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Value dimensions of digital applications and services: the example of voice assistants

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Abstract: This paper provides a joint perspective of activity theory (AT) and service-dominant logic (SDL) to understand the role of customer activity, which has largely remained unexplored in investigating service ecosystems. The research question is how user activities, as described in AT, can be integrated into the theoretical framework for service systems provided by SDL to explain users' specific value creation in digital applications. We use value creation to synthesise AT and SDL, integrating the focus of AT on human activities and the service perspective of SDL. This synthesised theory reveals dimensions of customer value: dematerialisation, objectification, institutionalisation, modularisation and platformisation. These dimensions are applied to voice assistants, as an example of a smart application with significant user interaction. Hereby, the paper contributes to research on customer experience of digital applications. It shows how the service dimensions add value to digital applications and supports systematic design of smart service systems.

Keywords: service-dominant logic; SDL; activity theory; value creation theory; digital technologies; digital applications; digital services; voice assistants; conceptual paper; theory synthesis.

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1 Introduction

The value that users create with the assistance of digital applications has proven to be a key economic driver. Therefore, building applications that have the potential to create such value is crucial. This is what makes the digital economy, where customers are constantly rethinking the value of services. Hence, considerations of value must be incorporated in the service design. Nambisan et al. (2017) have determined digital technologies as a critical component of value creation in service systems. Moreover, there are some approaches to include value creation into service design, for example, Häikiö and Koivumäki (2016) have suggested a value generation process framework

for the digital service innovation process. In general, however, research on how digital technologies create value is little developed.

In this context, the work of Vargo and Lusch (2004) led to the rise of a new paradigm in understanding digital technologies, shifting the perspective from a firm-centric view to a service-centric view of value creation. This paradigm shift changes the view that a company is the source of *value creation* to the view that all service providers including the final service beneficiary are involved in *value co-creation*. The result of this shift is the service-dominant logic (SDL), see Vargo and Akaka (2009).

The shift to a service-only logic has also brought forth criticism. For example, Grönroos (2011) critically noted that the new SDL concept of value co-creation leaves the nature and origin of the creation process rather unspecific. Instead, Heinonen et al. (2010) suggested a customer-dominant logic, in which they considered the role of customers in value creation more prominently. Moreover, they stressed the role of activity in value creation. To advance our investigation, we consider the role of actors in value creation and co-creation. We draw on another approach, namely, activity theory (AT), which puts the acting person at the centre. AT is rooted in Russian psychology and was mainly advanced by Engeström (1987). Meanwhile, it is an established theory (Kaptelinin and Nardi, 2012). The application areas of AT are diverse and range from information system design with a particular focus on human-computer interaction to information science and beyond (Allen et al., 2013).

Most researchers stick to one of the two theories and only notice the other peripherally. One of the few exceptions is Mickelsson (2013), who used AT in addition to SDL to better understand customers' service involvement. Recently, Schulz et al. (2020) combined AT and SDL for an analysis of smart mobility; however, they did not delve deeper into the connections between the two theories. To enable a deeper understanding of digital applications means, one needs to understand the value of both services and activities. Voice assistants (VAs) are a good example of applications, for which there is not yet a deep understanding of their full value potential (Ammari et al., 2019). We will use this example to show how we can gain more insight into value creation and co-creation in digital applications.

The growing interest in the customer journey (Stickdorn and Schneider, 2012) and customer experience (Jain et al., 2017) shows that value must be understood in a broader sense than SDL alone allows. SDL scholars, e.g., Lusch et al. (2007) state that customer experience is a central focus of SDL; however, the theory simply lacks the concepts to approach this point in sufficient detail. This requires an expansion of the perspective to more detailed customer interaction including customer activities, tools, services, and the collaboration with other actors. Drawing of our previous work Riss et al. (2022), the current paper makes a thorough attempt to bring AT and SDL closer together. The aim of this research is to provide an extended theoretical framework for digital applications and services that covers a wider scope of value creation and co-creation. To this end, we will use value creation theory as a common umbrella to address the following research question: How can we integrate user activities as described in AT into the theoretical framework for service systems provided by SDL to explain how value is created through the activities of users employing digital applications?

The paper is organised as follows. In Section 2, we present the relevant features of SDL and AT for the present study. Then, we explore value creation theory to provide an overall perspective to overcome differences between AT and SDL aiming at a theory

synthesis. In Section 3, we will describe our methodology, which applies a theory synthesis to SDL and AT. Section 4 will present the details of the theory synthesis of AT and SDL, starting with a presentation of common ground for both theories and moving on to acknowledge contradictions and resolve them where possible. Next, the resulting synthesis is used in Section 5 to investigate value dimensions of digital technologies with a particular focus on VAs. Finally, in Section 6, we will provide conclusions of our findings.

2 Theoretical background

2.1 Service-dominant logic

Starting from the work of Vargo and Lusch (2004), a new paradigm called SDL has emerged in marketing research that focuses on service as the foundation of the digital economy. It has led to a reorientation of the understanding of economic value and its creation. According to Maglio et al. (2009), SDL provides important insights into the workings of the evolving service economy. This reflects the fact that services have gradually emancipated themselves from the dominance of goods production during digital transformation. SDL places services at the centre and subordinates goods as resources. In a later version, Vargo and Lusch (2008) have determined eleven fundamental premises (FP1-11) for SDL, four of which are considered axioms. The fundament of SDL is the assumption that all activities take place in an actor-to-actor network of collaborating service providers in a *service ecosystem*.

In the following, we will consider only those FPs that are relevant to the value analysis of digital technologies. SDL considers digital technologies to realise a service (FP1). *Resources* mainly appear as service enablers that can be *operant* or *operand*; resources are operant if they can act on other resources whereas they are operand if they must be acted on by other resources. Although digital technologies represent operant resources (Akaka and Vargo, 2014) and FP4 states that operant resources provide strategic benefits, their contribution to value creation remains mainly hidden. Through theory synthesis, we will later illustrate the way this happens in more detail. Another view of SDL is that one main activity in a network consists of *resource integration* (FP9), which is enabled by digital technologies. The precondition of such resource integration is *service exchange* (FP1) between the service providers.

Normann (2001) states that digital technologies can enable dematerialisation and liquefaction of resources, which refers to the decoupling of information from an underlying object. Demateriality is a central feature of SDL because the service perspective has been developed in distinction to the previously prevailing goods perspective. Campbell et al. (2013) emphasise that the primacy of service-rendering operant resources over operand resources (e.g., material) has led to a neglect of increasing material consumption. A material tool is only regarded as a *type of delivery channel*. It is also reflected in the fact that the resulting value of a service plays a more important role than the object that only appears as an operand resource but not as a proper target. A hammer, which an actor uses to drive a nail in a wall, is an example of an operant resource (tool); this can be understood as a service of power reinforcement. The actor provides resource integration with his or her own strength and skill. The role

of the actor appears to be distinct (and somehow unrelated) from that of the service beneficiary.

In FP10, Vargo and Lusch (2008) state that the beneficiary uniquely and phenomenologically determines value of a service. Accordingly, the beneficiary is the main actor in the activity system.

Vargo and Lusch (2016) describe SDL as the coordination of value co-creation through *institutions and institutional arrangements*, which determine the rules of service handling in service ecosystems (FP11). In this context, Vargo and Lusch point to the observed 'restricted cognitive abilities and bounded rationality' of economic actors, which entails a need for heuristics given by institutions and institutional arrangements (e.g., norms, meaning, symbols, etc.) to facilitate coordination and cooperation.

Furthermore, SDL emphasises the role of networks for services and that their value is always co-created (FP6). Since this also applies to services provided by digital technologies, we must ask how they support services in networks and value co-creation.

Figure 1 Basic conceptual system for SDL

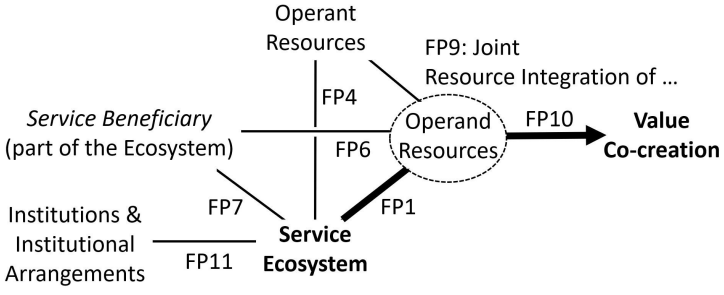


Figure 1 describes the main concepts and FPs in a basic conceptual diagram; its structure is deliberately like that of an activity system, which will be presented later in Subsection 2.3 (cf. also Figure 3).

Figure 2 Core processes of SDL according to Vargo and Lusch (2016)

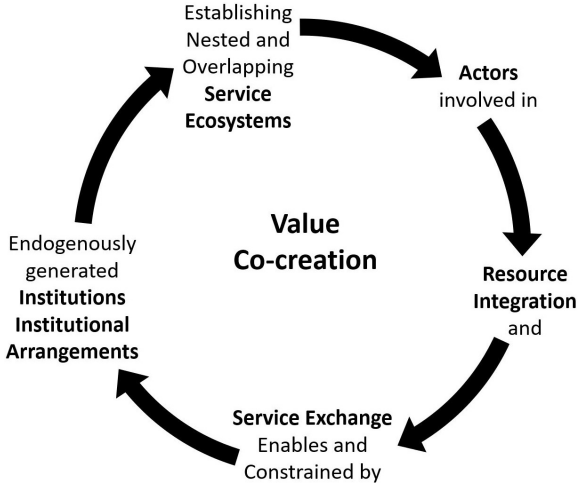


Figure 2 shows the dependencies between the basic SDL concepts around the focus of value co-creation. SDL makes a significant contribution to explaining the role of digital technologies in value co-creation by identifying opportunities for innovation through opening physical devices to digital service infrastructures. However, as Mickelsson (2013) points out, SDL tends to hide the value contribution of actor's agency due to its strong focus on resources as means of service delivery. Recently, Vargo and Lusch (2016) introduced agents in the SDL setting, but this investigation is mainly restricted to simulation and does not go into more details of the actors and their objectives; their role is mainly restricted to resource integration. Here, AT plays an essential complementary role in bringing focus onto the actors as well as their objects and objectives.

For a more concrete view of the SDL perspective, let us consider the example of VAs. For SDL, VAs can be mainly understood as a service (or more precisely, a service platform), which brings voice-based services and their potential users (as service beneficiaries) together. The service of the VA (platform) provides the infrastructure that helps users find suitable services and enables them to execute the financial transactions (as a service) necessary for them to benefit from these services. Users become service providers themselves by offering their knowledge of the services in ratings and by supporting other users to find good services. The users integrate various resources for their own benefit; value results from the co-creation of all parties so that all parties profit from the exchange of services (including the user fees that are understood as services as well). The standards and business rules that the VA provider (platform) establishes provide the institutional arrangements for interaction and simplify the transactions.

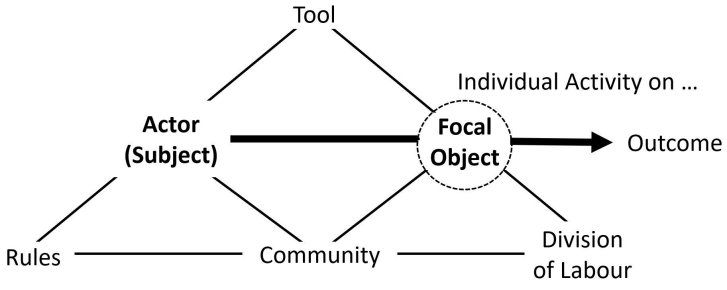
2.2 Activity theory

Regarding AT, we take our starting point from the work of Engeström (1987), who used AT as a framework for the study of different forms of human practices. AT has a long application history in human-computer interaction (Kuutti, 1996), service design (Sangiorgi and Clark, 2004) or digital applications (Uden et al., 2008). AT is concerned with processes in their social development and considers activities as influenced by their social and cultural embeddedness. In this context, conflicts of social practice receive particular attention; Kaptelinin et al. (1999) regarded them as the driving forces of development and sources of change.

The basic structural element of AT is the *subject-object relation*, in which an actor, regarded as the *subject* of action, is directed towards an *object* (of action) with a specific *objective*. In addition to the interaction of subject and object, AT also includes the social dimension of activities. This means that most activities are carried out in cooperation with a *community*. The community is involved in the execution of the action where the cooperation with the actor is organised in a certain *division of labour* and governed by *rules*. In contrast to SDL, where all actors are equivalent resource integrators, AT always has a clear focus on one focal actor, who also appears as the beneficiary of the action.

The second structural element is the *mediation* of action. Mediation refers to the use of *tools* in human action, where the tool can be material or intellectual. Here, we can see an overlap to the idea of operant resources in SDL, which act on resources as tools. Figure 3 describes the connections between the different components in an activity system as provided by Engeström (1987).

Figure 3 Basic activity system according to Engeström (1987)



A third structural element is the *object-orientedness* of AT (Kaptelinin and Nardi, 2012). Here, it is important to note that the object must not be directly identified with a material object but rather represents the focus of action, which is limited by the situational horizon (Engeström, 1999). It can also be an intangible object, such as an idea, or a hybrid object, such as a plan (Naaranoja and Uden, 2014). Despite this wider scope, the object's materiality plays a particular role, as it indicates that the action is assumed to lead to some tangible result. Even if the actors only learn new capabilities, these capabilities must become manifest in their brains. Thus, we always must look at the object of activity in a double sense, namely oriented to a set of perceived (material) objects and to a scope of action that encompasses them. The object also determines how the performed action creates value for the actor as described by Kaptelinin and Uden (2012). Mediation by tools always comes with a trade-off because tools require specific skills and can also limit the range of action. For example, a car can go faster than a human being but not everywhere and requires driving skills. This obviously affects the value of a tool (in both directions).

A fourth structural element is the *hierarchical structure of activity*. AT distinguishes three levels of activities:

1 *activity* (in general), which is driven by motives
2 *action*, which aims at specific goals (or objectives)
3 *operations*, which consist in routines and depend on given conditions such as the availability of resources.

An example of the activity level is the motivation to improve the capabilities of a production site, for example, a factory. Which activities serve this goal is quite open. It might even include the dismantling of old machines or implementing completely new business models. Operations are those routines that are conducted by human actors but also those that are executed by automated services and only require the actor to trigger them.

A fifth structural element is the interchange between *internalisation and externalisation*. For example, using a specific application the actor might first need some instructions on how to proceed. After using the application several times, the instructions are no longer necessary because the actor has internalised the routine. On the contrary, actors who realise that they regularly use a particular procedure might externalise this by adding a shortcut to their favourite tools. Kaptelinin and Nardi (2012) emphasised that externalisation can be used to share knowledge with other actors. Moreover, actions can

become operations by internalisation as operations can become actions by externalisation (Allen et al., 2011).

Sawhney et al. (2004) advocated the idea to investigate the activities of customers more closely regarding them as more than service users. Mickelsson (2013) took up this idea, pointing to the role AT should play in investigating these activities. Although he acknowledged the role of value in such activity, he did not investigate this role in detail.

A central point of interest in AT is the identification of contradictions inherent in the system (Engeström, 2008). In a service perspective the concept of contradiction is not applicable since contradictions arise from the involvement of human actors and their intentions. To return to the example of the hammer: for example, a contradiction can arise when an actor must pay more attention to the hammer than to the hammering. Contradicting experiences are the rule rather than the exception.

Considering the example of the VA, we will now take an AT perspective and examine the service. Maier et al. (2022) have found various characteristics of users interacting with VAs. Although the services available from the VA were, in principle, useful, it was often difficult for them to make them work because the VAs had problems understanding the users. Moreover, many users had considerable privacy concerns that caused them to remain reluctant to use the service. Although there are hundreds of services available on the platform, it was difficult for the users to find them. Therefore, the VA as a tool was often not helpful to let them achieve their goal. The users could give feedback about services, but they did not assume that this would improve the services. Most of the advantages that the services promised were not fulfilled.

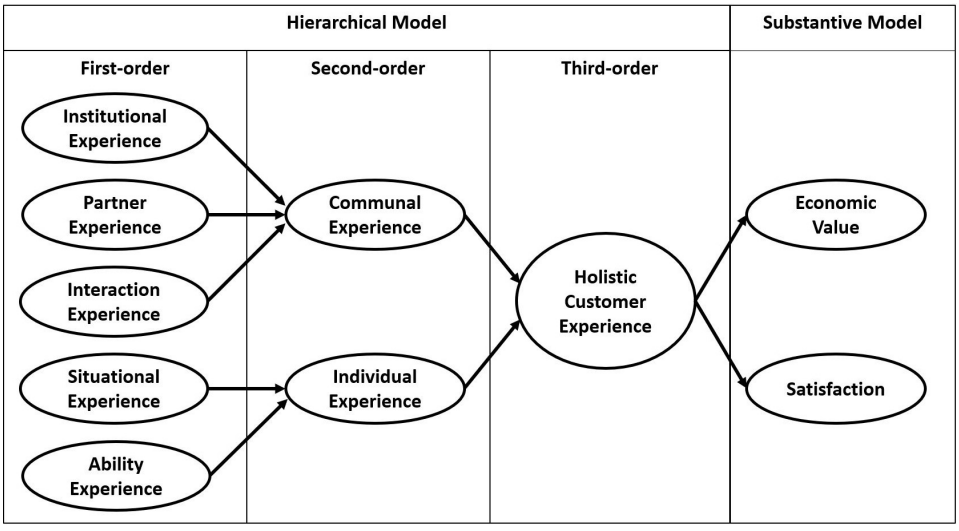
2.3 Value creation and customer experience

Value creation is closely associated with companies and seen as their very goal. Correspondingly, companies and economic activity have been regarded as a system for creating value and wealth. Kotler and Keller (2009) show how broad and multi-layered the topic of value creation is. For our current purpose, we will focus on the role of technologies implemented as tools to help actors create value. Häikiö and Koivumäki (2016) have found three basic streams of value creation: value creation in the enterprise, shared value creation, and value creation for the customer. Since we are only interested in the actor's perspective and the act of value co-creation, we limit our consideration to the latter two streams. To examine shared value creation, we will mainly focus on SDL, whereas the focus of AT is on individual value creation.

In addition, there is the idea that value can be understood as a balance between benefits and costs (or sacrifices), for example Zeithaml (1988). Gummerus (2013) has recently criticised this idea on the basis that actors do not constantly and rationally evaluate the ratio of benefits and costs when performing an action. We agree that actors are unlikely to evaluate their actions continuously during their performances, nevertheless evaluation of action is a necessary means of control. Actors consider benefits and costs as significant criteria for evaluating actions. However, these actions can be sequential and extend over a longer period. Therefore, the evaluation can become quite complex. To obtain a better view of the value creation process, we have a closer look at the details of such action. So far, most research such as that of Lindman et al. (2016) focuses on value creation in companies but not in individual action, however, this view is changing.

According to Lambek (2013) actors can *evaluate* the results of an action in terms of total benefit achieved versus the effort invested. Nevertheless, assessing value is more complex than simply weighing benefits and costs. For example, benefits may be only obtained when the action is fully completed. Therefore, actors must continuously check the progress of the action to make sure that the action is still on track. To achieve this, they need transparency about the entire systems they are working in. To avoid wasting resources in a failed outcome, they must also be prepared to abandon an action. For example, to avoid ending up with a half-driven nail in the wall, an actor might realise that a change of the size of the hammer may be required.

Figure 4 Customer experience model following Piyathasanan et al. (2015) and Carlson et al. (2016)



SDL shows some weakness in this respect because it mainly regards customer value as a measure to compare services in a service-for-service exchange but does not recognise the specific role of the actors. Customer experience (as the basis of value assessment) has become a stronger focus, as the increasing interest in customer journeys shows. Customers can perceive the individual interaction differently. Taking this into account, customer value becomes a highly multi-faceted concept that goes beyond the idea of representing an exchange factor for services. This insight has shifted the focus from customer value to customer experience (Jain et al., 2017), where AT with its more fine-grained perspective on action better grasped the latter (Gonçalves et al., 2020). For the present purposes, it is sufficient to point out that the details of the (inter)action between agents and service providers move more into the centre of attention. Thus, the insights provided by AT become more important for systems.

Carlson et al. (2016) have further elaborated the relationship between customer experience and AT using the example of event tourism, where they point to the role of rules, objects and community as well as communal relationships for customer experience. They refer to Helkkula et al. (2009) who emphasise the role of such experience in customers' perception of value while they present a framework for evaluating such value. Customer experience beyond service experience plays a major

role when material components are involved, such as in the case of smart products. In such cases an activity perspective is indispensable.

In Figure 4, we consider a customer experience model, by which the connection between AT and value creation theory can be demonstrated. It mainly follows Piyathasanan et al. (2015) and Carlson et al. (2016) except for some adaptations in the first order and the substantive model; here we abstract from the respective application scenarios and adapted the model to general AT. The term substantive model is taken from Piyathasanan et al. (2015). The customer experience model (depicted in Figure 4) describes how the constituents of the activity influence the experience and finally the value. The three communal experience constituents refer to rules (institutional experience), community (partner experience), and division of labour (interaction experience) of the activity system in Figure 3. With respect to the individual experience, we only distinguish between situational (external) and ability (internal) experience. The model describes the connection between the activity and its experience components and the final value.

3 Research methodology

Conceptual research methodology has attracted growing interest, and Jaakkola (2020) has significantly contributed in developing a proper foundation for different approaches in this area. One of them is theory synthesis that aims at the integration of different theoretical perspectives into one new view by combining previously unrelated or incompatible approaches. Theory synthesis requires both finding the differences or even contradictions in the conceptualisations of the two theories, as well as a common ground that facilitates integration. This common ground is maintained through synergy with another theory.

In this paper, we use SDL and AT and integrate both from the perspective of value (co-)creation theory, as we interpret both theories as approaches to understand value creation, even though from different perspectives. In doing so, we aim at a conceptualisation of *value creation in mediated action*. We can draw on a wide range of investigations that deal with either SDL or AT. The two theories are rather complementary, as we will show in Section 4, so that a synthesis gives a more complete insight in customer activities.

According to Lukka and Vinnar (2014), theory synthesis involves applying a method theory to a domain theory, where the latter describes the research field of interest while the method theory deals with specific issues that occur at the level of domain theory, from a different perspective. In this study, we use value creation theory as method theory as a common perspective for AT and SDL. It is the aim of using value creation theory to understand and resolve the differences at the meta-level. AT and SDL are suitable theories for synthesis because they deal with actors in networks but regard them from two different standpoints: SDL primarily takes the actor network perspective while AT focuses on the perspective of an individual actor, whom we can consider as a customer. Another common aspect of both theories is the inclusion of mediating resources; in AT we find the central concept of *mediating tools* while in SDL we have the similar concept of *operant resources*, which both contribute to value creation.

This conceptual paper examines the value of digital applications as an embodiment of value creation. To this end, we refer to AT and SDL as overlapping. SDL will

provide the perspective of resource integration and value co-creation, which concentrates on the interconnectedness of digital services. On the other hand, AT will provide the perspective of an individual user of such an application. So far, neither theory has been systematically synthesised. The scaffold of the performed theory synthesis consists in merging the conceptual SDL system, as depicted in Figure 1, with the activity system shown in Figure 3. Service systems as described by Maglio and Spohrer (2008) must be incorporated in this schema. Building on this scheme the synthesis will be developed in four steps:

1 *Common ground:* We show which concepts overlap in AT and SDL. For this purpose, we refer to the related terms in both theories.

2 *Distinct contribution of SDL:* We point out which conceptions of SDL go beyond the common ground in a distinct SDL perspective.

3 *Distinct contribution of AT:* In the same way we show in which respect AT goes beyond the common ground in a distinct AT perspective.

4 *Synthesis via value creation theory:* We use value creation theory to synthesise the distinct perspectives of AT and SDL into a common understanding of value (co-)creation.

Theory synthesis closes the gap between value creation because of individual action and value co-creation as the result of resource integration in service systems. The objective is to develop a 'big picture' that helps us better understand the economic role of digital technologies, which appear as tools as well as resources in service systems. As Vargo and Koskela-Huotar (2020) described, the development of new theoretical frameworks goes hand-in-hand with empirical studies that require a theoretical lens to interpret results beyond their own methodological soundness.

After accomplishing this theory synthesis, we use the result to describe four dimensions of technology-enabled value creation and corresponding examples of digital applications. The first of these dimensions (dematerialisation) has been suggested by Normann (2001) and has been integrated in SDL, as described by Lusch and Nambisan (2015). The second dimension (objectification) stems from AT following Karanasios (2018), who has emphasised the role of objects in sensemaking referring to AT. The last two dimensions (modularisation and platformisation) have been discussed in the context of SDL referring to Lusch and Nambisan (2015) again. We will use theory synthesis to provide a joint picture of how these dimensions support actors in creating value using digital applications. We use VAs as a practical example of such applications and regard this as a final check of the usefulness of the synthesised theory.

4 Synthesis of AT and SDL

Referring to Tronvoll et al. (2020), there are three major topics in the digital transformation process: organisational identity, dematerialisation (due to the digitalisation of services), and collaboration between various actors inside and outside the organisation. The latter also includes the collaboration between companies and their customers. The synthesis of AT and SDL perspectives allows a comprehensive treatment of all three topics. Indeed, the considerable number of related concepts in both theories

shows that the respective scopes of AT and SDL have a significant overlap. The focus of SDL is value from service interaction; this is reflected in scholarly works such as Lusch and Nambisan (2015). As Blaschke et al. (2017) pointed out, this concerns service ecosystems, the use of technologies, resource mobilisation, and the interaction of services. The disadvantage of this view is the high level of abstraction. For example, nobody would use SDL for human-computer interaction studies. The strength of AT is its focus on human activity, which makes it an excellent tool for investigating the details in the interaction of human actors with tools and other human actors. As we explained in Subsection 2.3, the focus of AT is value from mediated activity, where the mediation refers to tools (including services) and collaboration. In the following we will investigate the role of value in both theories as basis for synthesis.

4.1 Common ground

We will start with an investigation of concepts that are similar in both theories and point out where we find differences in the perspective. Generally, the differences are related to different interpretations of the underlying reality of the customer's perception of the interaction with the company. We identify four similarities in this section and consider the differences in the following sections.

Firstly, both theories are built on the interplay of individual and communal *activities*. In AT the focus on activities is on the individual actor and his or her action. When other actors are involved in an activity, we find a division of labour, which can either refer to other actors with complementary capabilities, or to services. It should be noted here that services play an ambiguous role, as we can see them both as part of the division of labour and as tools in the sense of AT. SDL associates all interactions with services, but interactions can also be associated with actors, that is, more complex human interaction. In SDL cooperative actions of other parties as well as automated services are described as services, following Lusch and Vargo (2014), who have defined service as a *process*, in which one actor does something for another actor (the beneficiary). This view corresponds to Alter (2010), who describes services as activities performed for other parties. This process can be understood as composed of different actions. Actors appear as collaborators of the community in AT and as service providers in SDL. Both theories agree in the distinction of one focal actor, who appears as service beneficiary in SDL.

The second similarity concerns the *target of action*. In AT this is the *object*. In SDL, the object is hidden in some way. However, we can carve it out if we understand that the object refers to resources, on which one acts; these resources correspond to the *operand resources* in SDL, which are distinguished from operant resources in accordance to the distinction stated in Sect. 2.1. The focus of action in SDL consists in *resource integration*, which is based on these operand resources. Although resource integration is not explicitly mentioned in AT, it is inherent in all actions.

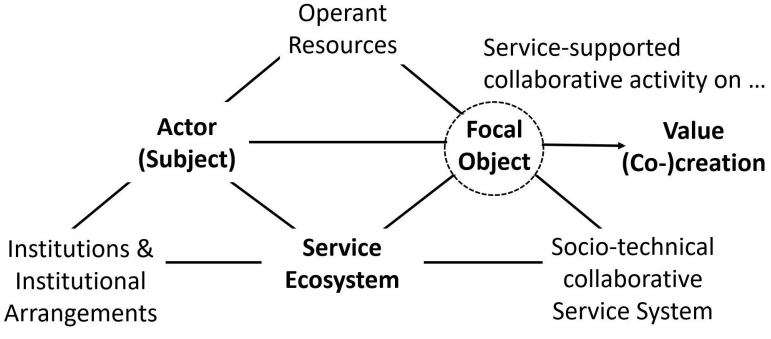
The third similarity, in line with the previous consideration, concerns *tools*. In SDL they appear as *operant resources* that are acting on other resources. In AT the focal actor uses tools to act on the focal object. In SDL we consider all operant resources of all services independently of the service beneficiary or other actors.

Fourth similarity is that both theories look at the *outcome of action*. SDL reduces this outcome to a value assessment by the service beneficiary, which includes the benefits as well as costs. However, an implicit assumption is that a service system that does not provide value is not sustainable. Makkonen (2015), who examined the

relations between value, value creation, and service processes in SDL, pointed out the conflicting perspectives of value from the performance of co-creation and value as it is perceived, where the former describes an actor-neutral perspective while the latter is actor-dependent. In contrast, AT mostly avoids the abstract consideration of value creation but focuses on the performance and occurring contradictions – these are often related to costs – that allow for a more fine-grained assessment.

The fifth similarity is the inclusion of the *service ecosystem* in SDL, which can be understood as part of the more general *community* in AT. Both theories agree that there is a communal governmental structure, to which AT refers as *rules* while in SDL we can relate it to the concept of *institutions and institutional arrangements*. In addition, both theories also refer to a structure in the interaction of communal actors, which is related to the *service system* in SDL as described by Maglio and Spohrer (2008). In AT this structure is represented by the *division of labour* that describes the interplay of different activities.

Figure 5 Service-oriented activity system



Based on this common ground, we can represent the integrated view of AT and SDL in a model that is based on the activity system as depicted in Figure 3. It resembles the one presented by Beckett and Dalrymple (2017), but instead of business model we take a focus on the service ecosystem and the related service system, which we identify with the division of labour. This system is depicted in Figure 5. The delivered services are represented by the line from the service system to the object. Accordingly, the community who provides the division of labour is replaced by the service ecosystem of the respective service providers.

4.2 Distinct perspective of SDL

The theoretical basis of SDL is the actor-to-actor network of service providers, where all actors are equivalent. The interaction in this network consists of the *exchange of services* between these actors (FP1). Even the payments are incorporated in this exchange as transfer of service rights. This means that in this respect SDL does not build on the directionality of action that is central for AT. However, there is a second directed activity in SDL besides the exchange of services and that is *resource integration*, which is performed by individual actors (FP9); resource integration is essentially irreversible so that time evolution is relevant.

The concept of *value co-creation* plays an essential role in SDL. In particular, Findsrud et al. (2018) describe resource integration as the essential way to create value (in SDL). Again, the description that "all parties uniquely integrating multiple resources for their own benefit and for the benefit of others" [Vargo, (2008), p.211] rather points to the reciprocity of value co-creation than that it shows a specific goal to reach. It is the continuous and smooth exchange of service as the basis for resource integration that produces value. The term value co-creation already indicates that value emerges from the network activities rather than from individual actors. From the SDL perspective for individual actors, it is almost impossible to create value on their own since they always depend on others regarding acquired knowledge or necessary resources. Individual actors and their objectives always take a back seat in SDL. The subordinate role of development over time abstracts from the fact that the actors' activities are subject to situational circumstances. Resource integration is not a process with a single possible route but rather a variety of possible routes.

The concept of *value proposition* (FP7) is a concept that does not occur in AT. One reason is that AT has no specific enterprise context such as SDL, but the idea of value proposition goes further than that. It means that actors propose a potentially beneficial service to other actors. In this respect SDL goes beyond the scope of concrete execution that is typical for AT.

4.3 Distinct perspective of AT

The focus of AT is on the *actor* (subject), in contrast to SDL, where actors only appear in connection to services, that is, as resource integrators and as service beneficiaries. AT does not assume action as an abstract service but looks in the details of how an action is performed. Against this background, the role of the *object* must also be understood. Even though there are similarities between resources in SDL and objects in AT, they have a different function. In SDL resources serve as means of service, whereas in AT objects comprise the actor's focal point of action. This also explains why tools are seen as resources in SDL but are separated from objects in AT, where they are regarded as auxiliary.

Moreover, *materiality* plays an important role in AT, while it is mostly irrelevant in SDL. Svabo (2009) described the view of AT towards material reality as the context and the elements of a physical outer world that can mediate action or be the object towards which an action is directed. As we mentioned, this includes the operand resources, from which a resulting material entity is built. The neglect of objects in SDL can be seen as a side effect of turning away from material goods towards services, which are not necessarily bound to products. However, Campbell et al. (2013) pointed out that services also possess a material side. Indeed, the concept of object can be regarded as one of the most interesting contributions of AT to a synthetised theory because it is often related to a materiality that plays a significant role as in the case of smart products, see for example, Ainamo (2016).

The concept of value is hardly mentioned in the context of AT. The reason may be that value mostly appears in the context of economic activities but not as a general feature of action. However, Lambek (2013) points to a connection between action and value from an anthropological perspective. A successfully accomplished action will also create value for the actor. Kaptelinin and Uden (2012) point at the fact that actors experience value through their activities. If we look at Grönroos (2008), however, we

see that value creation for the benefit of actors is mostly attributed to companies, although it is clear that actors are also essential participants in value creation; they are co-creators of value.

4.4 Synthesis via value creation theory

As described in the introduction, we use value creation theory as method theory and apply it to AT and SDL as domain theories to address a central contradiction between the two theories, which we see in the question of the source of value creation. Both theories explain how a successful outcome can be achieved. SDL clearly indicates that the concept of value co-creation is crucial. In AT it is more hidden, but focusing on the outcome of individual action, the success – and that means the value from action. The difference between AT and SDL results from the fact that AT sets its focus on one individual actor and puts the network in the background while SDL sets its focus on the interplay of services (as activities) – as we can also see in Figure 1 – and puts the individual actors in the background.

Regarding SDL, Basole and Rouse (2008) describe value as co-created in value networks through the joint integration of services. According to SDL, value co-creation is realised in communal resource exchange and integration (Akaka et al., 2012) and thus appears as a result of the network interaction – single actors cannot create value independently. This view extracts value co-creation from its time dimension and ignores the involvement of actors. Grönroos and Voima (2013) have included the time dimension pointing to different stages with a provider sphere that is followed by a customer sphere that involves this actor – ultimately, it is the individual actor who creates the benefit and correspondingly the value. With the distinction of the two spheres, they distinguished communal value co-creation and individual value creation.

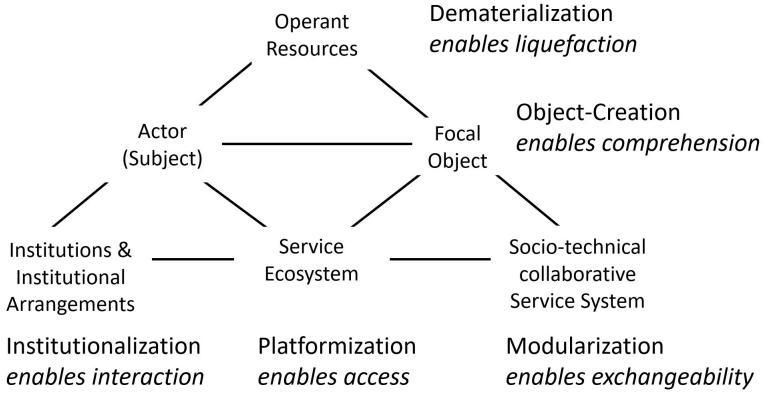
Gummerus (2013) distinguished the value creation process from value outcome as an abstract assignment of value to the result of the respective activity, in line with SDL that states that the value outcome is determined phenomenological, as SDL described it. These considerations indicate that value creation has to be regarded as a proper *value creation process* with a time dimension and the involvement of individual actors, for example, see Ravald (2010). However, while from a temporal point of view it makes sense to distinguish a sphere of value co-creation and a sphere of value creation, in the end this separation is artificial.

In this respect, it is interesting that Bernacchio (2022) points to the role of *recognition* among members of a company as precondition for value creation. Translating this idea from the traditional view of the company as creating value to the view of value creation in service ecosystems, we can resolve the observed contradiction by pointing to the role of reciprocal recognition of service providers and individual actors as beneficiaries. The individual actors acknowledge that value creation is communal by monetarily compensating the efforts of service providers through the price (value-in-exchange) for using services. Service providers acknowledge the need of individual actors by anticipating their demands, providing resources that might not be needed at the time of production and realising that co-created value is for the benefit of an individual actor as customer (value-in-use). None of the two sides can exist without the other, and the temporal discrepancy of production and use is resolved by their mutual recognition.

To translate this insight into concrete action, we must first realise that *institutionalisation* is the medium for this recognition. Expected benefits are mainly clear to actors before the execution – serving as motivation. Costs are more difficult to anticipate because they often depend on the circumstances of execution. Reducing efforts by using (mainly operant) resources means a reduction in costs, which is offset by the compensation to the service provider for these resources. What this compensation looks like can be rather complicated. It may be a one-time price paid for a tool in anticipation of its contributions to a series of actions or a fee to be paid each time the tool is used. The tool does not possess a value proposition since the actual value is only realised in the action when it reduces the costs or increases the benefit.

Institutionalisation has to take the mutual dependence of service providers and actors into account. Transparency is a central means to establish recognition. Access to resources determines a touchpoint between the two sides that form a *customer journey* – see for example Følstad and Kvale (2018) – with a focus on the actor instead of the service-providing company. Tax et al. (2013) pointed out how the customer journey contributes to value creation. Such a customer journey may not only be seen as a tool to improve customer experience but also as a theoretical concept that represents the interplay of service providers and customers at their touchpoints (value in exchange). At the same time, it explains how customers, as actors, proceed in their activities to reach their objectives.

Figure 6 Dimensions of value increase in a SOAS



5 Dimensions of value increase – illustrated by VAs

For the design of digital applications, it is essential to always consider the decisive factors of value creation from the beginning; we refer to these factors as dimensions of value increase. The previous consideration of value creation based on the synthesis of AT and SDL encompasses the two most important factors in this respect, the actor and the network perspective. It allows us to associate the components of the service-oriented activity system (SOAS) with strategic targets that are implemented by means of digital technologies. These components are depicted in Figure 6.

It is important to understand that the upper part of the diagram (Figure 6) is more closely related to the individual actors and possible circumstances of action, while the

lower part refers to the service ecosystem that provides the necessary resources for this action. For each component in the SOAS, there is a dimension in which value creation can be further developed. These dimensions (and the corresponding terms) are not new, whereby we refer to the corresponding literature. The specific aim of the SOAS is to better systemise the dimensions and put them in perspective. We have identified several dimensions from existing literature as they are presented below:

- Dematerialisation: The term 'dematerialisation' originates from Normann (2001) and describes the degree to which information is decoupled from the object that carries the information. According to Lusch and Nambisan (2015), dematerialisation is the precondition for resource liquefaction, which means the translocation of information via digital infrastructure according to Blaschke et al. (2016).
- Objectification (object creation): We follow Engeström (1995) in understanding object-orientation as a central means of cognition related to an activity. More precisely, we see an object as the organising principle for the material and information required for the performance of an action. Vetoshkina and Paavola (2021) used the term objectification for the provision of an object-oriented access. From the point of digital technologies, the focus is rather on information but often in a representation that is related to material things.
- Institutionalisation: According to Lusch and Vargo (2014), institutionalisation supports actors in exchanging resources, that is, they simplify the mutual use of services. Orlikowski (1992) has stressed the importance of institutionalisation for the successful use of technologies since it constitutes communication of meaning. Digital technologies can support the constitution of meaning by building institutional connections as basis for value co-creation (Cooke et al., 2012).
- Modularisation: Hanseth et al. (1996) describe modularisation as the decomposition of a technical system into compatible components. It is the compatibility which allows building complex service systems. Wei et al. (2022) regard modularisation as precondition to leverage servitisation. Vargo et al. (2015) argue that institutionalisation is a central process for innovation.
- Platformisation: Bygstad and Hanseth (2018) describe platformisation as "a process where IT silo solutions are gradually transformed to a platform-oriented digital infrastructure." This process aims at using the possibilities of digital platforms to provide access to information and services according to Parker et al. (2016).

While the underlying approaches are rather technical, we have taken these service dimensions as lenses to examine the benefit that digital support provides to an actor in performing an action. In the following we go into more detail on these dimensions.

- *Value in dematerialisation:* The decoupling of information from a focal object makes this information almost globally available via digital infrastructure. This is why Normann (2001) talked about resource liquefaction as the translocation of information. Although Lusch and Nambisan (2015) have related resource liquefaction to SDL, the leading idea was to increase the quality of service. From an AT perspective dematerialisation and resource liquefaction enable the use of

digital services as the basis for the cooperative use of digital technology. The effect is not only that an object can be simultaneously handled from different locations but also that the access to digital services is simplified and adapted to the situation the actor is in. This also concerns the user interface. The easier users can access digital services the higher the resource density becomes. More flexibilisation of interfaces does not only increase the actor's value creation but contributes to value co-creation of the service system, too.

VAs: In this case this means that the user interface is reduced to a minimum, consisting in a universal auditory interface. In contrast to interaction via keyboard or touchscreen, users can make use of a service simply by voice commands. These commands are transformed into data streams and transferred to the service providers, analysed and performed. Moreover, the interface does not affect the object as such but provides a mediating tool to access this object. The voice interface of the VA is used for all kinds of available services. Finally, it means that VAs work on the operation level because they change the users' routines.

- *Value in objectification:* Objectification means the aggregation of information regarding an actor's object of activity. Regarding the term objectification we refer to Miller (2010) but use it in a slightly modified way. While material objects mostly provide a natural focus because the material resources must be at hand for the action, digital resources tend to spread information over various representations. By objectification, we mean the reintegration of the dispersed information related to one focus of activity into one frame. This view is closely related to the theorisation of digital objects by Faulkner and Runde (2019). Digital objects can serve as reference points that are not only relevant for individual actors but also support collaboration. Ewenstein and Whyte (2009) have highlighted the epistemic role of object-like visual representations. Recently, Vetoshkina and Paavola (2021) have pointed to the proximity between objects of activity and intermediary objects, drawing a connecting line to Engeström (1995), saying that an 'object is both something given and something projected or anticipated' in an action. The focus on objects is a central contribution of AT to the synthesised theory because SDL abstracts from all specifics of material interaction.

  VAs: VAs realise an objectification by concentrating the activity on the universal auditory interface as the communication partner perceived by the user. However, this kind of objectification is rather limited since it is not visual. Therefore, VAs are often enhanced by visual components such as screens that keep the information present in contrast to the transient provision of information via voice. Maier et al. (2022) observed that for some users the physical presence of the VA plays a specific role, developing an almost personal relationship to their device.

- *Value in institutionalisation:* Scott (2013) describes institutions as consisting of humanly devised rules, norms, and meanings as basis for action. Vargo et al. (2015) describe the influence of technologies on these social institutions. How value is co-created depends on the interplay of technology and social institutions. In an environment in which digital technology is accepted, value co-creation will work in a different way than in an environment where it is rejected.

VAs: Since voice assistants are becoming more and more common in domestic use and interfere with actors' daily routine (Li et al., 2021), we can consider this as a kind of institutionalisation of this technology. However, Maier et al. (2022) have found that because of the way VAs work today, people are usually reluctant to use them, as they are constantly attending to their conversations.

- *Value in modularisation:* Modularisation, as the decomposition of digital services into service components, has been identified to digital generativity, as stated by Lusch and Nambisan (2015). This feature goes back deeply into the nature of technology, a major characteristic of which has been seen in its modularity that Arthur (2009) has described as a precondition of innovation. Modularisation enables the efficient interaction of different actors or service providers, which is a precondition for division of labour or a functioning service system.

  VAs: In general, modularisation in VAs has not progressed very far. Most of the services that can be executed via them work in isolation, which severely limits the benefits. Smart home services are a certain exception in this respect according to Kumar et al. (2020). However, this is rather due to the modularisation of smart home applications, which, for example, enables the interplay of several devices, than to the VAs themselves, which mostly appear on the periphery of such smart home service systems.

- *Value in platformisation:* The term platformisation goes back to Helmond (2015) and refers to building a digital platform. Service ecosystems provide a space where actors find suitable services. However, this requires *transparency* – knowledge about service providers and their resources – and *accessibility* – the capability to make suitable use of these services. Lusch and Nambisan (2015) have emphasised the relevance of digital platforms in this respect. Platforms can appear in different forms. Tapscott et al. (2000) have distinguished between integrative platforms that provide already integrated resources for required services and aggregative platforms that only provide access to resources but leave integration to the actors. Figure 6 shows that we associate platformisation with the service ecosystem and the availability of a digital platform.

  VAs: They offer a variety of services from various partners realising the basic features of a platform. However, transparency on services offered on VAs is limited and finding the right service is quite difficult. The auditory interface is the main restriction in this respect. Service providers use additional means such as apps to support users in finding services. However, the support is limited compared to other digital platforms. Integration of services is missing to a large extent.

The analysis of VAs in these five dimensions shows that there is significant potential for improvement. SDL aspects are mainly related to the service access on VAs while AT refers to the manageability of these services. Which services users require largely depends on their situational target. However, the way they get access to them depends on the functionality of VAs. Both required services and access define to which degree these devices contribute to user value creation.

6 Conclusions

The presented synthesis of AT and SDL allows for a deeper insight into the interaction of the customer with services and other actors that is necessary for a detailed investigation of customer experience. This is crucial for service systems. The need for this arises from the fact that customer activities are becoming increasingly important in service systems. In this respect, smart products are an important example because service and material interaction are inseparably intertwined. This kind of smartness can be better addressed by the synthesised theory – see also the example in Gonçalves et al. (2020). This study illustrates the role that AT can play in understanding the customer journey in a more material and social world beyond purely digital interactions.

The aim of this article has been to synthesise AT and SDL, as both theories focus on customers using services either in pursuit of an action objective or as a part of a service ecosystem. The two theories have a different focus of attention. AT is interested in the particular action and its outcomes; SDL concentrates on the interplay of different service providers. Both perspectives share one idea, that is (co-)creation of value, either as a success of action in the case of AT or as resource integration in the case of SDL.

To completely understand value (co-)creation, we have synthesised the two perspectives. Hereby, we could address two blind spots of the two theories: the neglect of the specific customer role in SDL, as described in Grönroos (2011), and the challenge of digital ecosystems as 'distributed activities with no clear centre of gravity' in AT, as stated by Karanasios et al. (2021). Our synthesis has aimed at the resolution of the contradiction between the understanding of value creation as individual and as social achievement.

Looking for adequate representation for the digital ways of value creation, we recognise the increasing role of customer journeys. It is the nature of a customer journey to encompass aspects of the customer activities but in combination with the touchpoints to service providers; it reflects the individual considerations as well as the service exchange and the resource integration. However, even customer journeys still lack a comprehensive description of the underlying service system. In supplementing this view we see a future target for research.

With a closer look at concrete applications, we have considered various dimensions of value creation through digital technologies, which we have previously discussed in our studies. We have related them to certain aspects of the SOAS. They represent specific patterns that have been identified as value creating. They provide benefits to individual users but are deeply rooted in service systems. Thus, they show how digital technologies and application patterns help individual users to better achieve their objectives, which can again be described by a suitable customer journey.

The current research provides an access point for bridging the perspectives of SDL and AT but does not yet delve into the details of customer-service interaction. This example might help to give a first impression, but more research is required to reveal the mechanisms of the interaction. Another topic for future research is value creation theory itself. As indicated in Figure 4, there is a relation between action-related features of customer experience and the concept of value, as we know it from traditional marketing theory. However, as we mentioned before, the first-order model that we provided is only a starting point and needs to be more closely linked to AT (Collins et al., 2002).

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