Conceptualizing Resource Integration: The Peculiar Role of Pure Public Resources

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Resource integration is fundamental to value co-creation. In service-dominant logic, operant resources are the primary interest of actors' economic exchange. However, the resources in service-dominant logic are rarely classified and analysed in detail. In addition, natural resources are widely neglected in conceptualizations of resources and resource integration.

To fill these research gaps, this article aims to extend the existing conceptualizations of resource integration by specifically focussing on the integration of different types of resources. For this purpose, resource classifications from both the German-language literature, which is internationally mostly unknown, and the English-language research are included. Furthermore, natural resources are used as a case to discuss the peculiar role of pure public resources. Following calls for 'oscillating foci' to gain a better understanding of value co-creation, we further analyse resource integration at different levels of analysis by specifically focusing on the micro-level. Nevertheless, we emphasize the interdependencies between different levels of analysis. Therefore, we close important research gaps in the service-dominant logic literature, specifically regarding resource integration.

1. Introduction

The publication of Vargo and Lusch's (2004) article, which introduced service-dominant logic (SDL) as a new lens for marketing, initiated a tremendous stream of research dedicated to SDL's refinement, extension, application and critical reflections thereupon. It has also led to a focus on some of its main concepts, especially value co-creation, which has resulted in new perspectives on and better understanding of actor collaboration. Within the value co-creation paradigm, the involved actors are understood as resource integrators that use resources provided by other actors and combine them to derive benefit for themselves. At the same time, they also provide resources to others, who integrate them for their benefit. Since these processes typically require a multitude of actors for mutual resource provision, value co-creation is embedded in so-called service ecosystems (Vargo & Akaka 2012).

Resource integration (RI) is central for a deeper understanding of value co-creation, actor collaboration and networks. Since different types of resources exist, conceptualisations of RI must consider that different types of resources are integrated in different ways. While various types of resources have been discussed in this regard, pure public resources and the role of actors without agency have so far largely been neglected in the discussion of RI in SDL. For example, natural resources are clearly essential for outdoor activities, and many of these resources are not provided by other actors but can be integrated

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without the permission of any other actor (Horbel 2013). Consequently, to understand RI, it is necessary to differentiate between different types of resources and how actors can integrate them to co-create value. The objective of this article is therefore to extend the existing conceptualizations of RI to include pure public resources as a specific type of resource and illustrate the processes of their integration in value co-creation by various actors.

Thereby, this article makes some important contributions. First, it provides an overview of classifications of resources from past research relevant to RI. This review for the first time integrates resource concepts from both SDL and goods-dominant logic (GDL) with the concepts discussed in earlier German-language research, which have remained largely unnoticed by the international research community. Second, pure public resources and their peculiarities when actors utilize them for value co-creation are introduced to broaden the understanding of RI using natural resources as an example. The differences with private and impure public resources in this regard are further explained, enabling us to, third, extend well-established resource classifications in international marketing research by including pure public resources. Fourth, a framework for the understanding of RI is proposed, which allows for considering different levels of analysis and their connections, namely, micro (dyads and triads), meso (engagement platform: EP) and macro (service ecosystem) levels. Fifth, we demonstrate how the application of 'oscillating foci' benefits the gaining of a better understanding of RI as the interdependencies between analyses at micro-, meso-, and macro-levels can be revealed.

The paper proceeds as follows. We first provide some basic foundations for RI. Since the German-language literature on resource integration has a long tradition but was hardly recognized in international research, we present a synopsis of the contributions of this particular stream of literature to the understanding of RI until the early 2000s, when it gradually merged with international research, especially on SDL, due to a major shift towards a more international orientation among German researchers.

Subsequently, an overview of the development of SDL with a particular focus on the concepts of value co-creation and RI is provided. Further, we discuss why the analysis of value co-creation and RI requires different levels of analysis. These levels are briefly introduced. We then provide an overview of various classifications of resources that have been proposed for RI. This review particularly discusses the advantages and disadvantages of the different approaches. The conceptualisation of RI starts with a discussion of the peculiarities of natural resources as a case for pure public resources since these matters have thus far only rarely been considered in RI. We discuss how they can be integrated into existing resource classifications. Furthermore, we propose an overall framework for resource classification that considers existing approaches and specifically includes pure public resources. Finally, we conceptualise RI considering the different levels of analysis for value co-creation (micro-, macro- and meso-levels) and the corresponding types of resources. RI at the micro-level is analysed in greater detail to demonstrate how the resources of actors without agency are used. The article concludes with a brief summary of the main research contributions and limitations.

2. Resource Integration

2.1. German-language Research

There has been a long tradition of German language service management research, with valuable approaches developed but largely going unnoticed in the international literature. Certainly, the main reason is that the German language lost its original importance in international research after the Second World War. Despite the English language having become the predominant 'scientific language', most German scientists continued to publish in German. However, a new wave of internationalisation at the beginning of the 21st century led to a dramatic shift and an increasing number of English language publications on service management by German researchers. This shift roughly coincided with the publication of the seminal article on SDL (Vargo & Lusch 2004), which emphasized the importance of RI for value creation. German researchers in marketing and service management since then have become active contributors to the debate around SDL and RI and have published even in the highest-ranked journals.

The following section provides an overview of the contributions to value creation and research integration that were made in the German-language research until the early 2000s, when German researchers' contributions to international, English-language research rapidly increased, and the formerly largely separate research streams merged. German-language research on service management at a very early stage recognized an important distinction between general marketing and services that relates to RI (e.g., Maleri 1973). At the time, it was common to consider resources as production factors, including raw materials, auxiliary materials, operating supplies, and managerial and other human resources (Gutenberg 1951). However, research on service management emphasized that, for services, resources provided by the customer or even the customer as an individual must be included in the production process. The inclusion of such 'external resources' was therefore identified as a special feature of services (Maleri 1973).

Indeed, the debate around the distinguishing characteristics of tangible goods and services dominated the German-language research on service management for many years (e.g., Camphausen-Busold 1981; Decker 1975; Gerhardt 1987; Graumann 1983; Hilke 1989; Kulhavy 1974; Maleri 1973; Meyer 1993). Most publications attempted to distinguish services from tangible goods by emphasizing the need to integrate external factors into the production process as a special feature of services. However, this view was also criticized, and it was emphasized that external factors also play roles in the production process of tangible goods (Altenburger 1980).

A ground-breaking article in Germany's top management journal *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung* emphasized for the first time that the distinction between services and tangible goods is not economically meaningful (Engelhardt, Kleinaltenkamp, & Reckenfelderbäumer 1993). It is certainly no exaggeration to say that this article, of which he was a co-author, marked the initiation of Michael Kleinaltenkamp's outstanding career as a researcher in service management. The article contributed four main arguments to the economic discussion (Engelhardt et al. 1993): First, a strict distinction between tangible goods and services is not economically meaningful. Second, sales objects consist of a bundle of partial objects with tangible and intangible components. Third, external factors are integrated to varying degrees into the creation processes of both tangible goods and services. Fourth, sales objects can be classified along two dimensions: (1) on the process dimension according to their degree of 'integrativity' (Freiling & Paul 1997); and (2) on the outcome dimension according to their degree of immateriality.

The term 'integrativity' is similar to the term 'resource integration' (Kleinaltenkamp, Bach, & Griese 2009), yet there are also differences. Whereas RI can refer to every type of actors' perspectives, integrativity is limited to the firm's perspective. Integrativity refers to the phenomenon of including customers' resources (external resources) in the organisations' production or creation processes. Thereby, integrativity can be more precisely determined by considering two dimensions: First, the 'depth of integrativity' ('Eingriffstiefe') is high when the integration of external factors is required at many stages in the value chain. Second, Engelhardt et al. (1993) introduced 'intensity of integrativity' ('Eingriffsintensität'), which refers to the extent to which and manner in which external factors are included.

In the further course of the discussion within the German service management community, the other so-called IHIP characteristics (intangibility, heterogeneity, inseparability, perishability) of services were also shown to be economically irrelevant for the differentiation between tangible goods and services (Woratschek 1996). Instead, Woratschek (1996) proposed a modification and extension of Engelhardt et al.'s (1993) approach. He suggested that three dimensions -- the process dimension, the output dimension and the risk dimension -- should be considered from an economic perspective. He supported Engelhardt et al.'s (1993) view considering the degree of integrativity at the process level. At the output level, the degree of individuality and, at the risk level, the degree of market uncertainty were proposed to be the economically relevant factors influencing the conclusion of sales contracts and the resulting revenues and costs (Woratschek 1996).

In particular, the discussion around the relevance of integrativity in the German-language research demonstrates that the German scientific service management community was at the forefront of service management research. Nevertheless, the application of the concept of integrativity was largely confined to a micro-level analysis, i.e., to dyads and triads of relationships mainly including firm(s) and customer(s). At least in coopetition scenarios, such as sports events, integrativity must be extended to include external resources of competitors or other partners ('competition-induced integrativity'; Woratschek 2002, p. 13). Through this extension, the German concept of 'integrativity' becomes more similar to the concept of RI as established in the SDL. Ultimately, when 'integrativity' is extended to include the idea that all actors integrate each other's resources to create value, the concept largely overlaps with RI. It is further worth mentioning that SDL in the beginning also considered RI mainly from company and customer perspectives, while the extension to network constellations (Vargo & Lusch 2006) and service ecosystems (Vargo & Akaka 2012; Vargo & Lusch 2016) followed somewhat later.

2.2. Service-Dominant Logic

In the international service marketing literature, the concept of RI became very popular through SDL. In the original publication, Vargo and Lusch (2004) intended to develop a new dominant marketing logic called 'service-centered dominant logic' (p. 2). SDL was established as a contrast to traditional goods-centred logic (goods-dominant logic: GDL) in which products and services were understood as being the centre of economic exchange.

According to SDL, the benefits derived from the specific competences, knowledge and skills of other actors are the core of economic exchange, not actual goods or services. These applied competences, knowledge and skills are called 'service'. Thereby, SDL's perspective on economic exchange reflects the process of using -- among other things -- a firm's resources for the customer's benefit and -- among other things – a customer's resources for the firm's benefit (Vargo & Lusch 2004). Consequently, the

process of RI is the focus, rather than a specific type of output (Vargo & Lusch 2006), further implying a different view of the role of customers in economic exchange, compared to GDL. Customers must always be active parts of value creation because they use and integrate products and services that they buy and act upon to gain benefits from economic exchange. Because firms act in a similar way to gain benefits from economic exchange, that is, they integrate customers' and other resources, SDL uses the term 'actors' to refer to both firms and customers, as well as others.

Actors are endogenous to economic exchange (Vargo & Lusch 2006). They demand resources from other actors but also supply resources to them. Hence, firms and customers, as well as other actors, demand and supply resources to each other and integrate them in a collaborative process called value co-creation. As a consequence, all actors in service exchange are fundamentally resource integrators (Vargo & Lusch 2011). By broadening SDL from a dyadic relationship (Vargo & Lusch 2004) towards a network orientation, it increasingly develops into a logic for markets (Vargo & Lusch 2016), rather than a logic of marketing, as stated in the original article (Vargo & Lusch 2004).

Another key difference between SDL and GDL is the conceptualisation of value. From the perspective of SDL value for 'consumers' (or more precisely, customers and all other actors) is 'value in use', instead of being determined by the suppliers and embedded in products and services (Vargo & Lusch 2004). Therefore, a company cannot on its own create value for the customer. The customer contributes to the creation of value not only by using the products and services of companies as the output of a combination of resources but also by using his or her own skills, knowledge and competence, as well as the skills of others to co-create value. The same applies to the firm and all other actors in a network. In this way, the view is extended to service ecosystems (Vargo & Akaka 2012; Vargo & Lusch 2016), in which a variety of multiple actors contribute resources and use the resources of others to co-create value. RI is the process by which 'resource integrators (actors) can co-create phenomenologically determined value' (Kleinaltenkamp et al. 2012, p. 201).

Since value is 'phenomenologically determined by the beneficiary' (Vargo & Lusch 2016, axiom 5), actors' evaluations based on RI are decisive. There are many actors involved in RI, and many experiences in long-term relationships can play a role. Therefore, value determination is anything but simple. Actors must perceive benefits; otherwise, they would not engage in collaboration, and no exchange on markets would occur; i.e., no sales contracts would be made. Hence, co-created value is an outcome of RI, on the one hand. On the other hand, there is consensus about neither perceived value measurement nor about its meaning (Kleinaltenkamp et al. 2012; Sánchez-Fernández & Iniesta-Bonillo 2007). However, most authors agree that value is subjective and context-dependent (Rust & Oliver 1994; Vargo & Lusch 2004; Zeithaml 1988).

For service exchange to occur, actors must engage in RI. Because of the involvement of multiple actors, RI 'requires process(es) and forms of collaboration' (Kleinaltenkamp et al. 2012, p. 203). Therefore, Kleinaltenkamp et al. (2012) called for gaining a better understanding of 'how to design and configure the integration process' (p. 203).

Institutions, as well as institutional arrangements, serve to both enable and constrain RI and hence service exchange (Vargo & Lusch 2016). Institutions are 'humanly devised constraints' (North 1990, p. 97), structuring interactions or regulations, normative rules, and cultural-cognitive beliefs that guide actors' behaviour (Scott 2014). Regulative, normative and cultural-cognitive institutions represent the so-called 'pillars', which are conveyed by different carriers (Jepperson 1991; Scott 2014). Carriers are symbolic systems (rules, values, norms, classifications, schemas, and frames guiding behaviour), relational systems (patterned interactions linked to actors' social positions), activities (e.g., monitoring, sanctioning, habits, job routines, predispositions), and artefacts (objects made by human beings). Higher-order sets of interrelated institutions are called 'institutional arrangements' (Vargo & Lusch 2016). In the fifth axiom of SDL, institutions are described as human-devised resources that provide the structural properties of service exchange (Vargo & Lusch 2016, p. 17). Thus, institutions form the social context of exchange, represented by unique actors and the unique reciprocal links between them (Chandler & Vargo 2011; Edvardsson, Tronvoll, & Gruber 2011), which is why value and value creation cannot be considered without context. Context-forming institutions are resources integrated by actors in service ecosystems, such as social groups, industries, and societies, to guide service-for-service exchange. Importantly, institutions and institutional arrangements can both represent constraints and enabling properties for exchange and RI (Scott 2014; Vargo & Lusch 2016). Since institutions and institutional arrangements are a combination of operant resources of different actors, they form a specific type of resource at a higher level of aggregation.

Originally, Vargo and Lusch (2004) formulated eight foundational premises (FPs) to express the core ideas of SDL. These premises were developed over time, extended and merged into five axioms (Vargo & Lusch 2016, p. 18):

1. 'Service is the fundamental basis of exchange.'
2. 'Value is cocreated by multiple actors, always including the beneficiary.'
3. 'All social and economic actors are resource integrators.'

4. 'Value is always uniquely and phenomenologically determined by the beneficiary.'
5. 'Value cocreation is coordinated through actor-generated institutions and institutional arrangements.'

2.3. Levels of Analyses

In general, complex problems must be analysed at different levels of aggregation. Chandler and Vargo (2011) suggested using 'oscillating foci' to gain a better understanding of structures and activities. We follow this argumentation and apply a commonly proposed distinction at three levels to analyse the role of RI, as well as institutions and institutional arrangements for value co-creation processes: (1) the service ecosystem perspective at the macro-level; (2) engagement platforms at the meso-level; and (3) detailed analysis of RI at the micro-level (Breidbach, Brodie, & Hollebeek 2014; Breidbach & Brodie 2017; Ramaswamy 2008, 2009a).

RI occurs in a complex net of actors who are interdependently related to each other (Frow et al. 2014). All of these relationships build the holistic unit of analysis of exchange between actors at the macro-level (Maglio & Breidbach 2014). This unit is called the service ecosystem, defined as 'relatively self-contained, self-adjusting systems of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange' (Lusch & Vargo 2014, p. 161).

At the meso-level, we consider EPs as the relevant unit of analysis of RI. EPs are 'physical or virtual touchpoints designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value between actors in a service ecosystem' (Breidbach et al. 2014, p. 594). In marketing and service research EPs were mainly analysed in relation to information and communication technologies (e.g., Ramaswamy 2009b; Sawhney, Verona, & Prandelli 2005), but today, physical touchpoints are also regarded as EPs (e.g., Breidbach et al. 2014; Frow, Nenonen, Payne, & Storbacka 2015). EPs are normally driven by pivotal actors who manage them and grant access to other actors. EPs gather subsets of actors within service ecosystems that have special common interests of exchange. The number of actors can be very large and their activities diverse. Thus, although EPs are less complex than service ecosystems, their level of aggregation is still too high to describe the resources integrated by the actors in detail and completely. However, EPs are very well suited for analysing networks of actors and their relationships. For example, mappings of actors that are more closely related to each other can be created to understand how they co-create value.

A detailed analysis of RI can be conducted at the micro-level. However, in detailed analyses, the superordinate relationships are lost. If, for example, researchers analyse the resource exchange of a triad of actors, they ignore that value creation requires the RI of other actors. While this paper focusses on analysing RI at the micro-level, it is not limited to this level. 'Oscillating foci' are applied to consider the meso-level and macro-level, as well as interde-

	German Perspective (until 2004)	SDL (2004)	SDL (2020)
Analytic level of economic exchange	mainly micro-level (dyads and triads)	mainly micro-level	micro-, meso- and macro-levels, extension to network constellations and service ecosystems
Core of economic exchange	combinations of products and services	service defined as applied knowledge, competences and skills	service defined as applied knowledge, competences and skills
Value	utility as an outcome of collaboration between firm and customer determined by the beneficiary (perceived customer value, firm's financial value)	value as a co-creation process of firms, customers and other actors whereby value is determined by the beneficiary	value co-creation processes of social and economic actors whereby value is determined by the beneficiary
Resource integrators	mainly firms (and competitors: 'competition-induced integrativity'), as well as customers	mainly firms and customers	all social and economic actors
Resource categories	internal and external production factors	operand and operant resources	operand and operant resources
Operationalization of RI	depth and intensity of integrativity	not specified	not specified
IHIP-properties of services	regarded as relevant by mainstream *(but not by Woratschek 1996)*	regarded as irrelevant	regarded as irrelevant
Dimensions of RI	process, outcome *(Engelhardt/Kleinaltenkamp/ Reckenfelderbäumer 1993)* and risk dimension *(Woratschek 1996)*	not specified	not specified
Coordination mechanism	institutions, especially property rights	not specified	institutions and institutional arrangements

Tab. 1: Comparison of German Service Management Research and SDL

pendencies between the levels, which is useful because RI is the basis for the exchange between actors in a complex service ecosystem that serves to create value for all actors.

In *Tab. 1*, the German perspective is contrasted with SDL until 2004. Thereafter, international scholars jointly developed SDL (Brodie, Löbler, & Fehrer 2019) further to its status in 2020, which is also shown in *Tab. 1*.

2.4. Resource Classifications

A vast variety of resource categorizations have been proposed under both the GDL and SDL paradigms. In SDL, resources are distinguished as operand (raw materials, physical products) and operant resources (skills, competences, knowledge) (Constantin & Lusch 1994). Goods are operand, physical resources that must be acted upon with operant resources (Vargo & Lusch 2004). Hence, operant resources are applied to act on other resources, whereas operand resources are manifestations of the application of operant resources. Service exchange requires the application of knowledge, competences, and skills (operant resources), while products and services are basically operand resources that must be integrated with other resources to co-create value. Edvardsson et al. (2011) aimed to connect SDL's resource categorization with Hunt and Derozier's (2004) GDL-based resource typology and assign the operand resources to the physical resources and the operant resources to the human, organizational, informational, and relational resources. However, two resource categories mentioned by Hunt and Derozier (2004), namely, financial and legal resources, are not considered in Edvardsson et al.'s (2011) categorization.

Therefore, we propose refining the assignment of the resource categories proposed by Hunt and Derozier (2004). We agree with Edvardsson et al.'s (2011) view that physical resources correspond to operand resources. Under the SDL paradigm, human resources should not be limited to the skills and knowledge of individual employees but be applied to all types of actors respectively resource integrators and be categorized as operant resources (Evardsson et al. 2011). Physical resources only provide value if they are edited or used for any other purpose, which requires operant resources so that they ultimately serve to co-create value, as formulated in SDL. Hence, in accordance with Edvardsson et al. (2011), we categorize physical resources as operand resources.

Informational resources are knowledge from consumer and competitive intelligence. At first glance, these resources also seem to match operant resources, but often these informational resources are documented on paper or electronically so that an unambiguous assignment can be questioned. Organisational resources are competences, controls, policy and culture. In SDL's terminology, such resources could be interpreted both as institutions and as operant resources. Vargo and Lusch (2004) explicitly mentioned competences as being operant resources. Policy and culture are, however, institutional arrangements. Legal resources constitute a similar case. As argued above, institutions and institutional arrangements are operant resources at a higher level of aggregation (Edvardsson et al. 2011). Legal resources are in general institutional arrangements. However, in some cases they are created, possessed and exchanged for money between actors (e.g., sponsoring rights); i.e., they are very specific to one service-to-service exchange. Rights in general are also documented and therefore include physical resources. Similar difficulties exist when financial resources are considered. Access to financial markets consists of a combination of ownership rights (operant resources) and legal arrangements (institutional arrangements). At first glance, coins and notes are physical resources, but their value as perceived by actors is reflected in actors' trust in the currency and thus the operant resources of the governments and organisations that make them available. Similarly, while deposit money is printed on a piece of paper by a bank, the associated financial value depends on governments' or others' behaviours. Therefore, financial resources can be both operant and operand resources, and any attempt to clearly allocate financial resources to one of these categories appears to be a relapse into GDL.

The difficulties in clearly distinguishing resources according to the categories proposed by Hunt and Derozier (2004) and assigning them to the common SDL resource categories 'operand' and 'operant' resources indicate that not only RI but also the roles that various resources play for a particular RI and hence for a specific value co-creation process are dependent on context. Consequently, we argue that the classification of resources according to Hunt and Derozier (2004) can be used for the analysis of the resources in a specific value co-creation process at the micro-level. An unambiguous, general allocation to the categories 'operant' and 'operand' resources is neither possible nor meaningful. It fails because operand and operant resources are more abstract than the categories suggested by Hunt and Derozier (2004).

Under the SDL paradigm, resources have also been classified according to their sources as public, private and market-facing resources to indicate that resources from different types of sources are integrated in different ways (Horbel 2013; Vargo 2012; Vargo, Lusch, Horbel, & Wieland 2011). Horbel (2013) illustrated this categorization using examples from the tourism industry. Roads and trails are examples of public resources, for which public authorities in a service-for-service exchange receive public currency, e.g., tax payments, in return. Private resources, like companions during a trip or biking skills, are exchanged for social currency, e.g., friendship or others' support. Prod-

ucts or services such as mountain bikes or helmets, which are exchanged for economic currency (i.e., money), represent market-facing resources.

More specifically, Horbel (2013) illustrated RI and value co-creation in the tourism industry based on Goeldner and Ritchie's (2011) tourism phenomenon model. In their model, Goeldner and Ritchie (2011) identified 'natural resources and environment' as a fundamental dimension of tourism management since each destination has physiographic and climatic peculiarities, which considerably account for their attractiveness (Gunn & Var 2002; Horbel 2013). Therefore, Horbel (2013) added an additional resource category of 'natural resources'.

3. The Case of Natural Resources

Following the argument by Horbel (2013) that natural resources represent a peculiar phenomenon of RI compared to the integration of other resources, we subsequently discuss their special characteristics in greater detail. This analysis shows that (some) natural resources represent a resource category that more generally can be described as pure public resources, and we demonstrate how these resources are different from private or impure public resources. In addition, we relate categorizations of natural and other resources to the different levels of analysis of complex phenomena.

3.1. Natural Resources and Actors' Agency

Natural resources have special characteristics compared to the resources discussed so far so that, in our view, they deserve special treatment. Horbel (2013) pointed out that, although natural resources can be integrated by actors of a service ecosystem, they were not created by humans, even if humans can change them. Conversely, natural resources exist (at least originally) independently of actors and are not their property: 'As a consequence, they can be used in RI without reciprocal service-for-service exchange processes between actors taking place, although they also do not belong to the resource integrator who is using them' (Horbel 2013, p. 139).

This fact does not mean that there is no exchange between the natural environment and the actors who integrate natural resources. "Service exchange is the fundamental basis for relationships between all species" (Löbler 2017, p. 75). However, the difference from other sources of resources is that the environment has no agency. Agency is defined as the ability of a self-reflexive actor to act with choice (Archer 2000) or as 'the temporally constructed engagement by actors of different structural environments' (Emirbayer & Mische 1998, p. 970). Kleinaltenkamp et al. (2012) emphasized that actors require agency to act on their own resources, and if they have other actors' allowances, they can additionally act on their resources to co-create value. Stated differently, if actors have no agency, there is no need to negotiate a contract or ask for an allowance to act on their resources.

Because the environment has no agency, it can neither agree to an exchange nor value the benefit (or sacrifice) resulting from an exchange. However, social and economic actors, who use natural resources, must have agency to integrate them into value co-creation processes. By using natural resources, they also change them, either intentionally or unintentionally.

Climate change and nuclear accidents bear witness to the extent to which social and economic actors can destroy the environment. Hence, the integration of natural resources and the resulting change of them are not always positive. Nevertheless, some economic actors can benefit, even from environmental degradation, at least in the short run. Hence, from the perspective of SDL, value cannot be co-destructed as is sometimes argued in the marketing literature (e.g., Echeverri & Skålén 2011; Plé & Cáceres 2010; Smith 2013; Stieler, Weismann, & Germelmann 2014). This argument seems to be a misunderstanding of the term 'value' as it is used in SDL. Some dimensions of perceived value can decrease for many actors who suffer from destroyed nature, but they still perceive benefits from other value dimensions in a collaborative process. Furthermore, there are some actors who (economically) benefit at the same time, at least in the short term. While they might underestimate their sacrifices in the long term, they might perceive an increased value by integrating natural resources, for example, in their production processes. We believe that Vargo and Lusch (2016, axiom 4) mean this perception when they write that 'value is always uniquely and phenomenologically determined by the beneficiary.' Although some interactions among service providers, customers and environment might not enhance the well-being of all actors involved, we believe that it is not in line with SDL to name these phenomena 'value co-destruction' since it would imply that the well-being of all actors is negatively affected and that value is a unidimensional construct.

If no institutions exist, e.g., legal regulations, to prevent it, social and economic actors can integrate natural resources into their processes, and as a result, natural resources usually also change. Hence, a service-for-service exchange occurs. This exchange also applies in the case of environmental pollution, but since the environment has no agency, an assessment of the benefits or sacrifices derived from this exchange cannot be made. This limitation obviously changes when actors, such as the government, intervene and change institutions to control and limit the use of natural resources.

In Norway, the so-called "Allemannsretten" (public right of access) is even established by law (Outdoor Recreation Act of 1957), entitling everyone to use natural resources for free, including walking anywhere on uncultivated land, picking berries, flowers and mushrooms, camping or building fires. While the law also requires everyone to treat nature with respect, not to damage nature and to leave the landscape as they would find it, exchange is required for actors to be able to integrate these natural resources included in the "Allemannsretten".

In summary, natural resources are special because they are provided by the natural environment, which generally is an actor without agency. Furthermore, in contrast to operant resources, they cannot be increased at will through co-creation. Additionally, in the long term, their use can lead to the detriment of many actors and the destruction of an entire service ecosystem, although individual actors derive a benefit, at least in the short term. This situation can be avoided only if institutions are changed by granting rights to natural environments.

3.2. Classification of Natural Resources

As discussed earlier, the understanding of complex problems requires analysis at different levels of aggregation. Since RI is a complex issue, resource categorizations that are utilized to enhance the understanding of RI must relate to the different levels of analysis.

At the meso- or macro-level, we argue that, in addition to distinguishing between resources in operand and operant resources according to their usage type, an additional dimension referring to actors' agency should be included to describe the peculiarities of natural resources in greater detail. We can distinguish between natural resources that are owned by an actor with agency and those that are not (see *Tab. 2*).

First, in case natural resources do not belong to actors with agency, they are so-called pure public resources. In economics, the term 'pure public goods' is used to refer to goods that are non-excludable, as well as non-rivalrous (e.g., Mankiw 2018; Varian 1992). We transfer this distinction to the case of natural resources because we consider goods (and services) to be resources that actors can integrate to co-create value. If resources are non-excludable, it is impossible to exclude an actor from usage, and if usage of these resources by any actor does not reduce the resource's availability to others' usage, they are called non-rivalrous. If natural resources are pure public resources (air, ocean), every actor can integrate them without benefits for any other actor. Natural resources are used and changed back to the environment, even without benefit to nature, which is what we call an unbalanced service-for-service exchange between an actor and the environment, in contrast to a balanced exchange.

In line with Gille (2009), the natural environment can be regarded as an actor: '... nature is an active participant in seemingly purely social relationships and transformations' (p. 8). However, the environment is a type of neutral actor without agency and cannot reject the service-for-service exchange. Actors use their own agency to integrate natural resources, but there is no benefit in return for the environment because it lacks agency.

Second, if access to the environment (e.g., a natural park) is regulated and limited by institutional arrangements (created from legal resources, such as licences or limited usage rights), these resources are non-excludable and rivalrous. If the environment is privately owned because of institutional arrangements (created from legal resources, such as property rights or leaseholds), these resources are excludable and non-rivalrous. In both cases, they are so-called impure public resources. Resources that are both excludable and rivalrous are private resources, which is why private resources are the opposite of public resources. Impure public resources and private resources are ruled by legal resources (institutional arrangements). When natural resources are appropriated or owned by actors with agency, we refer to them as private or impure public resources.

Pure public goods can become private or impure public goods if institutions change. For example, legal institutions are applied to regulate the use of national parks, which can include that access is only granted against an entrance fee. To establish such legal institutions for natural resources, an actor must acquire (or claim) the agency's ownership rights to the natural resources. This claim often happens when some powerful actors believe that the area of the national park must be protected from environmental damage. The reason, however, is that powerful actors have an interest in preserving the environment and restricting the use of natural resources. In this case, natural resources are changed into resources of a powerful actor with agency, e.g., the government, through the creation of new institutions.

The land property in the original Americas or Australia could serve as a historical example. The occupying powers created new institutions and, in some cases even left the land to private actors, who could make decisions on the resources of 'plants' and 'animals' on their property on the basis of the introduced law. This condition has not changed until today. Governments have the power to change laws, expropriate land or legislate how to use the natural resources of the environment. In general, this power means that the natural resources of the environment can only be freely used until the institutions change. However, as long as there are resources in the environment that have not yet been appropriated through the creation of institutions, they are freely available for resource

Resources related to agency	Usage type of resources	Natural resources
Private or impure public resources: appropriated or owned by an actor with agency	Operand: resources upon which one acts (physical products)	natural parks, fields and forests
	Operant: resources with which one processes other resources (skills, competences, knowledge)	environmental protection measures, such as waste separation, recycling or water treatment technology, or environmentally destructive measures, such as air emissions and animals with skills to act on other resources
Pure public resources:		
owned by an actor without agency	can be used without permission or contract	tangible (air, ocean) and intangible (climate), integrated by others with agency

Tab. 2: Categorization of Natural Resources at the Macro-/Meso-level

integration because the environment has no agency as an actor.

As mentioned above, there are many cases in which natural resources are appropriated by public administration to prevent anyone using or misusing them. To do so, institutions or institutional arrangements in a service ecosystem must allow public administrations to appropriate natural resources (e.g., a natural park). These arrangements usually exist if natural resources are owned by any type of actor because there is always a starting point of appropriation. In this case, institutions and institutional arrangements must be constructed in a way that allows actors to own natural resources.

Natural resources could be classified as operand resources because they are physical resources. However, some natural resources are operant resources, for example, animals with skills to act on other resources. Furthermore, pure public resources can be used without permission or contract and therefore represent another category in terms of usage.

Tab. 2 provides an overview of natural resources according to agency and usage type, with reference to SDL.

At the micro-level, natural resources could be classified as physical, legal resources according to Hunt and Derozier (2004). However, the specific characteristics of natural resources according to agency and the absence of a balanced service-for-service exchange for mutual benefit would be ignored. Horbel's (2013) classification according to the actors' roles does better account for the special character of natural resources. If a differentiation is to be made according to the type of resources, Hunt and Derozier's (2004) classification at the micro-level should be extended by adding natural resources as a category. The broader categories of operand and operant resources (Vargo & Lusch 2004), as well as pure public resources, are suitable for analyses at the macro- or meso-level, where the focus is not on single interactions and exchange processes between individual actors but on more complex actor constellations and their overall collaboration for value co-creation. *Tab. 3* provides an overview of the different classifications of resources at the micro-level.

4. Conceptualising Resource Integration

Based on the theoretical and conceptual considerations outlined in the previous chapter, this research proposes a framework for understanding the complex phenomenon of resource integration. As we have shown previously, the understanding of this complex phenomenon requires: (1) a differentiation of the resource types that actors integrate to co-create value; (2) the consideration of different aggregation levels in analyses that focus on different subphenomena of the overall complex concept; and (3) an appropriate connection of the resource categories depending on the level of analysis. These aspects are illustrated in *Fig. 1* and are discussed and integrated in the following to inform a deeper understanding of resource integration.

As we have discussed, pure public resources are different from other resources, especially because they do not have agency. Therefore, they must be treated differently in resource integration and its analysis. According to Kleinaltenkamp et al. (2012), actors must have agency to integrate resources for value co-creation. Therefore, the environment cannot create value, although it contains many natural resources that other actors can use to co-create value.

Since all social and economic actors operate in a natural environment, it cannot be avoided that they use natural resources and thereby change them. We therefore consider it necessary to consider this fact if RI is to be conceptualised. Natural resources can be owned or appropriated by actors if the institutions and institutional arrangements allow for it. Otherwise, they are pure public natural resources that cannot resist integration because the environment has no agency.

Natural resources are only one example of public resources for which the character of public resources is clearly visible. Technologies, which any actor can freely

Features of resources (Hunt & Derozier 2004)	*Resources according to economic sectors (Vargo 2012)*	*Resources according to actors' roles (Horbel 2013)*	*Features of resources extended (micro-level)*
physical (e.g., plant, equipment)	public-facing	public-facing (appropriation by a public actor with agency, e.g., a government-owned natural park)	physical (e.g., plant, equipment)
human (e.g., the skills and knowledge of individual employees)	private-facing	private-facing (appropriation by a private actor with agency, e.g., a friend with a fishing pond)	human (e.g., the skills and knowledge of individual employees)
organisational (e.g., competences, controls, policies, culture)	market-facing	market-facing (appropriation by a market actor with agency, e.g., a privately owned forest where hunting with paid licences is allowed)	organisational (e.g., competences, controls, policies, culture)
informational (e.g., knowledge from consumers and competitive intelligence)		natural resources (no appropriation by an actor with agency)	informational (e.g., knowledge from consumers and competitive intelligence)
relational (e.g., relationships with suppliers and customers)			relational (e.g., relationships with suppliers and customers)
financial (e.g., cash, access to financial markets)			financial (e.g., cash, access to financial markets)
legal (e.g., trademarks, licenses)			legal (e.g., trademarks, licenses)
			pure public resources (e.g., air or ocean, climate, 'free' technology, music, images and pictures without copyright)

Tab. 3: Categorization of Resources at the Micro-level

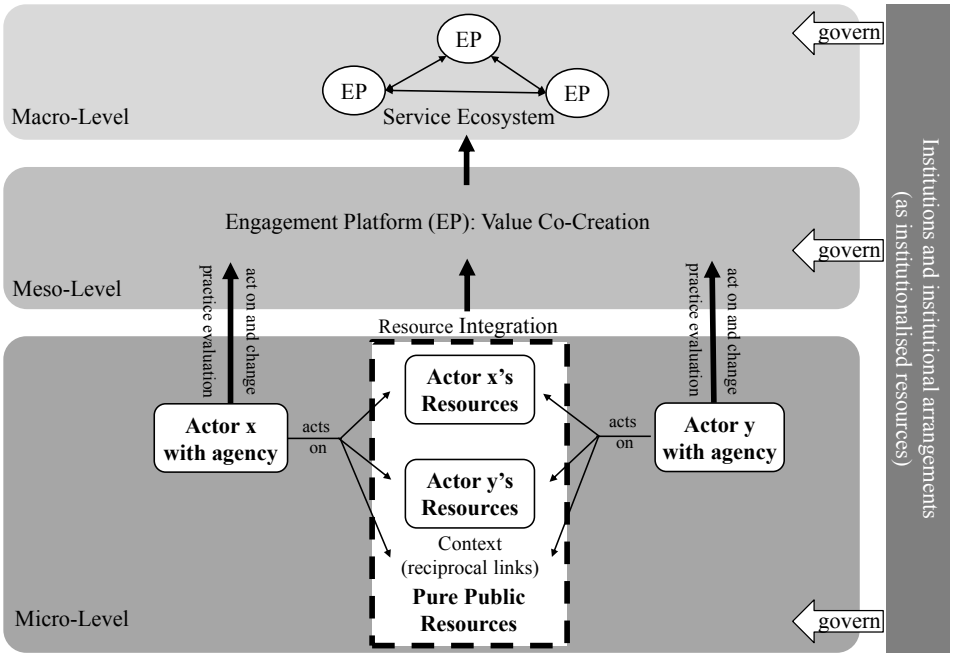

Fig. 1: Resource integration and levels of analyses

access because they represent 'general knowledge', are another example. The same applies in part to music, such as folk songs, which everyone can use freely, or to images and pictures without copyright. Therefore, the classification of resources into pure public, impure public and private resources represents a meaningful general classification of resources. It pronounces that value co-creation often includes an unbalanced service-for-service exchange. So far, most analyses of dyads and triads of actors have implied that each actor provides resources and receives resources as benefits in a service-for-service exchange. An unbalanced exchange of resources considering actors without agency has so far been largely neglected in the literature. Therefore, we propose that a conceptualization of RI should include pure public resources, and they must be considered in value co-creation analysis in future research.

Pure public resources are available to all actors in the service ecosystem but are still mostly neglected in economic analyses at the micro-level because they can be used free of charge. Often the actors even lack the awareness that, through integration into their value creation process, public resources are changed by them, often to the detriment of other actors. Individual actors cannot even be prevented from enriching themselves at the expense of others through the integration of pure public resources.

Pure public resources have an influence on value co-creation because they can be evaluated by actors and influence their perceived value (at the micro-level). Actors practice evaluation of value co-creation processes (*Fig. 1*: arrows from micro- to meso-level) and their evaluations, or more precisely, their expected value (at the micro-level) is decisive for both contractual and voluntary engagement in collaborative RI processes on EPs (*Fig. 1*).

At the micro-level, actors with agency (actors x and y in *Fig. 1*) integrate physical, human, organisational, informational, relational, financial, legal and natural resources (air, ocean, climate). While in reality, often more than two actors (as in *Fig. 1*) collaborate in value co-creation, it is hardly possible to consider all of the involved actors in a detailed analysis of RI. Micro-level analyses are therefore usually confined to RI within dyads or triads of actors and a deeper understanding of the specific types of resources involved herein (micro-level in *Fig. 1*). Furthermore, not every service-for-service exchange is balanced, as in the case of integration of pure public resources.

Therefore, a more abstract level of analysis must be chosen for larger numbers of actors. Because of the greater complexity caused by a multitude of actors, it is neither possible nor meaningful to differentiate between the various types of resources in meso- or macro-level analyses. Resources are then summarized in the broader categories of operant and operand resources, as well as pure public resources (*Tab. 3*). EPs are often used as the unit of analysis of multilateral RI at the meso-level, symbolised by arrows between the levels in *Fig. 1*. Meso-levels of analysis like EPs are useful for analysing the various types of actors, as well as their relationships and collaborations with other types of actors (*Fig. 1*: meso level). At the macro-level, the highest level of aggregation, relationships between these EPs in a service ecosystem (*Fig. 1*: macro-level) can be analysed.

Like RI, institutions can be analysed at different levels. However, when RI is the focus of analysis (at the micro-level), institutions are often not specifically differentiated and are separately included in the analysis. Nevertheless, it is important to consider them in an abstract form because they control and govern RI (as indicated by the arrows in *Fig. 1*).

RI demands actors with agency acting in an institutional framework, but this demand is not a one-way street. By acting through RI, they often change the institutional framework, so that institutions and RI are always subject to dynamic processes and change. On the one hand, institutions form the framework for the actions of actors, and on the other hand, actors change institutions through their actions. Thus, pure public resources are also subject to constant change and are not available to actors in constant quality and conditions.

In summary, pure public resources deserve special consideration in the analysis of RI. Depending on the institutional framework, either the same type of natural resources could be freely used (when they are pure public resources) or a benefit must be created for another actor in exchange for use (when they are impure public or private resources). In the case of pure public resources, the resources can simply be used or, with no necessity for permission, can even be used to the detriment of other actors.

Pure public natural resources are only a prominent example of pure public resources within RI. We therefore propose generally differentiating operand and operant resources, as well as pure public resources. So far, pure public resources have been widely neglected in research inspired by SDL; therefore, we call for initiating a discussion about pure public resources in value co-creation.

5. Conclusions and Limitations

This article contributes to the SDL research, more specifically to a better understanding of RI as follows: First, we provide a brief overview of different classifications of resources. Second, we work out the peculiarities of pure public resources using the case of natural resources (*Tab. 2*). Third, we extend the existing classifications of resources by considering aggregation at different levels of

analysis by introducing pure public natural resources (*Tab. 3*). Fourth, we conceptualize RI at different levels of analysis with a focus at the micro-level (*Fig. 1*). Fifth, we show the interdependences between different levels with regard to RI (*Fig. 1*).

This paper has been a first attempt to provide a more detailed conceptualization of RI. However, future research should apply the suggested framework to refine and advance it. More specifically, more research is necessary to refine the classification of resources at the micro-level. Furthermore, more analyses of other pure public resources in addition to pure public natural resources, for example, technology, would be useful. Moreover, we distinguished between private and pure public resources. However, in light of the increasing relevance of sustainability and growing concerns for ecological aspects, governments and political actors increasingly grant rights to specific elements of nature. For example, some governments (Australia, New Zealand, India) grant rivers and mountains legal personhood, which means that they have the rights, powers, duties and liabilities of legal persons represented by human guardians (Argyrou & Hummels 2019; O'Donnell & Talbot-Jones 2018). In this respect, they can be compared to the rights of children since children also require guardianship to enforce their rights. Governments have the power to grant such rights to other actors. Consequently, actors who originally had no agency are granted agency to some extent. Other actors cannot arbitrarily dispose of them anymore. Therefore, future research could discuss the full continuum between pure public and private resources.

Finally, the conceptualization of RI at the meso- and micro-levels must be specified and understood in greater detail. Apart from RI itself, more research is needed on other central SDL concepts, such as value, institutions, institutional arrangements, actors, agency, and practices. More specifically, a better understanding of how they should be considered in analyses at the various levels of aggregation (micro, macro and meso) is needed, and conceptual adjustments corresponding to these levels may be necessary.

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