resources are recycled) to produce the outcome, the higher the provider gain.

5.1. Theoretical contribution

Given the mutually appealing premises of OBS offerings, a significant number of case studies have explored ways in which OBS offerings can be delivered efficiently in different industries. For instance, OBS providers must consider inventory costs (Settanni et al., 2017; Tan et al., 2017), equipment and system reliability (Ge et al., 2018; Guajardo et al., 2012; Kim et al., 2017) and contract design (Liang & Atkins, 2013; Liinamaa et al., 2016; Selviaridis & Van der Valk, 2019). However, no general investigations on OBS providers' profitability existed before the current study. To fill this gap, we drew upon an unbalanced panel dataset and conducted a two-stage longitudinal analysis. In the first-stage analysis of this study, we globalized the results of earlier case-focused OBS studies by showing that an average OBS provider has gross margins 4.40 percentage points higher than those of an average manufacturer that does not offer them. Thus, our first-stage analysis specifically contributes to OBS consequences stream of literature (Schaefers et al., 2020) by providing external validity of extant studies advocating the financial potential of OBS. More generally, we contribute to the financial consequences of servitization literature (Neely, 2009; Eggert et al., 2011, 2014) and the movement towards advanced services (Baines & Lightfoot, 2014; Story et al., 2017; Ziaee Bigdeli et al., 2018), given the positive findings in terms of profitability.

On the other hand, the second-stage analysis in the current study contributes especially to the OBS requirements stream of literature (Schaefers et al., 2020). Prior servitization research has argued that

larger manufacturers often struggle to convert servitization activities into profits (e.g., Neely, 2009), and we found that the same applies to OBS provider firms. Given the complexity (Hou & Neely, 2018; Schroeder et al., 2020) and the high customer-specific customization (Kohtamäki et al., 2019; Ng & Nudurupati, 2010) endemic to OBS offerings, we argue that in order to cope with such scale-induced issues, OBS providers must continually invest in digital technologies and modular service development. Providentially, the long-term nature of OBS offerings has been found to provide security for providers to invest in digital technologies (Visnjic et al., 2017), such as adaptive preventive maintenance (Öhman et al., 2015), sensor technology (Sjödin et al., 2020) and remote diagnostics (Brax & Jonsson, 2009). Indeed, our second-stage analysis of OBS provider firms only revealed that R&D investments of OBS providers moderate the negative relationship between scale and profitability, in contrast to the findings of some earlier studies on the effect of R&D investments on technology firm performance (Ribeiro-Soriano, 2010). Therefore, although our second-stage analysis deals with OBS consequences (i.e., profitability implications), it also offers a valuable contribution to the OBS requirements stream of literature (Schaefers et al., 2020). In terms of the servitization literature more generally, the second stage of the current study contributes to the digital servitization literature (Coreynen et al., 2017a; Kohtamäki et al., 2019; Kohtamäki et al., 2020b; Vendrell-Herrero et al., 2017).

5.2. Managerial contribution

The current study provides managers with clear and tangible contributions. First, it demonstrates that OBS offerings have been a profitable servitization strategy for manufacturers of equipment and machinery. The underlying business logic of OBS offerings is to reduce excessive inputs and harmful outputs—in other words, to operate machinery and systems sustainably. In effect, many traditional machinery manufacturers have turned sustainability trends to their advantage. For example, one of the main drivers of Wärtsilä's engine power plants in markets such as the US is actually increasing renewable energy production (Yang, 2020). This is due to the intermittent nature of renewable energy: when solar energy is unavailable, flexible energy generation units with quick ramp up and guaranteed availability are needed. Second, we show that OBS offerings do not pay off only for the few advanced market leaders but also offer viable ways to capitalize on servitization for organizations of various sizes. However, we caution that larger OBS providers tend to struggle to generate returns. Third, for large providers struggling with scaling problems, we show that investments in R&D may offer a helping hand. We also pinpoint some digital technologies and modular service development as potential targets for investments. However, these results should be interpreted with caution in the wake of the global COVID-19 pandemic. For instance, as the revenues of the iconic Power-by-the-Hour and Total Care jet engine offerings of Rolls-Royce greatly depend on flying hours, the company reported record-breaking losses for the first half of the year 2020 (Partridge, 2020).

5.3. Limitations and future research

Despite its high attention to detail, the current study has limitations. Because the aim of the study was to draw more general inferences to contrast the numerous existing case studies, some of this generality meant sacrificing granularity. For instance, due to the technical limitations of the database, we could not account for whether the OBS firms had just recently started offering OBS or whether they had offered them for a while. The given limitation is an attractive avenue for future research to investigate the profitability effects before and after OBS using the fixed effects (i.e., within-firm estimator) model, for instance. Furthermore, due to the database-sampled data, we could not account for the more relational aspects adding value to the OBS relationship. Thus, taking note of the paper by Randall et al. (2011), future research could further investigate how relational assets (Ng et al., 2013), such as regular exchange and trust (Hypko et al., 2010; Korkeamäki & Kohtamäki, 2020), affect OBS financial success. Additionally, in the second stage of this study, we only focused on one of the required factors for successfully delivering advanced services (i.e., R&D investment), and we recognize that the relationship is more complex (Sjödin et al., 2016). Hence, more research on the topic is required. Last, although provider success stories are important to garner both academic and practitioner interest, failure cases and customer perspectives merit further attention.

6. Conclusions

This study considered the profit impact of OBS offerings on manufacturers of machinery and equipment. The research approach was two-staged and utilized a PA model to accommodate correlated data in both stages of the panel data analysis. The first-stage analysis aimed to fill the gap in the empirical knowledge on OBS firm profitability since extant studies have investigated OBS profit potential through case studies, analytical frameworks or survey-based data. The results of the first-stage analysis showed that there is a direct positive relationship between OBS offerings and manufacturer firm profitability. Thus, the first-stage analysis of the current study globalizes the results of extant studies by building on time series financial data (n = 1566 (N = 14,756, consisting of 49.62% OBS providers and 50.38% non-OBS firms)). The alternative estimation methods generated concurring evidence as well. At best, in terms of the alternative estimation methods that aim to minimize the sum of squares (POLS, BE, and RE GLS), the models capture half of the between-firm variation and slightly over one-third of the overall variation in the manufacturer gross margin percentage.

The second-stage analysis drew upon a subset of data (n = 336, N = 2250) consisting of only OBS provider firms and tested the relationship between scale and profitability as well as the moderating effect of R&D investments on the given scale-profitability relationship. In alignment with extant servitization studies that have found negative relationships between servitizing firm size and profitability, the results showed that there is also a direct negative relationship between scale and OBS firm profitability. On the other hand, statistically significant evidence showed that OBS firm R&D investments mitigate the aforementioned diseconomies of scale effect. To draw more general inferences than earlier studies, some granularity in the data sampling needed to be sacrificed when compared to survey-based sampling, for instance. Therefore, future studies could pay attention to before-and-after profitability effects of OBS offerings for providers using a fixed effects (or within estimator) model. For managers, the current study offers empirical evidence of OBS profit potential, warns about scale-related issues, and emphasizes the role of R&D investments in digital technologies and modular solution development in OBS offerings.

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Ecosystem of outcome-based contracts: A complex of economic outcomes, availability and performance

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Abstract

The number of studies concerning outcome-based contracts (OBCs) has gradually increased over the past decade, with a focus on servitizing companies. The mutually beneficial baseline logic behind such contracting provides a fascinating area for research because, for instance, it facilitates overcoming the service paradox through network-driven value co-creation. In addition to contractual techniques, the digitization of services in product-service systems (PSS) has gained attention as the enabler of the given business models. We set out to research OBCs that are based on economic value (eOBCs) in the energy technology sector. We mapped the ecosystem surrounding IPP-provider contract relationships and found that the outcomes sold ultimately consist of value propositions made to serve economic outcomes that subsume availability guarantees, which subsequently subsume performance. The depiction of the value system serves as a basis on which to develop future findings concerning practices comprising the outcomes.

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Keywords: Digital servitization; Performance-based contracts; Outcome-based contracts; Product-service systems (PSS)

1. Introduction

During the past decade, research concerning performance- or outcome-based contracts (PBCs or OBCs) has rapidly increased in number [1, 2, 3]. Despite the academic abundance, the terminology used to describe the phenomenon lacks cohesion [4, 5]. Some authors refer to the overarching phenomenon as OBCs [6, 7], while others use the term PBCs [8, 9, 10].

Despite the variation in the terminology used, scholars agree that the conjunctive factor of outcome-based contracting is the payment, which, in this context, refers to the revenue generation logic. By definition, OBCs represent a means for contracting wherein a customer is obliged to pay only when the provider has delivered the outcome agreed upon [11].

Recently, the OBC concept has been challenged in a way that questions the existence of OBCs that are established to provide economic results (eOBCs [12]). Grubic and Jennions [4] argue that most OBCs are bound to outcome attributes that relate to availability (aOBCs). The authors conclude that the only case plausibly matching their definition of eOBC is the renowned 'Power by the Hour®' contracts of Rolls-Royce. However, the authors argue that, from the remote monitoring technology (RMT) perspective, eOBCs are not feasible, even in the case of 'Power by the Hour®'.

We set out to investigate the validity of the claim of the inexistence of eOBCs. In the energy technology sector, the societal and environmental issues and economic potential of flexible power generation have caused alternative power generation methods to emerge concurrently with new agents in the value chain [13]. These so-called independent power producers (IPPs) usually invest in renewable energy production, such as wind or solar power [14]. In cooperation with public utilities and industrial solution providers, IPPs theoretically form a triadic hub for cleaner energy production networks.

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To investigate the assumption of the existence of eOBCs in the given network context, we interviewed managers from the industry, building upon the framework presented by Kohtamäki et al. [15] depicting the interplay of macro/micro environments of practices in the value system of a servitized ecosystem. As the concept of IPP is fundamentally connected to economic value, it thus provides a relevant setting for mapping the ecosystem of eOBCs in practice.

Furthermore, the value chain of the interconnected network regarding the mentioned triad most likely necessitates the presence of multiple OBC-related, service-intensive phenomena, such as advanced services [16, 17], result-oriented product-service systems [18], performance-based logistics [19] and PBCs [8]. In total, the value chain thus creates interorganizational value through reliable performance, availability, and, ultimately, economic results. The given aspects are addressed through our research question: Why and how should the servitizing providers in the energy technology sector utilize eOBCs?

To ensure the focal scrutinization and the depth of analysis, we chose to conduct a single case study in an international manufacturing company (Company Alpha) operating in the energy technology industry. Additionally, the case company has had an accomplished history in intensive service operations, such as operation and maintenance agreements (O&Ms). We researched a dataset constituting 30 managerial interviews related to the company's service business. The interviewees held various positions, ranging from project managers to vice presidents and general managers. The dataset used contained 1754 minutes of recorded interviews, which were transcribed into almost 450 pages of text (Times New Roman 12, single space, 2.54 margins all around). Accordingly, the case evidence provided valid and consistent evidence for our conclusions. The lens through which we set out to investigate the data was established through a literature review focusing on outcome-based business models (OBMs) and contracts and the risks and value drivers associated with them. Additionally, the concept of IPPs was reviewed.

2. Literature review

The literature concerning OBCs strongly relies on case studies describing the nature of the contracts among their constituents [16, 17, 20]. According to Ng, Ding and Yip [2], the connecting factor of the given contracts is the mutual mission towards achieving an outcome. The vessel through which the given outcome value is created and delivered is embodied by the OBM. Thus, the literature review assessed the challenges of OBMs (i.e., risks), the incentives of OBMs (value drivers) and the concept of IPPs, and how they fit into the concept of an OBM triad in the energy technology industry.

2.1. Risks

Essentially, OBMs are executed through a risk transfer. The asymmetry of the risks between constituents allows the provider side to enjoy marginal gains [21], but on the other hand, it also simultaneously exposes the providers to the risk of not achieving the outcome or performance agreed upon. Conclusively, the payment methods must address performance with regard to both penalties and rewards [17, 2].

Furthermore, the risks associated with OBCs are linked to both context-related and stakeholder-related issues, with some issues more closely connected to economic risks, while others are more closely connected to operational risks [5]. The context-related risk factors are, in an overarching manner, categorized as complexity and dynamism, while the stakeholder-related risk factors constitute capability, alignment and dependency themes [5]. The interplay of the context and stakeholder-related risks necessitates the investigation of social exchange in the OBM context, as Kleeman and Essig proposed [8]. Additionally, the identified risk factors call for further cross-referential research.

2.2. Value drivers

The reconfiguration of the risk structure in OBMs will allow new value drivers to emerge. Value drivers are defined as variables with a positive impact on the overall value creation connected to a business model [22]. First, as the focus shifts from individual actions to the outcome attributes, the customer companies engaged in the network may enjoy the benefit of using multiple services concurrently through the provider's vertical and/or horizontal integration of activities in the value system, causing a relative complementarity of services [23]. In effect, the mentioned shift would apply to power generation through the providers' increased operational responsibilities, such as in O&Ms.

Second, customer lock-in is regarded as a value driver for OBMs in the sense that long-term contracts result in warranted and predictable value for investment and recurring revenues [23] for both providers and investors. Additionally, the long-termism allows providers to pursue cost optimization activities, driving marginal gains [21]. Therefore, the lock-in, as a value driver, is directly linked to efficiency as the third value driver associated with OBMs. Expanded access to the product-service systems [18] and the broader mandate of the outcome provider reduces conflicts and delays caused by disunity [23].

Accompanying the expanded mandate is the asymmetry of accountability, which is the fourth value driver of OBMs. The outcome provider therefore accepts that new operational risks and liabilities, which previously belonged to the customer, are assigned to their account. However, the shift on the risk scale acts as a vessel, making it in the provider's best interest to assess and act upon metrics that alert them about errors [23, 21].

While transitioning to an OBM, service companies also engage in open business models in the sense that their reliance on partner/supplier ability to create new activities out of their own scope of competences increases [7]. Hence, novelty, as a value driver, concerns the possible Schumpeterian rents to be achieved through the creation of entirely new means of value creation, which may decimate the preceding means [24]. Visnjic et al. recognized three reasons why novelty may act as a value driver related to the long-termism of OBCs: it facilitates procedural and mutual strategic learning and

enables the use of case-relevant lifecycle data. Additionally, the reallocated accountability allows trial and error to be more flexible in comparison to traditional product business models [23].

2.3. Independent Power Producers

Due to the reliable power grid's crucially positive effects on economic development [25, 26], many economies, especially developing economies, have turned to the private sector to ensure financial and operational support for their public utilities. The reason for the reform, for instance, in sub-Saharan African countries or India [27, 28], is that many of these economies are excessively in debt, and thus, their abilities to source capital funds may be restricted. The private investment here refers to IPPs. The IPPs represent a model that originally emerged in the 1970s in the industrialized world [14] and currently grows, for instance, in the United States. The IPP model is advanced by policies allowing the functional unbundling of transmission operations that enable drastic increases in renewable energy capacity through IPPs' access to transmission grids that were previously governed by vertically integrated utilities [29], which emphasizes the importance of policies and their effect on IPP incentives.

Green et al. [21] argued that a servitization model of offering outcomes through integrated solutions is applicable in closed systems with low variety and objective measures. However, to pursue OBCs in higher variety, open systems, the development of capabilities related to customer autonomy management has been regarded as imperative [11]. As power generation assuredly is a high variety, open system, although with relatively objective measures, it forms an interesting setting in which to investigate the value system nuances and their meaning for the interplay of micro/ macro environments.

3. Empirical results and discussion

3.1. Company Alpha and IPPs

Company Alpha's interviewees held positions ranging from lower level managerial positions to vice presidents and general managers who were connected to the service offerings of their company. The interview questions concerned business models, value propositions and customer expectations regarding the scope of service offerings. When asked about the value propositions for different customer segments, the concept of IPPs was clearly demonstrated by the interviewees, as is presented in Table 1, in addition to the mutual value drivers and the logic behind operating such a business model.

3.2. The balance of risks and value drivers

The interview data presented in Table 2 rather elaborately demonstrate the context-related risks of complexity and dynamicity, which is in alignment with the results presented by Hou and Neely [5]. However, stakeholder-related risks, on the other hand, can be considered effectively mitigated in the case of the IPP-provider relationship. Accordingly, stakeholder-related risks include capability issues, such as providers' lack of capabilities to contract or deliver, the internal incoherence and/or resistance of the provider, and customers' inability to fulfill their part of the contract [5]. In the Alpha-IPP relationship, these dimensions of stakeholder-related risks can be considered relatively well mitigated based on the case evidence.

Table 1. Company Alpha & IPPs

	Representative Quotations
IPPs	"Some customers do not want to do anything else other than cover the financial side and leave the operation of the plant to us."
	"The group that is the most interested in our O&M services are these kinds of new players in the energy markets who we call IPPs, independent power producer customers. So, they can be investment firms that may not have the knowhow of the details of energy markets but regard it as a good investment that could pay itself back in, well, a couple of years."
	"In the energy segment there is the fact that you don't always need to acquire it, there are these so-called IPPs, which stands for independent power producers. That means that someone invests in that facility and establishes a power purchase agreement with utilities. In addition, they sell electricity for them for fifteen years, but they outsource the operations to Alpha."
	"And, of course, we have a lot of these arrangements where we have the operation and maintenance agreement with the customer, meaning that we run that system. So, there, it is in our own interest to perform these assignments and actions so that the performance remains on the desired level."

Table 2. Context-related risks from Alpha's perspective

	Representative Quotations
Complexity	"Because the problem with these is always how do we measure and how to agree about the measures and how undisputed are the indicators, things like this. So, it's not easy."
	"And you need to remember that, when you are talking about power plant business, the deals are not closed in days or weeks. Instead, we are talking about, well, from the first contact, if it goes quickly, it's a year. Sometimes it can take three, four or five years. You need to find the money-men; you must consider different permissions, environmental permissions especially. You need to think about power purchasing agreements; does the end-customer even have the authorization to dispatch the electricity and at what cost."
Dynamicity	"And then, there are these IPPs, independent power producers, that are investors looking for investees here. So, our value proposition is an outcome of a massive calculative function. If you think about that, the prices in the market change every five minutes; we have then taken all the prices for the last five years. That's 104,000 prices per year. And then, there are the service prices, like frequency control or these kinds of grid support services, so their prices. So that's well over half a million input cells counting in excel. And that is then optimized every five minutes, that's what should be done with facility. So, it's historical data-based calculations."
	"So, based on the forecasts that you can input for gas prices and such, you can estimate how much profit he will generate. Then, with these, these calculations are the essential building blocks for creating our value proposition, through which we can say, hey look, by doing this and this, you would earn this much."

However, other stakeholder-related risk schemes also seem to apply in the case of Alpha-IPP relationships. For instance, stakeholder alignment remains uneven in a sense, although it is driven by the same performance incentives, reducing discrepancies in terms of goals and visions (i.e., value drivers). Therefore, the IPPs and their lenders retain greater financial power, supporting their bargaining power, as demonstrated by an Alpha interviewee quote in Table 3. Furthermore, while the providers may have the capabilities to operate such a model themselves, the operational logic of not doing so is rooted in their resources, for instance, an efficient capital structure.

Table 3. Bargaining power of the financers due to the provider's reliance on the financial integrator

Representative Quotations
"When it comes to third-world countries, the developing countries, there the requirements for financers have increased significantly. So, it does not depend on the country that much, but rather on the financer facet."
"But, we, we do not want to own it (the power plant) because there will be… The owners don't want this on the balance sheet. Because it is an awful burden if Alpha placed a hundred power plants on their balance sheet."

On the other hand, regarding practices and understandings, the discrepancy favors the providers. In that respect, the bargaining power [5] of the provider increases. In the given context, practices and understandings refer to the investor's lack of knowhow, resulting in a reliance on the providers. Nevertheless, the risk dimension of dependency [5], in the form of reliance, is not only a risk but also an asset. Due to the recognition of Alpha as a provider, the IPP's undertaking may enjoy increased credibility in the eyes of their lenders, as the interview quotes in Table 4 demonstrate.

Table 4. Customer's reliance on provider's capabilities

Representative Quotations
"Then, you should have a low-risk type of investment because you have a power plant price guaranteed by Alpha, and you will be guaranteed an operation contract, and that's why this kind of business were started in the 90s, to guarantee the operation cost to these investors. And you had also a financer normally involved, a bank which is financing this thing, and then you have owners which bought the shares in this special purpose company."
"And this very same calculation should be in the hands of the lender at that point when they ponder whether they should grant a loan to that fellow; is he going to generate earnings with his facility. So yeah, these are the kinds of models that turn engineering techniques into economics."

3.3. The logical relation of eOBCs and aOBCs

The misalignment regarding the definition of eOBCs also transpires in our research. Grubic and Jennions [4] use the functionality of a product as the purchased attribute, whereas Böhm et al. define eOBCs as agreements constituting direct economic outcomes [12]. In the case of the IPP-provider relationship, both terms seem to apply. First, providers such as Alpha bill the customer by kWh; they thus sell the functionality of the power plant. However, although the contract is closely associated with the functional value of electricity, the outcome bought by the dispatching agent, in other words, the IPP, is the guaranteed value of their investment, as demonstrated in both Tables 1 and 2. Thus, the return on investment is to be ensured through servitization, i.e., the optimization of production based on dynamic market prices. Furthermore, in addition to the added servitization fees that allow the provider to capture additional value, the provider is also exposed to availability-related sanctions, which demonstrates the increased accountability. This issue is summarized below in Table 5. Thus, the deduction of an eOBC subsuming aOBCs, as presented by Grubic and Jennions [4], is verified in our case. Moreover, we argue that performance is, subsequently, subordinate to availability. The logic behind this reasoning was elaborately explicated by Alpha interviewees when asked about what kind of value their customer buys.

Table 5. Economic value, availability and performance

Representative Quotations
"In a sense it is kind of "as-a-service". So that there, from the power plant there will be this much coming out and if not, then it is on us."
"Well, of course there is certain a fixed monthly price, but in principal it depends on how much is produced. And there we have then bonuses and sanctions in place, so like availability and production penalties and else."
"In principle, you can summarize it to one word or two words, your choice. Availability. And then, the other one is performance. But the availability is the most important, without it, it does not work. It has no significance, what the performance without it is, or would be. So, you could say that's the most important."

3.4. Discussion

While the O&M agreements associated with the IPP contracts are extremely appealing to the providers due to their extensive scope (e.g., the customer is willing to outsource all the related operations), the asymmetry of the bargaining power fundamentally remains tilted in the direction of the IPPs. This result is despite the synergic effects of the provider's recognition of the uses of sourcing. The reason for the given skewness gained support from both the literature and the interview data. The value driver of novelty in OBMs enables mutual strategic learning and the ability to develop competences outside the scope of one's own activities during the long-term contract periods for stakeholders [7, 23]. Furthermore, and more pressingly, the lifecycle data that is gathered for utilization purposes thus becomes an issue with regard to rights and ownership. This is due to the learning activity of the customer, as elicited in Table 6.

Table 6. The role of learning and data

Representative Quotation
Then, there is also this group who want to learn, and it means that the investor knows that they will be able to cut costs when they, at some point, start operating themselves. They basically want to gain access to the core. And there, we have a lot of examples, where the owner locates their own group on the site, and of course, it's their property. You cannot restrict them there, they can monitor. They can watch and follow what we are doing, so they have this kind of five-year university, after which our prospects of continuing the operation agreement are fairly limited. But these are recognized issues in a sense, when the owner says they want their own office on the site, then we know it's this kind of shorter operation project. This is one group."

One apparent means for responding to the mentioned learning-enabled internalization is that the providers can develop capabilities to invest in the IPP to become capital shareholders. This finding conclusively verifies the existence of eOBCs in practice in accordance with the definition and example, where the outcome provider *de facto* condones incremental revenues based on the economic outcome [12]. The option is expounded upon by an Alpha interviewee in the table 7.

Table 7. A gateway to shared incremental revenues

Representative Quotation
"We have a rule that we can own X percent of an IPP. But no more than that."

4. Conclusions

4.1. Theoretical contribution

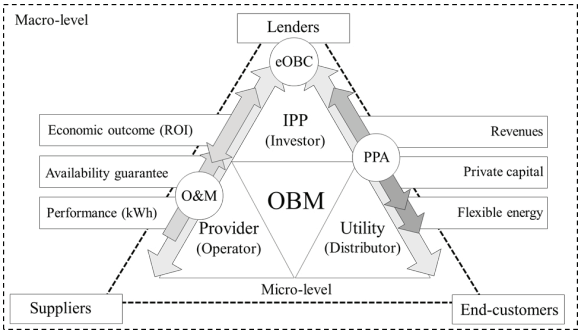
Although seamless regarding the chosen RMT perspective, Grubic and Jennions [4] refer to Selviadris and Wynstra [3] to define outcomes as 'the value derived by the customer from a given service or product.' However, Grubic and Jennions use the definition of eOBC in a manner in which 'the customer purchases the functional result of the product.' Therefore, they diverge from the original eOBC definition provided by Böhm et al. [12] who define eOBCs as follows: 'In contrast, when customers pay for economic results, the performance indicator is a monetary outcome variable, such as incremental revenues or profits.' Thus, the term 'functional result' could, in this context, refer to any singular actions performed that lead to an outcome such as performed maintenance activities.

In the context of the IPP-supplier relationship, the IPP ideally does not have to be concerned with such functional activities for two reasons. First, the IPP's economic outcome (i.e., return on investment) is accounted for by the provider penalties compensating for the losses in case of production or availability failures. Second, the O&M agreement is based on output (i.e., kWh), while the fixed operational fees in a certain sense amount to a guarantee of a service-level agreement. Finally, the power purchasing agreement with the utilities ensures the continuous revenues, accounting for the return on investment.

Conclusively, and in practice, the provider of the power plant or generation unit agrees to ensure the IPP the return for their investment at the risk of availability-related penalties. Furthermore, as suppliers have the option of owning a share of the IPP, thus making them a capital shareholder, which is justified by the incremental revenues, the given arrangement assuredly meets the definition of eOBC, as presented by Böhm et al. [12] while subsuming aOBCs that, together with performance values, ensure the fulfillment of the economic outcomes.

Therefore, the value system at hand forms a triadic hub that shares interconnections with the provider, financial integrator and distributor, as presented in Figure 1. The given setting combines the intraorganizational microenvironments, thus making the figure an exciting area for the further examination of practices and other societal meanings. Furthermore, along with the shared goal of outcome achievement and an expanded microenvironment, the role of digital servitization, from the RMT perspective, for instance, becomes even more important and, thus, should be further studied.

Figure 1. The ecosystem of an economic outcome-based contract



4.2. Managerial implications

The reason why the providers cannot sell the electricity themselves, although they retain the capabilities to do so, is simply that it would substantially burden their balance sheets. However, the given business model allows the providers to enjoy long-term O&M contracts, which furthermore enables cost optimization and thus marginal gains [30]. Additionally, and importantly, the providers have the option to invest in the IPPs, at least to some extent. The mentioned option allows for even greater alignment between the interests of the IPP and the supplier. Furthermore, IPPs can benefit from having the support of the provider while negotiating the PPAs and loans with utilities and financial institutions. Thus, formulating value propositions, with a focus beyond value chain micro-level borders, is highly recommended for servitizing solution providers.

In this paper, we found that eOBCs related to IPPs enable customers to create new competences that may eliminate the need for an outsourced operator. Consequently, it is vastly important for providers to develop strategies that enable the defense of the continuity of their advanced services. One plausible solution to the paradox seems to be similarly developing financial capabilities that allow for partnership agreements in the IPP context through capital investment. Some perspectives, on the other hand, emphasize developing customer autonomy-management capabilities [2], but ultimately, this will only mean fighting the inevitable. Therefore, rather than striving to maintain the extensive scope of delivery, we recognize the need to focus on the particular pockets of value creation that will create the dimensions for profit sharing.

We mean that, although the providing company moves beyond products and singular actions in the value chain, the resources and core competences eventually facilitate the development of a competitive advantage for it. For example, although customers may be able to learn the best practices, resulting in optimal economic outcomes, their total cost of ownership is still dependent on the providers' high-quality

spare parts and, more importantly, availability. This kind of knowledge about the installed base and inventories is something very inimitable and thus is a potential value driver for competitive advantage. Importantly, simultaneously using various business model configurations has been proven to hold potential for complementarity, rather than conflicting effects [31]. Therefore, instead of merely applying service-dominant logic towards their servitizing operations [21], the managers in the servitized manufacturing companies engaged in outcome-based contracting, should explore the possibilities emerging from product-dominant logic as well.

4.3. Limitations

Although throughout this paper we criticized the prior assumptions made concerning the existence of eOBCs, we scrutinized the phenomena using entirely different theoretic lenses. The criticism of this article, however, concerned the definitive terminology and its interpretation. Thus, the RMT perspective could be applied in the case of IPPs, to falsify or expand the generalizability of the paper and to investigate its role as a part of digital servitization in the given context. Second, this study focused on the perspective of the providers. Expanding the scope of focality to also cover the perceptions of IPPs and utilities/grids might elicit a prolific area for the further investigation of this extreme case of servitizing ecosystems.

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Research paper

To outcomes and beyond: Discursively managing legitimacy struggles in outcome business models

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ABSTRACT

Outcome business models (OBMs) guarantee and deliver economic and operational results for customers. The risk transfer from customer to provider enables the emergence of new value drivers, such as mutual learning. However, if the outcome-based service (OBS) customer learns the operational capabilities, based on which they are willing to rely on the OBS provider to achieve outcomes, how then does an OBS provider justify its role as a legitimate partner in the future? To answer this question, we conducted an in-depth single-case study and performed a critical discourse analysis with an OBS provider delivering outcomes. We identify causes for legitimacy struggles (lack of intentional and competence trust) in an OBM and subsequent discursive legitimation strategies used to defend legitimacy: 1) trustification, 2) rationalization, 3) authorization, and 4) normalization. For managers, we elaborate certain OBM problematics causing legitimacy struggles and offer discursive resources that can be mobilized to recreate legitimacy.

1. Introduction

To avoid the commoditization trap, technology companies have turned to servitization and outcome business models (OBMs) as a path to competitive advantage (Baines & Lightfoot, 2014; Story, Raddats, Burton, Zolkiewski, & Baines, 2017; Visnjic, Wiengarten, & Neely, 2016). Through outcome-based contracting, the customers pay for the outcomes achieved (Ng, Maul & Yip, 2009). Probably the most renowned examples are Rolls-Royce's 'Power by the Hour' and 'Total Care' offerings, where operating hours of jet engines are being sold instead of the actual products (Ng, Parry, Smith, Maull, & Briscoe, 2012). To deliver the outcomes agreed to in the contracts, the service providers change their business model to closely resemble and align with their customer's business model (Visnjic, Neely, & Jovanovic, 2018). The given OBM change has been presented as a process consisting of three phases: define, design and deliver (Sjödin, Parida, Jovanovic, & Visnjic, 2020). An essential feature of OBMs is that the service provider takes greater accountability of the operational and business risks of the customer (Hou & Neely, 2018). The greater accountability not only exposes the provider to increased risks but also allows them to create value in new ways (Visnjic, Jovanovic, Neely, & Engwall, 2017). For instance, the outcome provider may pursue marginal gains through internal optimization (Böhm, Backhaus, Eggert, & Cummins, 2016) and often is incentivized to do so (Nowicki, Kumar, Steudel, & Verma, 2008).

OBM research stems from servitization (Batista, Davis-Poynter, Ng, & Maull, 2017) and product-service systems (PSSs) literature (Grubic & Jennions, 2018; Van Ostaeyen, Van Horenbeek, Pintelon, & Duflou, 2013). Some even argue that OBS is servitization in its most advanced form (Ng, Ding, & Yip, 2013; Visnjic et al., 2017). Given the essential features of transferring risks, sharing accountability and offering incentives, scholars have investigated moral hazard in OBMs from the perspective of principal-agent problems, for instance (Howard, Wu, Caldwell, Jia, & König, 2016; Kim, Cohen, & Netessine, 2007). Studies have found that opening operations in the given manner do not come without barriers and dependency considerations (Sjödin, Parida, & Lindström, 2017) and may cause opportunism to emerge from both customer and provider sides (Sjödin et al., 2020), which is in alignment with classical transaction cost economics (Williamson, 1975, 1981). The given considerations are clearly present in extant OBM literature concerning, for instance, contract designs and bonus/penalty payment schemes (see, e.g., Huang, Liu, Parker, Tan, & Xu, 2019; Patra, Kumar, Nowicki, & Randall, 2019; Qin, Shao, & Jiang, 2020; Selviaridis & Van der Valk, 2019). Thus, there is considerable knowledge about the formal control in OBMs.

However, little emphasis has been placed on social science's

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perspective on mitigating relational risks in OBMs. Namely, trust can be regarded as a viable factor for mitigating the relational risks (Klein Woolthuis, Hillebrand, & Nooteboom, 2005; Nooteboom, 1996). The definition of trust is twofold. First, competence trust is built on technical, cognitive, organizational and communicative competences of a partner (Nooteboom, 2002), and second, intentional trust refers to trust in the intentions of the relationship counterparty (Rousseau, Sitkin, Burt, & Camerer, 1998), i.e., that they will refrain from opportunism (Klein Woolthuis et al., 2005). Calls for further research on relational elements of OBMs have been made (Kleemann & Essig, 2013; Ng et al., 2013; Sjödin et al., 2020). Therefore, we set out to study a well-established OBM relationship between power generation solution providers and independent power producers (customers) as our unit of analysis. In this OBM, the provider promises not only to deliver the facility turnkey but also to guarantee its output (kWh) for a certain period of time under the risk of liquidated damages terms. We used 31 managerial interviews from the OBS provider firm as our primary data and annual reports of both the provider and five example customer firms as secondary data. In the process view of OBMs (Sjödin et al., 2020), we focused on the delivery phase, where the contract is already signed and the focus is on how the two parties collaborate and how well the provider is responding to evolving needs of the customer (Sjödin et al., 2020, p. 173). Discourses assist in creating legitimacy for change (Phillips, Lawrence, & Hardy, 2004; Suddaby & Greenwood, 2005). For example, managers use storytelling to build trust and to create a common sense of meaning among storytellers and listeners (Küpers, Mantere, & Statler, 2013). Thus, the current study applies discursive methodology to answer how OBS providers manage legitimacy struggles using discursive legitimation strategies (Rojo & van Dijk, 1997; Van Leeuwen & Wodak, 1999) to avoid OBS partnership's dissolution (Sjödin et al., 2020).

Studies suggest that trust is an integral element of legitimacy (Jackson & Gau, 2016; Tyler, 2001). Thus, we opted to look at legitimation through the lenses of intentional trust and competence trust (Nooteboom, 2002). Considering OBM development's legitimacy from the perspective of trust is not exclusive of formal control (i.e., contract theory; Hensher & Stanley, 2008). Research indicates a complementary and dynamic nature between the two (Klein Woolthuis et al., 2005). We found that in our OBS case, the service provider's managers use four discursive legitimation strategies to address legitimacy struggles and to extend the partnership with their customer: rationalization, authorization, normalization (Vaara, Tienari, & Laurila, 2006; Van Leeuwen, 2007; Van Leeuwen & Wodak, 1999) and trustification. The discovery of the new discursive legitimation strategy, namely, trustification, makes an important theoretical contribution to both OBM literature and discursive legitimation strategies. First, if the customer remains in doubt that the provider's intentions are opportunistic (e.g., to develop operational capabilities to sell to competitors), the strong formal control inherent to OBS makes it relatively simple to dissolve agreements. Thus, trustification as a discursive legitimation strategy can be applied to increase intentional trust (Nooteboom, 2002) among OBS customers. Second, we show that the other side of trust that is based on competence actually unfolds in the three other discursive legitimation strategies (rationalization, authorization and normalization). This finding not only adds to the content validity of the given preexisting discursive legitimation strategies but also amplifies the importance of the discovery trustification as a new discursive strategy.

2. Theoretical background

2.1. Organizational legitimacy

Legitimacy is defined as social acceptability of activities and actors (Suchman, 1995; Tost, 2011). The legitimation theories have roots in sociology (Habermas, 1975). Research on discursive legitimation in management and organizations has substantially built on the seminal grammar work of Van Leeuwen (Van Leeuwen, 1996, 2007) and currently arouses considerable scholarly interest (Luyckx & Janssens, 2020; Suddaby, Bitektine, & Haack, 2017). Common for many studies concerning discursive legitimation is the unit of analysis that is of interest to wide audiences. For instance, prior studies have focused on social construction of legitimacy (and illegitimacy) of widespread publicly debated issues, such as the Eurozone crisis (Vaara, 2014), corporate social responsibility (Joutsenvirta & Vaara, 2015; Siltaoja, 2009) and mergers and acquisitions (Demers, Giroux, & Chreim, 2003; Vaara et al., 2006; Vaara & Monin, 2010). These studies have added much to our understanding of how organizations apply discursive strategies to render debated activities legitimate for an audience consisting of multiple stakeholders with varying interests (Glozer, Caruana, & Hibbert, 2018). However, fewer studies have focused on construction of legitimacy in closer relationships, such as those between an industrial service provider and its customer.

2.2. The role of legitimacy in outcome business models

Studies identify OBM as an ideal and typical form of a servitized business model, separating servitization business models as 1) product-oriented service provider, 2) industrializer, 3) customized integrated solution provider, 4) platform provider, and 5) outcome provider (Kohtamäki, Parida, Oghazi, Gebauer, & Baines, 2019; Kowalkowski, Windahl, Kindström, & Gebauer, 2015). In OBMs, customers hire service providers to deliver outcomes, rather than the separate service activities and resources resulting in the outcomes (Ng et al., 2013). For example, downtimes of advanced technical systems such as manufacturing systems may lead to serious losses (Öner, Kiesmüller, & Van Houtum, 2015), which is why OEMs have turned to after-sales services to ensure operational continuity (Kim et al., 2007). In an advanced form, the service providers take over the operations leading to the outcome (Baines & Lightfoot, 2014). The arrangement does not come without barriers (Sjödin et al., 2017) but also allows new value drivers to emerge (Visnjic et al., 2017). However, to seize the opportunities enabled by the better aligned business interests (Selviaridis & Van der Valk, 2019) and mutual learning of the provider and the customer, renegotiating value creation and capturing logic becomes inevitable (Sjödin et al., 2020).

Commonly, the contract delivery phases in OBSs are relatively long (Kleemann & Essig, 2013). Given the long-termism and the close collaboration OBM usually entails, the partners in the relationship have to develop relational capital (Huikkola, Ylimäki, & Kohtamäki, 2013) required for further development of customer-oriented services, which are especially important for service providers in mature industries (Visnjic et al., 2016). Therefore, the circumstances for renegotiating outcome-based contractual terms can be argued to differ from the ones under which the initial contract was crafted. Studies highlight the importance of the qualities of social acceptance and reasonability, which the actors and their activities must have when implementing the business model (Suchman, 1995; Tost, 2011). To create and improve these qualities, organizations apply discursive legitimation strategies.

A discursive legitimation strategy is an argumentation scheme (Erkama & Vaara, 2010; Suddaby & Greenwood, 2005; Vaara & Tienari, 2008) used to avoid legitimation crisis (Habermas, 1975). In other words, organizations, as actors, can gain, maintain and defend legitimacy strategically (Suchman, 1995). A discursive legitimation strategy constitutes of discursive resources (Luyckx & Janssens, 2016, p. 111) or instruments (Van Dijk, 1998), such as ideologies, authority or rationality. In their research concerning mergers and acquisitions, Demers et al. (2003) identified that legitimation can be rooted in traditions, means and ends rationality, charisma or value rationality. Reflectively, in their research of organizational recombination activities, Suddaby and Greenwood (2005) detected teleological, historical, cosmological, ontological and value-based rhetorical legitimation strategies.

Moreover and importantly, building on the findings of Van Leeuwen

(1996) and Van Leeuwen & Wodak, (1999), Vaara et al. (2006) identified five discursive legitimization strategies: moralization, rationalization, authorization, normalization and narrativization concerning global industrial restructuring. The same discursive legitimation strategies have been identified in many other contexts, such as CSR (Joutsenvirta & Vaara, 2015; Siltaoja, 2009), multinational corporations in globalization (Luyckx & Janssens, 2016), social media (Glozer et al., 2018), political crises (Vaara, 2014) and ERP system adoption (Lepistö, 2014). Thus, the legitimation strategies identified by Van Leeuwen (1996), Van Leeuwen and Wodak (1999) and refined by Vaara et al. (2006) entertain further investigation due to their omnibus presence in different contexts. Thus, we used the given discursive legitimation strategies as the base of our analysis, as presented next.

2.3. Theory development

Rationalization is a discursive legitimation strategy that is based on references to the usefulness or function of distinct practices (Vaara et al., 2006; Van Leeuwen & Wodak, 1999). As OBSs are often found in complex engineering systems (Hypko, Tilebein, & Gleich, 2010a, 2010b), driven by lifecycle logic (Kleemann & Essig, 2013), it is likely that upgrades and technological advancements will emerge over the course of the outcome delivery (Erkoyuncu et al., 2013; Öner et al., 2015, p. 868) Therefore, outcome-based service providers must rationalize subsequent the system alterations to the customer, such as whether to upgrade components preventively before they fail or correctively after they fail (Öner et al., 2015). The customer relies on the provider's competence to achieve the desired outcomes (Nooteboom, 2002). This capability-driven power allows the provider to legitimate the search for rents further in the value system and even beyond its current borders (Hao & Feng, 2018). To create acceptability and reasonability for new activities, the provider may apply rationalization as a discursive legitimation strategy by making references to discursive resources (Luyckx & Janssens, 2016) that rationalize the efforts. These references may include, for instance, reliability improvements (Patra et al., 2019) and economic benefits (Böhm et al., 2016) as instruments.

Authorization, on the other hand, is a discursive legitimation strategy that is based on references to authorities (Van Leeuwen, 2007; Van Leeuwen & Wodak, 1999). In OBMs, the risk of not achieving an outcome is not only dependent on the provider's activities (Hou & Neely, 2018). Rather, the success of the outcome delivery depends on the provider's capability to orchestrate multiple value-adding facets, such as suppliers (Caldwell & Howard, 2013; Li, Zhang, & Fine, 2013); and financers (Li, Qiu, & Wang, 2014). Thus, the justification of the evolving alignment of value creation and capturing can derive from the capabilities outside the provider's dyadic relationship with its customer (Hao & Feng, 2018). Discursive authorization attempts to create a position for an organization as a credible voice among other voices (Glozer et al., 2018). For instance, as the OBS provider is dependent on third parties, such as component suppliers, its authority over these parties depends on their ability to “keep the suppliers on their toes” (Li et al., 2013, p. 280). The given types of network capabilities (Kohtamäki, Partanen, & Möller, 2013) form a valuable reference category because they are founded on competences such as the ability to plan and coordinate activities to achieve outcomes (Nooteboom, 2002, p. 50). In conclusion, authorization as a discursive legitimation strategy builds on references to value-adding authorities to whom the provider has connections and influence.

Furthermore, normalization is a discursive legitimation strategy that is based on references to normality (Vaara & Tienari, 2008) via various discursive tactics. A manager adopting normalization as a discursive legitimation strategy should not only make exemplar references retrospectively but also in a prescriptive manner, i.e., providing examples of how should the things be (Vaara et al., 2006). Normalization can also be considered as a component of both rationalization and authorization strategies (Van Leeuwen & Wodak, 1999). Take benchmarking for instance: many OBMs owe a great deal to the ICT industry in terms of well-established practice of service level agreements (Alamri, Abbasi, Minas, & Zeephongsekul, 2018; Jain, Hasija, & Popescu, 2013; Sumo, Van der Valk, Van Weele, & Bode, 2016). By referring to cross-industry benchmarks, the service provider offers not only examples but also the rationales and authorities behind them. Thus, the discursive legitimation strategy of normalization also emerges in parallel and dynamically with other discursive legitimation strategies.

Additionally, we do not consider narrativization (Vaara et al., 2006) or mythopoesis (Van Leeuwen & Wodak, 1999) as separate legitimation strategies because we consider storytelling and narratives to be more instrumental by nature. For instance, managers may use stories as a technique to demonstrate the rationality or irrationality of a certain procedure. Furthermore, normalization strategy leans almost entirely upon a narrative method because referring to examples predominantly includes a story or a narrative to begin with. Lastly, we find moralization (Vaara et al., 2006) a bit problematic as a discursive legitimation strategy in closer business relationships. This is because when competing with the infamous “nothing personal, just business” norm (Stein, 2001), referencing moral values may prove ineffective.

2.4. The gap in the discursive legitimation theory

Moralization is a discursive legitimation strategy that indeed is based on references to higher order distinct values (Rojo & van Dijk, 1997; Van Leeuwen & Wodak, 1999). Thus, moralization seems more appropriate in cases where the audience of discursive legitimation is broader. For instance, in global corporate restructuring, the change at hand affects not only the companies involved but also national economies and labor force (Luyckx & Janssens, 2020). Thus, moralization as a discursive legitimation strategy used in global restructuring refers to higher order distinct values, such as national interests (Erkama & Vaara, 2010). In contrast, we argue that in closer relations such as between OBS customer and provider, conceptualization of a discursive legitimation strategy (Vaara et al., 2006) that aims to enhance relational trust (Sjödin et al., 2020) is required. This is because studies have found that OBSs are more likely to be successful when the relationship between the customer and the provider is characterized with qualities such as trust and regular exchange (Schaefers, Ruffer, & Böhm, 2020; Sjödin et al., 2020; Randall, Gravier & Prybutok, 2011) and relational assets such as complementarity and congruent expectations (Durugbo & Erkoyuncu, 2016; Ng et al., 2013; Schaefers et al., 2020; Visnjic et al., 2017).

In economics, moral hazard refers to a dilemma when an opportunistic hidden action results from a transaction (Arrow, 1985; Holmström, 1979). For instance, the customers of insurance companies may have a tendency to take more risks compared to uninsured consumers (Guesnerie, 1989). In the context of OBMs, opportunism (Williamson, 1975) can occur, for example, when the OBS provider develops new operational capabilities by operating on behalf of the customer (Visnjic et al., 2017) and then offers the given capabilities to competitors of the customer (Sjödin et al., 2017). In another instance provided by Sjödin et al. (2020), an OBS customer began to prioritize remote location deliveries that entailed higher delivery costs for the provider but not corresponding revenues, upon which the gain sharing in the contract was largely based (2020, p. 175). This example not only emphasizes that the risk of opportunism may also emerge from the customer's side but also that hidden information or knowledge (Cabrales & Charness, 2011; Li et al., 2013) plays a major role in OBMs.

The key consideration of the above examples is that OBMs by design must be revisable because in the long term, the emergence of unpredictable contingencies is likely (Sjödin et al., 2020). Importantly, the successful revision of value creation and capturing alignment often depend on whether a trustful relationship exists between the customer and the provider (Luo, 2002; Sjödin et al., 2020). This is in alignment

with prior research indicating a positive link between trust and organizational learning (Nonaka & Takeuchi, 1995) and innovation management (Lester & Piore, 2004). To distinguish between moral values and trust, the latter can be generally defined as the trustor's positive expectations of valued behavior of the trustee (Jackson & Gau, 2016; Lumineau, 2017; Tyler, 2006). Moral values, in contrast, are standards of good and bad (Van Leeuwen, 2007) that are often derived from individuals' social surroundings, such as society or religion (Vaara et al., 2006; Van Leeuwen & Wodak, 1999).

Scholars have distinguished between intentional trust and competence trust (Klein Woolthuis et al., 2005; Nooteboom, 2002). Competence trust, refers to the trustor's belief in the technical, cognitive, organizational and communicative competences of the partner (Klein Woolthuis et al., 2005, p. 814). The aforementioned features are likely to be found in the rationalizing, authorizing and normalizing discourses of the legitimating actor. Intentional trust, in contrast, means the trustor's trusting belief in the good intentions of the partner, and especially their refrainment from opportunism, even if short-term opportunities or incentives would emerge (Chiles & McMackin, 1996; Nooteboom, 1996). The notion of opportunism is particularly important for OBS providers seeking legitimacy because customer lock-in is usually higher than in traditional time- and material-based services (Visnjic et al., 2017). Thus, an opportunity to leverage a partner's greater dependence to appropriate a larger share of value may exist (Nooteboom, 2002, p. 51). Other forms of active opportunism include lying and stealing as means to seek interest from the relationship to the detriment of the partner (Klein Woolthuis et al., 2005; Williamson, 1975). Conclusively, a theoretical gap exists in terms of the legitimation discourse used by firms engaged in close partnerships in effort to legitimate their intentions towards their partners.

3. Methodology

3.1. Research setting and data

The research on OBS shows that their most prominent applications are in B2B service business settings (Essig, Glas, Selviaridis, & Roehrich, 2016; Ng et al., 2013). Thus, this study is based on a broader set of data gathered for research around servitization of industrial solution sellers. The case company of our choice (henceforth Alpha) is an OEM and power solution company with operating revenue of over 6 billion USD. Over the past 10 years, service business has accounted for 41.74%, on average, of the firm's net sales, with a yearly increase of 1.82% (average absolute value 0.74%). We chose to focus on the delivery phase (Sjödin et al., 2020) of OBS. In this regard, Alpha is an interesting case company because even their earliest available annual report online (from 1999) discussed the OBS arrangements with independent power producer customers – a customer segment that originally emerged in the seventies (Eberhard, Gratwick, & Kariuki, 2018). Furthermore, the CEO of Alpha has listed developing more robust partnerships and subsequently innovating solutions and services for increased value creation as the firm's major strategic aims. Thus, Alpha as a case company provides not only evidence of OBS activities but also prospective insights into OBM development. The case evidence constituted of 31 interviews with managers involved with service offerings (titles ranging from project managers to general managers and vice presidents) and summed to 1806 min of recorded data (455 pages of transcribed interview data, Times New Roman 12, single space, 2.54 margins all around).

3.2. Research approach

We adopted an abductive single-case study design (Dubois & Gadde, 2002) because we wanted to elicit valuable prescriptive sociological knowledge of the OBM development, which currently lacks scholarship. The microlevel investigation of legitimation discourse in a complex system allowed us to take a closer look into what individuals actually experience in organizations (Boje, 2006). To explore the causes of effects (Sayer, 1992) in OBMs through an intensive research strategy, we first needed to account for the context and conditions in which the causal mechanism under scrutiny, namely, discursive legitimation, operates. To holistically describe the setting where the discursive legitimation strategies are operationalized, we gathered data of the OBS relationship value system. For instance, we asked the respondents to describe the service and solution business models of Alpha and the value created through them. The method provided a clear illustration of the business logic behind the OBMs applied by Alpha but also brought forth the problematics involved. The depiction of the context, however, is hardly self-sufficient to construct a theory.

However, the emerged problematics laid the cornerstones for our critical analysis of the legitimation discourse. We continued the data collection by asking how the managers see value should ideally be created in order for the given problematics to be avoided. Therefore, our approach simulated Alpha respondents' legitimation towards their customers, thus differentiating our methodology from the prior studies on legitimation that often consider legitimation discourse retrospectively, through media texts for instance (Vaara & Tienari, 2008). The experiences with OBMs were easily retrieved and expounded upon by the respondents currently experiencing the phenomenon (Gehman et al., 2018).

To cross-validate both the contextual information and the perspectives on discursive legitimation, we also analyzed 2008–2018 annual reports of Alpha, with a specific emphasis on strategy, service business and energy market sections (the number of pages analyzed amounted to 191). To further validate the context from the customers' perspective, we analyzed the five most recent annual reports of five independent power producer (IPP) companies that are among the largest in the world (Asia/Pacific Rim: 2; Americas: 2; and EMEA: 1) according to Standard and Poor's Global Platts 250 ranking list 2018. The sections analyzed for Asia/Pacific Rim and Americas companies were 'Management discussion and analysis,' whereas for the EMEA company following a different report structure, the sections analyzed were 'Business report' and 'Risk report.' The page count of these sections was 874. The combined extent of the secondary data of the research amounted to 1065 pages of corporate reports.

3.3. Data analysis

The coding and analysis of the data was carried out following the Gioia methodology (Gioia, Corley, & Hamilton, 2013), utilizing the qualitative data analysis computer software NVivo by QSR International. We started by identifying common words and phrases connected to OBSs to reframe the scope of discourse to be analyzed. Such terms included but were not limited to words such as 'outcome,' 'performance,' 'guarantee,' 'risks' and 'responsibility.' The more technical terms included phrases such as 'per kilowatt hour,' 'investment,' 'return on investment,' 'profit' and 'independent power producers.' Once assured of the contextual fit of the discourse analyzed, we started to look for discourse concerning the problematics of OBMs. Subsequently, what Alpha's respondents regarded key issues challenging Alpha's legitimacy as an OBS provider, formed the first-order concepts (left-hand side) in the Fig. 1. Additionally, not only the causes for legitimacy struggles (Luyckx & Janssens, 2016; Vaara & Tienari, 2008) were discussed, but we were also able to detect discourses that represented managers' suggested responses to the issues (i.e., discursive legitimation). These discursive practices formed the first-order concepts of discursive legitimation (right-hand side). We continued the coding by grouping the first-order concepts of the detected issues into second-order problematics (left-hand side), and the first-order discursive practices into second-order discursive resources (right-hand side). Due to the emerging trust-related topics in the discourses, we reflected the findings in the light of organizational trust theories in business partnerships

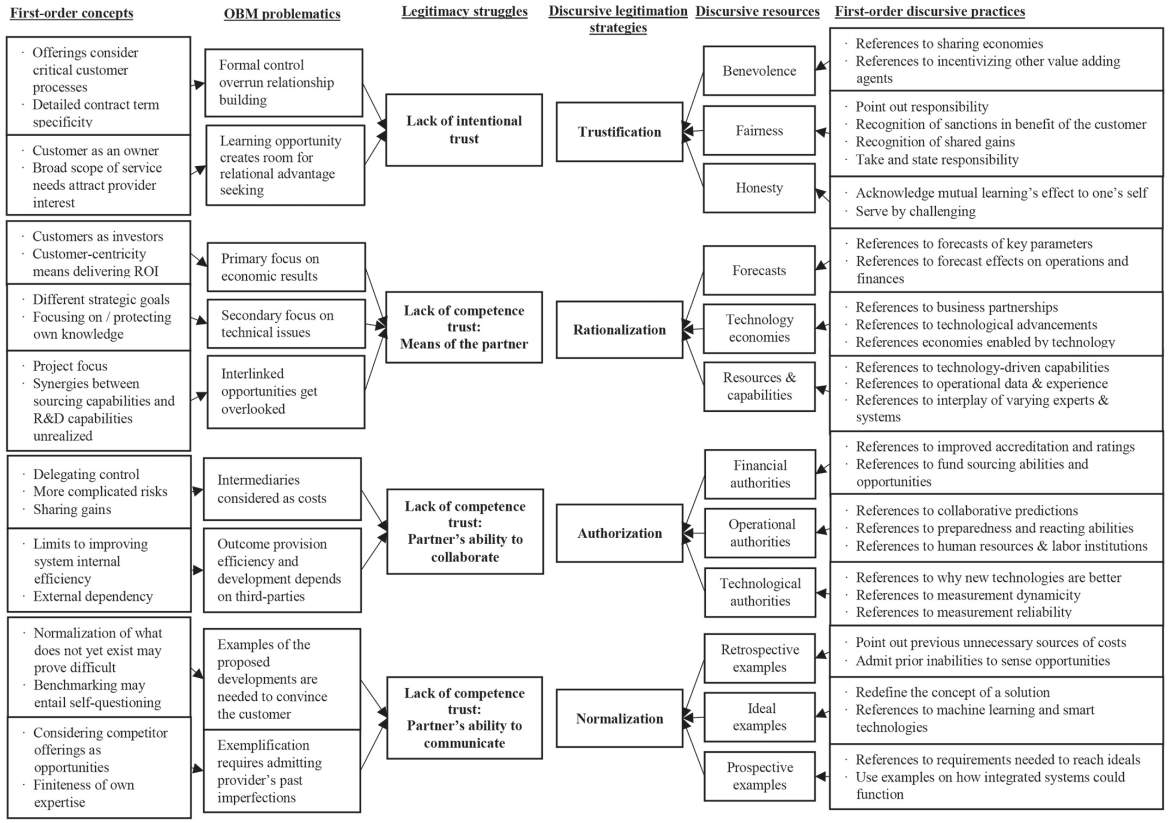

Fig. 1. Data structure.

(Nooteboom, 1996, 2002). The use of the additional theoretical lens served as a data triangulation practice that not only strengthened our standpoint (Bryman, 2006) but also aided in bridging the related concepts of trust and legitimacy (Jackson & Gau, 2016; Tyler, 2001). The aggregate dimensions we present in the middle of the data structure Fig. 1. are a result of systematic combining and analysis of the findings. The OBM problematics form the causes of legitimacy struggles, to which the discursive legitimation strategies constituting of different discursive resources aim to answer.

4. Findings

4.1. Situating the legitimacy struggles and discursive legitimation strategies

When a utility firm wishes to sell more energy, buying a new facility is not its only option. Instead, the firm can establish a power purchase agreement (PPA) with an investor who invests in power generation. These investors are called independent power producers. The given investment firms usually outsource everything from the turnkey to the operation and maintenance of the facility. The hired service provider (such as Alpha) may also assist the customer in the initial stages of the venture with issues such as funding, environmental permits and establishing PPAs with the utilities to whom the power will be sold. In the contract, power is billed by kWh produced. Errors in production are compensated for the OBS customer by the provider through liquidated damages clauses. To illustrate the arrangement, we used our secondary data (annual reports) to map the actors related to this OBM. In the resulting ecosystem figure (Fig. 2), we indicate the relationship of interest for the current study by a solid line between the OBS provider (Alpha) and the OBS customer (independent power producer). In addition, we elaborate the output being sold (dashed arrow) and point out a closely interrelated business relationship (dotted line), in which the produced output is sold by the OBS customer, in turn, to its customer (utility company). Henceforth, we refer to respondents by A (as in Alpha) + number (respondent identifier).

4.2. Managing the lack of intentional trust

Paradoxically, the high contract specificity endemic to OBS, can make relational opportunism contractually feasible. This is because, in our case, the customer remains as the owner of the facility operated by the OBS provider. Thus, nothing restricts the customer to monitor and learn the valuable operative skills sold by the provider in the first place (see Table 1 in Appendix). Therefore, Alpha respondents emphasized the more informal control's importance in ensuring continuation of the partnership:

> A11: *"…the customer-relationship should be good so that the customer practically operates as our partner and that there is a well-established trust in the collaboration and else."*

In order to convince the customer, that their intention is not just to capitalize on the high share of their equipment on the installation, but to build a trustworthy partnership, we found that Alpha uses a discursive legitimation strategy of trustification. Trustification builds on references to *benevolence*, *fairness* and *honesty* as values that guide the provider's operations. Alpha's respondents emphasized how the

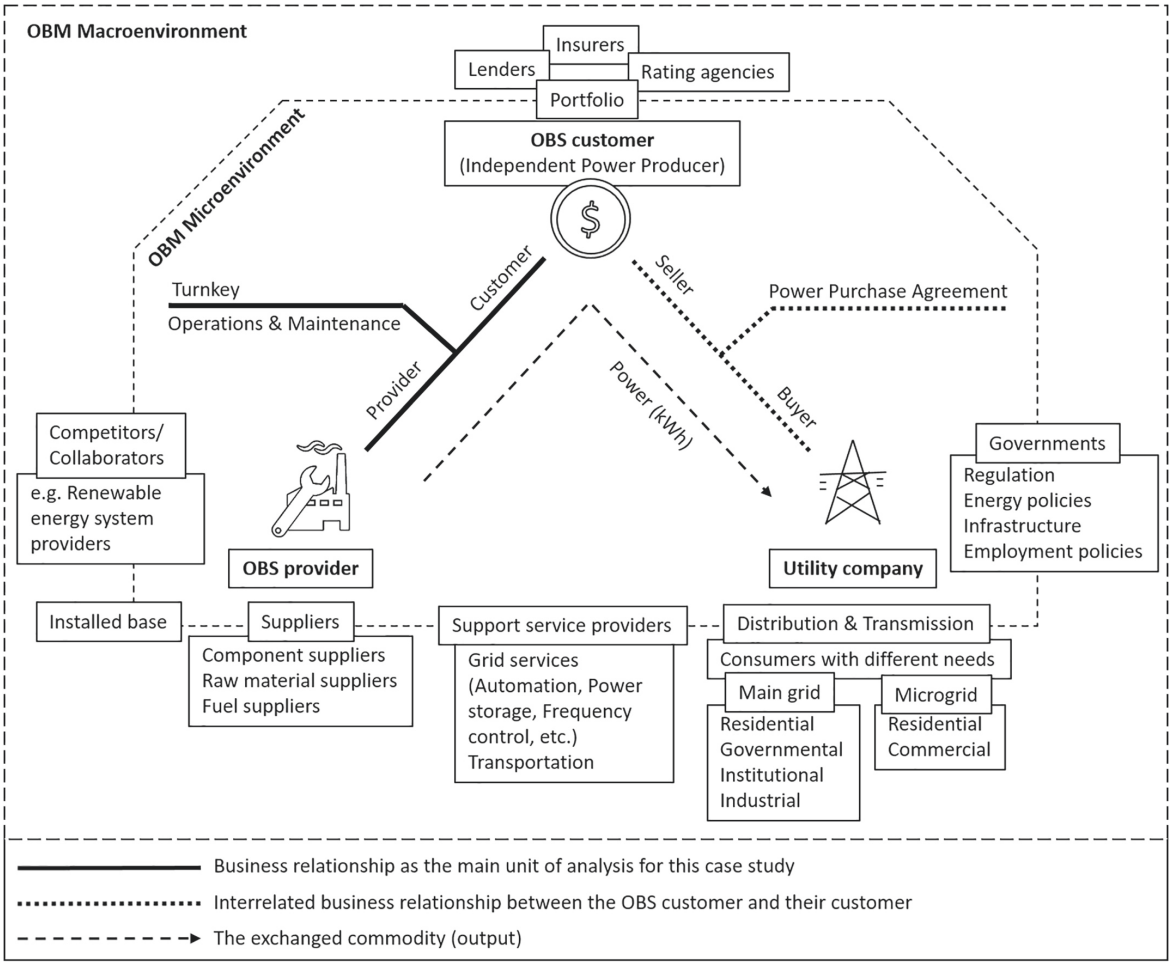

Fig. 2. Ecosystem of an OBM.

demonstration of benevolence often starts already in the design phase of the initial contract:

> A10: *"…and the operations and maintenance agreement can be, for instance, 5 or 10 years, but we intend to renew it to cover all of the so-called lifecycle."*

Thus, from the outset, the OBS provider strives to demonstrate its *refrainment from opportunism* by acknowledging that outcomes provided are situated by nature and that their intention is renegotiate the terms actively during the entire lifecycle of the facility. Additionally, we found that Alpha's offerings also involve contractual bidirectional adjustments on shorter timeframes (e.g. annual escalations). Because the customer (being an investment firm) may lack knowhow of technical specs and developments, Alpha could seize the opportunity to gain advantage based on the customer's dependency. Instead, the firm offers customers a transparent process description of the outcome delivery. During the delivery, this approach allows the customer to transparently monitor the relationship with regard to its *fairness*, resulting in dialogue of provider deservedness:

> A27: *"And they don't have the knowhow. That's when Alpha offers a package to deliver the turnkey and operations for 10, 15, 20 years with certain pricing policies, of course including annual escalations and reviews, etc. But that's when investors (customers) are satisfied."*

Lastly, *honesty* is a crucial part of intentional trust because despite communicating intentions and allowing evaluations of fairness, the trustee may not be truthful about them (Nooteboom, 2002). In other words, the OBS provider could be dishonest about its intentions or withhold information needed to evaluate fairness. In both instances, legitimation discourses impeding participation such as technologization, mystification and disciplining (Mantere & Vaara, 2008), could be employed by the OBS provider. However, in contrast, we found that Alpha endorses discursive practices that intend to involve the OBS customer in the development instead of restricting its participation. These practices included honest discussion of opportunism and serving by challenging the OBS customer's needs to renew the business model (see Table 2 for more quotes on legitimation discourses).

> A28: *"Before we practically served their needs, based on what they asked us to do… The current situation, on the other hand, is that we see together what works and, based on that, measure the performance. Then, based on these measures, when we reach certain performance targets, it will benefit us both. So, the contracting model is quite different from what it was before."*

4.3. Managing the lack of competence trust

We found that to maintain its legitimacy as a competent provider (competence trust) in the face of evolving customer needs, the OBS provider applies discursive legitimation strategies of rationalization, authorization and normalization. First, the rationalization strategy is employed because it offers the customer a rationale of how the provider's capabilities are useful in pursuit of sustained economic gains. The given strategy is required to align the different, path-dependent strategic goals and the converging knowledge bases of the two partners (see, Appendix 1, Table 1). For example, an Alpha respondent emphasized how the OBS customer, as an investment firm, easily values transaction costs over technical specifications:

> A2: *"In power plants you talk with investors, people who invest money in something that is going to give them a return on the investment, and they look at money, money out and money in."*

To address this problem, Alpha communicated rationales that tie together synergies between economic capabilities and operational capabilities, thus creating legitimacy for their means to realize the interlinked opportunities. We found that the rationalization strategy of the OBS provider is based on references to *forecasts*, *technology economies* and *R&C* of the provider. *Forecasts* as a source for rationality referencing are quite valuable for Alpha. This is due to the systemic complexity of not only the energy systems themselves but also the market dynamics in the energy sector. For instance, the five-minute settlement (electricity spot price settled every five minutes, used, e.g., in the US) was brought forth by an Alpha respondent:

> A16: *"If you think about that, the prices in the market change every five minutes; we have then taken all the prices for the last five years. That's 104,000 prices per year. And then, there are the service prices, like frequency control or these kinds of grid support services, so their prices. So that's well over half a million input cells counting in Excel. And that is then optimized every five minutes; that's what should be done with facility."*

Importantly, in energy markets as described above, making a profit with a power plant does not merely depend on the ability to predict market prices. An equally important feature is whether the facility can flexibly address price peaks technically. For instance, Alpha respondents highlighted how certain traditional generation units, such as gas turbines, are somewhat suboptimal for these types of environments because they need to cool down before restarting. Conclusively, the second discursive resource used in the rationalization strategy of the OBS provider is technology economies, as well summarized by an Alpha respondent below:

> A16: *"…these are the kind of models that turn engineering techniques to economics."*

Lastly, as technologies develop, operational capabilities based on the given technologies are prone to evolve as well. Thus, Alpha's respondents underscored in their discourses that keeping them involved in the business model is rational because their *resources and capabilities* develop together with technologies due to their manufacturing heritage. Therefore, the rationalization strategy also reflects the initial problem of the customer learning the operational capabilities during the outcome production.

> A29: *"The models and configurations, they need people who know the components. And the operations. That's not even necessarily the same person."*

Secondly, to assure the customer of their collaborative competencies, Alpha applied authorization as a discursive legitimation strategy. The authorization strategy employed by Alpha leans on references to value-adding authorities and aims to render Alpha a credible actor among these other actors. Gaining this authority-based legitimacy in the eyes of the customer is crucial for OBS providers because system-internal internal performance (e.g., average units produced vs. capacity; Grando & Turco, 2005) can only be improved to a certain point (for more quotations, see Appendix 1. Table 1). Thus, to innovate further value creation opportunities, collaboration and gain-sharing with external authorities becomes inevitable:

> A15: *"We just must be able to share knowledge, we must share this business model, we must share the digitalization with other industry players. Because no one of us alone can cover the entire value chain."*

We found that the typical authorities Alpha's discursive legitimation strategy refers to are financial, operational and technological authorities. *Financial authorities* such as banks or insurance companies have a major influence on the OBS customer's ventures in our case study. In this regard, OBS providers such as Alpha enjoy a special importance because they often have a proven history with financing institutions. Thus, Alpha's legitimation discourse underlined that many lenders favor Alpha to be involved as an operator. *Operational authorities*, such as grids or governments, form another party to which Alpha refers to in their legitimation discourse. For instance, the authorization discourse frequently speculated on possibilities the third-party collaborations could enable, such as joint predictions of system interruptions, conducted together with grid representatives (see, Appendix 2. Table 2). Lastly, in addition to financial and operational authorities, *technology* remains an indispensable authorization source for Alpha. For example, an Alpha respondent emphasized that the firm's technology adds to its authority among other authorities because it bridges together operational authorities' interests (e.g., renewable energy targets of governments) and financial authorities' interests (e.g., the stability of production, and hence revenues, in the intermittent renewable energy production):

> A31: *"And then it's perhaps also a societal element… our technology, Alpha's engines power plants; in many ways, they enable increases in renewables quite radically."*

Third, not only rationales and authority are required to convince the customer of the provider competence, but also examples illustrating both sources of legitimacy in practice. Where prior studies have identified *retrospective* and *prospective examples* as main discursive resources for the discursive legitimation strategy of normalization (Vaara et al., 2006), we found that firms may also refer to more intangible, *ideal examples* that work as frameworks for constructing the *prospective examples*. Retrospective referencing often builds on problematics of the prior activities, elaborating the kind of setbacks normally expectable with those activities. For instance, a respondent brought forward an example where a facility was operated by someone other than Alpha, which led to problems caused by a lack of technical knowledge:

> A16: *"And I remember when I had a chat with the gentleman running that system… It turned out that they had been running it only a quarter of the operating hours agreed in the original tender… And that fellow said that they had no clue, nor did they realize, what kind of features this facility actually had."*

Ideal examples, in contrast, focused on ideals that add value to the current business model, such as how Alpha regards solutions ideally as something that yields cash conversion (see Table 2 in the Appendix 2). Lastly, prospective examples present in Alpha's legitimation discourses referred to developments in progress that are likely to add value to the OBM. Importantly, these prospects leaned on not only Alpha's own resources but also those of other network actors, for example, how to integrate components such as other portfolio data into Alpha's equipment:

> A29: *"What is ahead of us is… that the devices communicate with each other and we can gather commensurate data of the operations."*

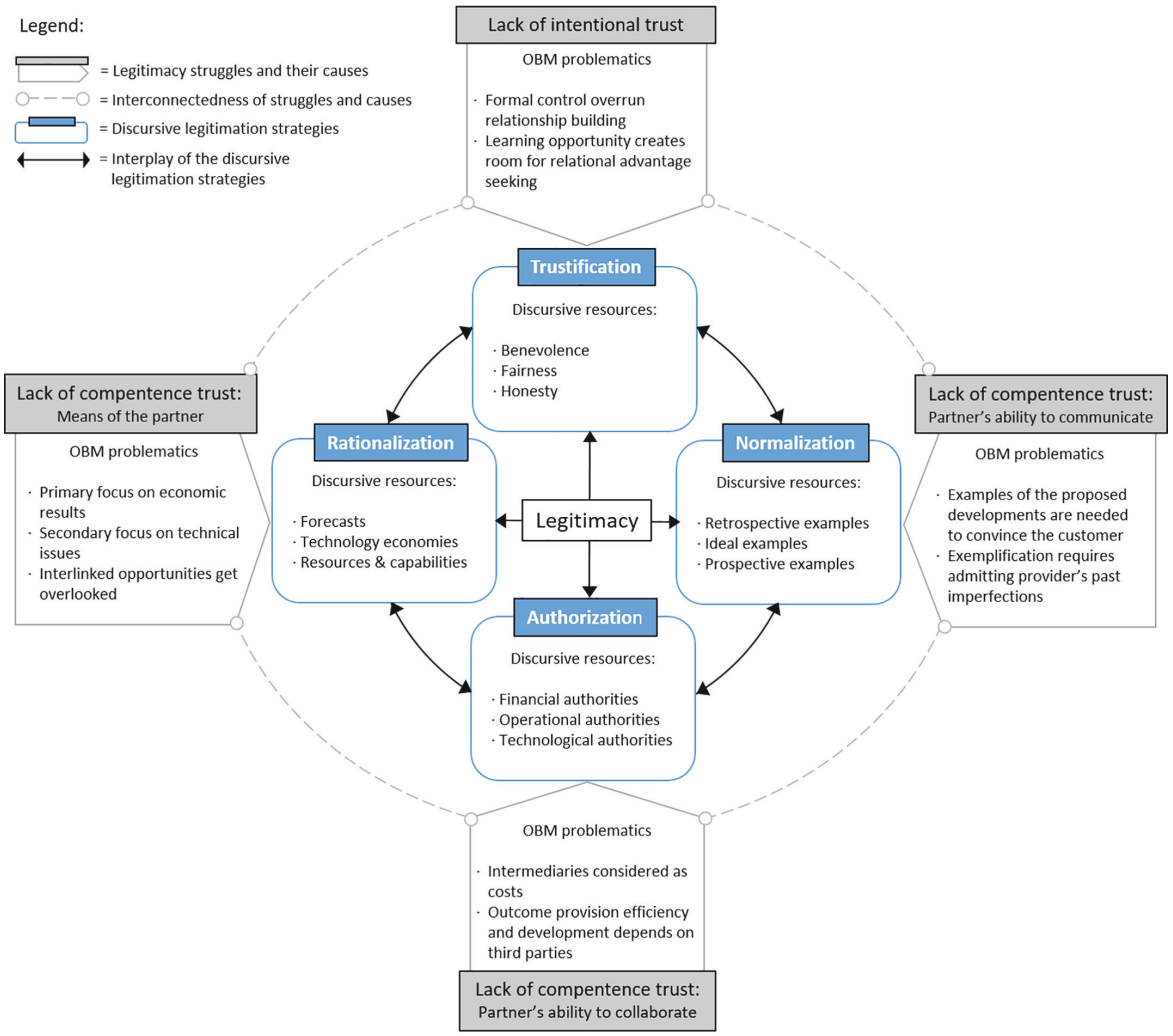

Fig. 3. Discursive legitimation of OBM development.

5. Discussion

In relations that involve high uncertainty and complexity, specific investments, and intensive knowledge transfer, one can expect explicit clauses to safeguard against multiple forms of opportunism (Klein Woolthuis et al., 2005). As all of the listed features characterize OBMs, high degree of contractual control functions are inherent to our case as well. Therefore, additions or alterations to the outcome production process require substantial efforts to renegotiate contracts (Sjödin et al., 2020). However, we found that not only technologies and customer requirements evolve during the service delivery (Erkoyuncu et al., 2013; Sjödin et al., 2020), but also the relationship between the customer and the provider is likely to develop because of the cooperation during outcome delivery. Nooteboom (2002) refers to this as "routinization," meaning that a relationship has been satisfactory for a while, and partners do not actively seek ways to gain advantage from it, while Morgan and Hunt (1994) argue that commitment and trust work in favor of relationship marketing because "it encourages marketers to resist attractive short-term alternatives in favor of the expected long-term benefits of staying with existing partners" (p. 22).

Organizations may apply discursive legitimation strategies to create, maintain and defend legitimacy (Suchman, 1995). For instance, to legitimate its existence, the auditing profession has faced a challenge of convincing users that accountants can be trusted (Holm & Zaman, 2012) in the wake of the global financial crisis and corporate scandals. Thus, trust is an integral part of gaining legitimacy (Jackson & Gau, 2016). The high contract specificity characterizing OBS seems to discourage relationship building, which may lead to opportunistic intentions and behaviors, causing legitimacy struggles between the customer and the OBS provider. To gain customer's trust in their intentions (Nooteboom, 2002), we found that OBS providers use a discursive legitimation strategy of trustification. Trustification builds on references to *benevolence* (Klein Woolthuis et al., 2005), *fairness* (Sjödin et al., 2020, p. 175) and *honesty* (Nooteboom, 2002) as values that guide the provider's operations. Thus, the use of trustification aims to answer the problem of conflict between contracts and trust (Malhotra & Murnighan, 2002), as strong contract control functions can decrease "goodwill-based trust" and thus decrease the net likelihood of

continued collaboration (Malhotra & Lumineau, 2011). After all, trust has no meaning if benevolence or goodwill are not present (Klein Woolthuis et al., 2005; Williamson, 1993).

In addition to trust in the intentions of the partner, the broader definition of trust includes the perception of competence of the partner to perform as expected (Malhotra & Lumineau, 2011; Nooteboom, 1996). We found that to maintain its legitimacy as a competent provider in the face of evolving customer needs, the OBS provider applies discursive legitimation strategies of rationalization, authorization and normalization. The triggering legitimacy struggle for rationalization is the lack of competence trust in the means of the partner to help the customer in achieving their long-term strategic goals. The crux of the rationalization strategy of the OBS provider is to persuade the customer to be "customers who want us to do it with them" (Baines & Lightfoot, 2014, p. 4) for rational reasons. Authorization, on the other hand, aims to create, maintain and reinforce the OBS provider's legitimacy as a value adding authority worth being associated with in the industry's many networks. Therefore, it aims to help in the legitimacy struggle of lacking competence trust in the provider's ability to collaborate. As "exemplars form an important element of organizational culture, in guidance of individual action" (Nooteboom, 2002, p. 51), we found that OBM legitimacy struggles may also be caused by the lack of concreteness, especially concerning the future of the partnership. In other words, the customer requires examples of the developments envisioned by the OBS provider. We found that the corresponding discursive legitimation strategy used by the OBS provider in this legitimacy struggle is normalization, which uses examples to support legitimacy.

Importantly, neither the legitimacy struggles, nor the discursive legitimation struggles manifest without reciprocal influence. The lack of intentional trust may impede the creation of competence trust, for example, if the customer does not trust that the provider is honest. How can one trust say the examples if there is doubt whether the normalizing actor is telling the truth? The interplay works in the other direction as well. Should there be doubts concerning the means of the partner (competence trust), their benevolent orientation will have less relevance. Although distinguishable, also the discursive legitimation strategies have dynamic influence over one another. For example, an actor using the trustification strategy may demonstrate their benevolence by referring to "satisfied customers" reference-cases with other customers. The given approach uses not only argumentation demonstrating the refrainment from opportunism, but also the elements of authorization and normalization. In summary, we present our findings in Fig. 3. We display the detected problematics that have potential to create legitimacy struggles (Habermas, 1975) during outcome delivery and the discursive legitimation strategies and their respective discursive resources to manage the struggles. Importantly, although the identified discursive legitimation strategies can help defend and maintain legitimacy, it is important to remember that legitimacy can also be built through means other than discursive (Luyckx & Janssens, 2020).

6. Conclusions

6.1. Theoretical contribution

OBS offerings are not a new business model (e.g., Rolls-Royce introduced the 'Power-by-the-Hour' trademark already in 1962; Rolls-Royce.com), and relatively much is known about the formal control exercised through contracts in many industries (Huang et al., 2019; Kim et al., 2007; Patra et al., 2019; Qin et al., 2020; Selviaridis & Van der Valk, 2019). Discourse, narratives and social interactions, however, have received limited interest not only in industrial B2B cocreation research (Kohtamäki & Rajala, 2016) but also in studies concerning OBMs (Hou & Neely, 2018; Kleemann & Essig, 2013). Our study intended to extend the previous research on discursive legitimation in OBMs. Our scope of interest, namely, discourse, was motivated by strategy as practice (SAP) theory. Practices are patterns of human activities that transpire over single individuals and even organizations (Vaara & Whittington, 2012) and can be divided into sayings and doings (Luoto, Brax, & Kohtamäki, 2017). Focusing on the former, we regard discourses as linguistically mediated representations of the world (Fairclough, 2003; Vaara et al., 2006; Vaara & Tienari, 2011) that can be instrumentally deployed to gain advantage (Rojo & van Dijk, 1997), such as social acceptance for an action or an actor (Van Leeuwen & Wodak, 1999). The given process of discursive legitimation aims to respond to legitimacy struggles (Habermas, 1975; Kostova & Zaheer, 1999) that deal with power relations of the actors involved (Vaara & Tienari, 2008, p. 986).

Focusing on the delivery phase (Sjödin et al., 2020) of a well-established OBM, we found that managers in an energy technology company providing outcome-based services mobilize four discursive legitimation strategies: *trustification, rationalization, authorization* and *normalization*. We did not consider narrativization (Vaara et al., 2006) or mythopoesis (Van Leeuwen & Wodak, 1999) as separate strategies because we regard them as tools for the other strategies. Moralization (Vaara et al., 2006), on the other hand, is a legitimation strategy more suitable in cases of broader legitimation audiences. The discovery of a new discursive legitimation strategy of trustification makes an especially important contribution to the legitimation research in marketing management. This is because to the best of our knowledge, the role of trust as an endemic part of legitimacy judgements has not been discussed in the management legitimacy literature, despite its ingrained presence in legal and societal disciplines (see, e.g., Jackson & Gau, 2016; Tyler, 2001). To distinguish between the two concepts, trust is willingness to rely on others based on positive and confident expectations concerning their intentions and behavior (Klein Woolthuis et al., 2005; Nooteboom, 2002; Rousseau et al., 1998), whereas legitimacy is a quality of social acceptability (Suchman, 1995; Tost, 2011) and possessing rightful power (Jackson & Gau, 2016). We not only found that the process of building intentional trust (Klein Woolthuis et al., 2005) is mirrored in the trustification legitimation discourse of an OBS provider but also that elements of competence trust (trust in, e.g., the means, collaborative and communicative abilities of a partner) are clearly present in the formerly identified discursive legitimation strategies of rationalization, authorization and normalization. This finding adds to the content of the preexisting strategies and amplifies the importance of the discovery of trustification.

6.2. Managerial implications

This study was designed bearing in mind not only the theoretic contributions but also the implications for managers developing OBMs. Prior studies have greatly advanced our knowledge about formal control in OBMs. However, rather than seeing trust and contracts as substitutes (see, e.g., Lyons & Mehta, 1997), this study adds to the knowledge of partnership development rather than just effective contract design and enforcement. We posit that the creation of trust (both intentional and competence trust) helps OBS providers to defend, maintain and recreate legitimacy as a value-adding factor in the outcome-based service system. We found that this is especially important in the case of OBMs because of the high contract specificity inherent for the given business models (Qin et al., 2020) that can make relational opportunism especially appealing and contractually feasible. We offer managers not only four empirically found problematics (lacking trust in the intentions, means, collaboration and communicative abilities of the partner) that can cause legitimacy struggles (Kostova & Zaheer, 1999) during the outcome-based service delivery but also four discursive legitimation strategies (with their respective discursive resources) to defend, maintain and regain legitimacy as an OBS provider.

6.3. Limitations and future research

Like all research, this study has limitations. As the study represents

an idiographic, single-case study, it seeks not to make nomothetic contributions. Nevertheless, we argue that our contextualized explanation of the causes of effects better captures the dynamics of the phenomenon. After all, legitimacy is a spatiotemporal phenomenon (Vaara et al., 2006), the discursive side of which should be studied at the levels of textual elements, production and institutional context (Fairclough, 2003). The given aspect also posits that different discursive legitimation strategies may be found in service relationships other than OBS, warranting more research. Additionally, because we chose to take a discursive perspective, further studies could investigate practices other than discursive (see, e.g., Omizzolo Lazzarotto, Borchardt, Pereira, & Almeida, 2014) by which the outcome providers build trust and legitimacy among their customers. Moreover, as we chose to investigate a well-established OBS relationship and the outcome delivery phase specifically – although not fully disregarding the path that had led to this point –future studies could place emphasis on how OBS providers create legitimacy in the define and design phases (Sjödin et al., 2020).

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Appendix 1

Table 1
Legitimacy struggles in OBM.

Further examples of quotations contributing to first-order concepts	Problematics	Legitimacy struggles
A7: "Selling O&M agreements was… A lot of contract negotiations." A24: "Because the fundamental problem with these has always been how to measure, how to come to an agreement about the measures and how indisputable are the measures. So it's far from simple." A27: "…the investor (customer) knows that they will be able to cut costs when they, at some point, start operating themselves. They basically want to gain access to the core."	Formal control overrun relationship building	Lack of intentional trust
A27: "…and of course, it's their property. You cannot restrict them there, they can monitor… after which our prospects of continuing the operation agreement are fairly limited." A17: "And that's one of the advantages of the O&M business, you don't let anybody in, we have 100% market share of that installation for the length of the agreement"	Learning opportunity creates room for relational advantage seeking	
A21: "So, they can be investment firms that may not have the knowhow of the details of energy markets but regard it as a good investment that could pay itself back in, well, a couple of years." A27: "…we must point out what is the customer's revenue generation model in it."	Primary focus on economic results	
A13: "…customers want to focus on their core business and forget the engine room and power generation in these facilities." A2: "They don't think about any technical scopes or something so much, it's like third key solution for them." A24: "…building and delivering machines, it has been the core for Alpha for ages.	Secondary focus on technical issues	Lack of competence trust: means of the partner
A10: "…to improve whole systems, it all emerges from the operations of the devices in the end." A22: "What should be understood is our solutions, our plants, how do they work, and how customers generate earnings and what's important for them, so it's extremely technical marketing." A18: "…to have control in-house so, that the dependency on intermediaries would not be severe."	Interlinked opportunities get overlooked	
A6: "…if the customer buys the components from multiple different suppliers, then they certainly need to invest in the integration…" A25: "Different parties need different knowledge, and it may be needed for equipment monitoring and operating, or the invoicing, meaning what is the compensations based on."	Intermediaries considered as costs	Lack of competence trust: partner's ability to collaborate
A25: "…for it to be actually scalable business, it may be that we really need the kind of parties that are not even in the picture today." A15: "And if we can't collaborate, it's just not going to fly…"	Outcome provision efficiency and development depends on third parties	
A10: "It is very much so, that nobody really buys anything nowadays if it does not contribute in terms of added value for the system" A31: "It turns into this Steve Jobs kind of stuff that you need to tell the customer about things they do not know yet, and neither do we. So, it's nowhere near easy."	Examples of the proposed developments are needed to convince the customer	Lack of competence trust: partner's ability to communicate
A15: "…you need to share knowledge… plans and opportunities to find some kind of interest for all to practice these things." A11:" Because solar panels, for instance, are not our own product or within our competences, but basically iron bought elsewhere to be integrated to our own (plants)"	Exemplification requires admitting provider's past imperfections	

Appendix 2

Table 2
Discursive legitimation strategies.

Further examples of quotations contributing to first-order concepts	Discursive resource	Discursive legitimation strategies
A15: "On the other hand, these should be viewed as opportunities rather than constraints and then to consider within the value chain, what to take on your own account, what are you trying to accomplish, and whether there is a business model that provides all the participants their respective share, so that everyone benefits." A24: "From our perspective, which is more beneficial, offering a plant repair or a new plant… Honestly, it should start from the customer value and what is best for them."	Benevolence	Trustification
A15: "They want us to give promises, or they want that promises are kept. And they want that… if promises are not kept, it will incur harm for us and be of benefit for them." A19: "So there's always both the carrot and the stick."	Fairness	

(*continued on next page*)

Table 2 (*continued*)

Further examples of quotations contributing to first-order concepts	Discursive resource	Discursive legitimation strategies
A27: "They can watch and follow what we are doing, so they have this kind of five-year university… But these are recognized issues in a sense…"	Honesty	Rationalization
A29: "And in a way, the need often comes from the customer perspective. If a company wishes to say they are customer-driven, then they really should sell… what they need, not what they ask."		
A13: "And electricity price is of course a good indicator, what is estimated that will happen to it in the next year and a half. It affects the investments and uptimes of power plant customers quite substantially."	Forecasts	
A7: "You have to understand where is the world going, where is the market going? What will be required in the coming years, what kind of fuel, what kind of capability of power plant"		
A7: "We also want to be our customer's best business partner and to create customer value through the creation of technology solutions that subsequently improve our customer's efficiency both economically and technically."	Technology economies	
A25: "The digital solutions must be built based on what's the business model."		
A16: "So, our value proposition is an outcome of a massive calculative function"	Resources & Capabilities	
A29: "It requires that the automation engineer, IT engineer and the mechanical guys discuss with one another."		
A17: "I mean we have been co-operating with the reinsurers… if you hire Alpha's operator, we will give a discount on insurance because we rely on them…"	Financial authorities	
A25: "Financial institutions, investors, insurance companies, rating agencies and other parties like these may be needed."		
A17: "…a professional operator. It's an insurance for the insurance company."		
A15: "And might it be possible to predict some consumption spikes in the power generation in co-operation with the grid, which would give our facilities the best preparedness to react upon and predict them."		
A18: "One should remember that financers or international environmental organizations or legislative bodies have quite significant roles in these things."	Operational authorities	Authorization
A17: "…in the western world, an owner or investor can find themselves competent manpower. But when you are in Africa it's very difficult."		
A29: "Most likely it will develop into a direction where the equipment itself contains the intelligence to monitor its own operation…	Technological authorities	
A29: "And this is kind of the very core of digitalization, removing the silos and collaboration beyond borders."		
A17: "…requirement is that there is an experienced operator… preferably the manufacturer."		
A6: "…perhaps we just did not previously know how to sell it so that the integration would have some value to it."	Retrospective examples	
A31: "We understood that the plant is not just a plant, but a part of a system, it's part of the customer's investment portfolio."		
A1: "In our eyes… solution is mainly conversion, for example, cash conversion."		
A15: "With these new digital services and measurement techniques, we end up in situations where we unambiguously have correctly measured things… everything we can measure we can guarantee."	Ideal examples	Normalization
A17: "We have modules so we come with units and put it together as Lego."		
A29: "What is ahead of us is a certain integration of our installed base in terms of data. So that the devices communicate with each other and we can gather commensurate data of the operations."	Prospective examples	
A16: "…to see what is their portfolio like; coal, nuclear what else is there? Then to optimize the portfolio for the future… in order to maximize the profits for that portfolio."		

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