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# The User Perspective on Service Ecosystems: Key Concepts and Models

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**Abstract.** The concept of service ecosystems emerged recently in service research as an important notion that underlines the complexity of structures in service interactions and the need for comprehensive approaches for the study of service systems. In this paper we focus on the role of the user as the ‘keystone entity’ of service ecosystems – especially for the creation of value. The research objective is to understand better the requirements and the implications of a user-centric perspective on service ecosystems and provide some basic modelling abstractions for the analysis of the structure and the objectives of the service ecosystem. The paper develops the concept of the user-centric service ecosystem at the beginning and then provides a conceptual model of its structure and a goal model for the intentions of the actors. The paper can contribute to the better understanding of service ecosystems, the explanation of the role of the user and the fulfilment of the initial phases of requirements analysis for service ecosystems.

**Keywords:** service ecosystem, service value, requirements analysis, conceptual model, goal model.

## 1 Introduction

We live in a service world, which is characterized by the great variety and multiplicity of the services people use in their daily life practices. The complexity of the modern life practices is reflected on the service processes and relationships for the development, the provision and the use of services. Moreover, service processes are considered ‘co-creational’ as they commonly receive contribution and require the collaboration of various service actors and stakeholders.

The concept of service ecosystems emerged recently in service research as an important notion for the better understanding of the complexity of service processes and relationships and the development of service systems that address the requirements of the service world of today. The ecosystemic nature of services is obvious in the definition of a service system as “a dynamic value co-creation configuration of resources that are connected internally and externally to other service

systems by value propositions” [13]. In this regard, service ecosystems are systems of actors who interact with their environment through mutual service flows [23].

In this paper we emphasize on the role of the user (or else the end-customer) as the ‘keystone entity’ [10] of service ecosystems. The user, first of all, may participate as co-producer in service processes and interactions. More importantly, taking into account the basic definition of service as “the application of resources for the benefit of another entity” [22], we gather the purpose of the processes of service providers (i.e. the application of resources) is reflected on the use of service and the benefit/value that is created for/ by the user. Hence, the user, with his intentions, skills and additional resources, has the most critical role in service usage and in value creation, as he determines the actualization of service value as ‘value-in-use’ [22]. For this, we consider the analysis of service ecosystems from the user’s perspective is important and meaningful and, additionally, it can inspire alternative approaches for the design of service systems that go beyond the operations and the concerns of the service providers to support service innovations, business model innovations and improved service value.

The paper proposes a user-centric perspective on service ecosystems and focuses on the initial phases of requirements analysis (‘requirements elicitation’) for service ecosystems. Taking into account the importance of requirements analysis for the design and development of successful information systems [6, 20], the paper can contribute to the better understanding of the role of the user in service ecosystems, the analysis of the context and the objectives of service ecosystems and the design of user-centric service processes.

The modeling procedures in requirements elicitation include domain descriptions that express the viewpoint of the analysis, conceptual models that describe the structure and relationships of the key concepts and goal models that describe the intentions of the actors [21, 28]. Following this approach as a rule of action, the rest of the paper is structured as such: after a short review of the concept of service ecosystems in the recent literature (section 2), we propose a user-centric perspective on service ecosystems (section 3). Next we provide an analysis of the conceptual structure of the user-centric perspective on service ecosystems in the form of a class diagram (section 4) and the intentions of the actors of service ecosystems in the form of a goal model (section 5). The paper concludes with a discussion of the importance of the research outcomes and the future research directions.

## 2 Basic Concepts of Service Ecosystems

The notion of ecosystems was introduced in the business literature firstly by Moore [16], who examined the analogy of the business operations to the relationships and the operations of biological entities in the natural environment. Iansity and Levien [10] developed further the strategic aspects of business ecosystems and Peltoniemi and Vuori [17] described their key attributes (complexity, self-organization, emergence, adaptation and co-evolution).

In ICT the notion of ecosystems was termed usually as ‘digital ecosystems’ or ‘digital business ecosystems’ [7], ‘software ecosystems’ [11] and ‘collaborative

networks' [5]. Digital ecosystems pay attention to the complexity and the distributed nature of the computing environment, the development of open, self-organized and adaptive socio-technical systems, the importance of the role of the user/ customer and the interdisciplinary nature of research [7]. The applications of digital ecosystems refer typically to collaborative software development processes [1], SOA environments [2], cloud computing [3], and smart system environments [18]. Software ecosystems emphasize on the relationships among the actors of the software industry for the development and use of software and services [11]. The software industry becomes more and more an ecosystem under the influence of platforms like Google Android and Apple iOS [14]. Manikas [15] characterizes the field multidisciplinary, proposes the characteristics of software ecosystems and highlights the predominant areas of research. The interdisciplinary structure of technological ecosystems is obvious also in the research in collaborative networks, which emphasize on the collaboration and the interrelationships of business and technological actors for the development of products and services [5]. In sum, service ecosystems have a mixed nature that combines both business and technological concerns.

The concept of ecosystems has greatly influenced the research of service systems in general. Service science defines service systems as "dynamic value co-creation configurations of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, all connected internally and externally to other service systems by value propositions" [13]. Using a less technical language, Spohrer, Demikan and Krishna [19] describe service systems as complex business and societal systems that include other technological and human-made systems and create benefits for customers, providers and other stakeholders. Camarinha-Matos et al. [4] regard service ecosystems as architectures that can address both the business/ economic aspects of services on the physical world and the technological aspects of services, as computing mechanisms for the implementation of the business service.

In the service management literature, Vargo and Lusch [24] defined a service ecosystem as "a spontaneously sensing and responding spatial and temporal structure of largely loosely coupled, value-proposing social and economic actors interacting through institutions, technology, and language to co-produce service offerings, engage in mutual service provision and co-create value". Hence, the Service Dominant (SD) logic emphasizes on interactions that co-create value in nested and overlapping service ecosystems [23]. The focal role of the customer in service ecosystems was introduced in Voima et al. [25]. The customer ecosystem, clearly influenced by the ideas of the Customer Dominant (CD) logic [9], is a system of actors (e.g. providers, other customers and other actors) related to the customer that are relevant to a specific service [25]. The customer ecosystem augments a service ecosystem with the dimensions of the idiosyncratic character of the customer and the social context. The interest is placed on what the customer is doing with services and how he involves the service offerings of the providers in his daily life practices.

### 3 The User-Centric Service Ecosystem

Service ecosystems, as complex and multidimensional structures, can be approached from different points of reference. For instance, in business ecosystems the focus is on the business organization and the strategic relationships with its environment; in digital and software ecosystems the attention is on the digital technologies that can be employed and their operations; in collaborative business ecosystems the interest lies on the production and delivery of products/ services through the collaboration of the participating business entities.

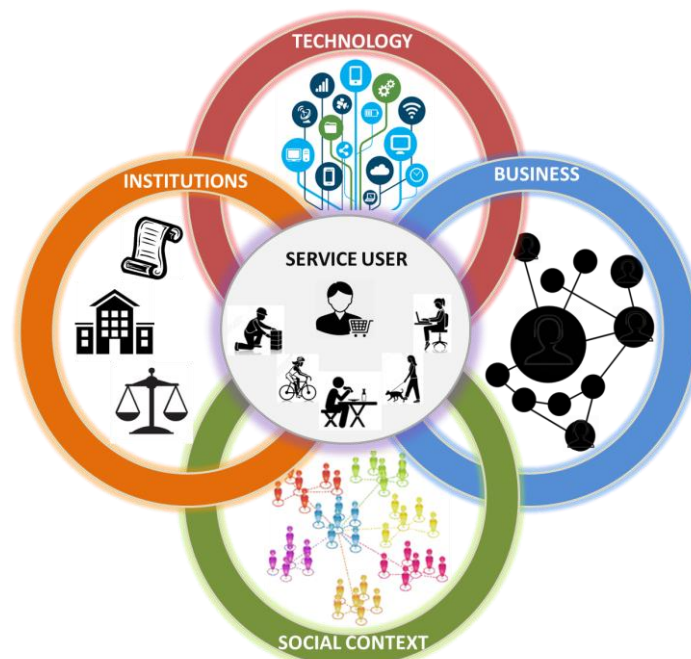
In this paper we approach the analysis of service ecosystems from the point of view of the service user. The user has a key role in service processes in general, but especially in the phase service usage, as his intentions, skills and resources, together with the contextual parameters, can determine the service value. Our analytical scope is focused on the use of services in the daily life practices of the user for the creation of value. The business processes for the development and delivery of the service offering are supportive to service usage and concern also the service ecosystems.

A user-centric service ecosystem is defined as a system of actors, with the user as the keystone entity with the focal role, and other elements related to the service. The actors include also service providers, technology providers, other users/ customers, other social actors, such as communities and social groups, and institutional actors, such as regulatory bodies. The actors can play various roles in the service processes and in the value creation process. The other elements of the service ecosystem include resources and other inputs that are used in the service processes, physical and virtual structures related to the service, social norms and structures and institutional arrangements.

The proposed definition provides a comprehensive and extended view on service ecosystems that combines elements from previous relevant works in business ecosystems (e.g. the complexity and the symbiotic nature of service relationships), software ecosystems (the importance of ICT in service provision), collaborative networks (collaboration between a variety of business entities for the development and delivery of service), service science (the ecosystemic approach on services as socio-technical systems), CD logic (the customer logic for the creation of service value in the daily life practices of the user) and SD logic (the importance of the social context and the intuitions in service processes).

The proposed conceptualization of service ecosystems is comprised of five sub-domains: a) the user sub-domain that refers to the use of service, b) the business sub-domain that refers to the service development and provision, c) the technological sub-domain that refers to the use of ICT for the development, the provision and the use of service, d) the social sub-domain that describes the social context of the service provision and usage, and e) the institutional sub-domain that includes the various institutions, rules, ethics, and beliefs that regulate and affect service provision and use. All the sub-domains are related to each other and affect the service processes.

The proposed conceptualization of the user-centric service ecosystem is depicted on figure 1. The user sub-domain is the epicenter of the analysis and the various service processes are approached from the point of view of the user who uses services in the daily life practices.



**Fig. 1.** The user-centric service ecosystem

*The user sub-domain.* The core entity of the service ecosystem is the service user (or else the customer as the end user of service), who resides in the user sub-domain. The attention here is on what the user is doing with services in his daily activities to accomplish his own personal goals. The user sub-domain is based on the ‘customer logic’ [8, 9] as an idiosyncratic life pattern and a set of actions, practices, preferences and decisions about how the user uses services as a part of his life. The main goal is the creation of service value, which emerges as value-in-use, that is when the service is used in the life practices. The service value derives fundamentally from the functional and non-functional aspects of the service and is affected by the experiences and expectations of the user.

*The business sub-domain.* The business sub-domain refers to the business processes performed by the service providers –and their collaborators– for the development and delivery of service. It corresponds to the concept of the business ecosystem as a network of interacting business entities that produces services. The service offering conveys a value proposition to the user based on the functional and non-functional characteristics of the service; the value proposition can be actualized and converted into real value when the service is used, according to the skills and preferences of the user. Key characteristics of the business ecosystem are the symbiotic relationships between various business entities, including suppliers, producers, competitors, customers and other stakeholders, and their mutual fate for the growth and the advancement of the ecosystem [10].

*The technological sub-domain.* It refers to the various computing resources and software, hardware and network technologies that are used by the service providers for the development, management and dissemination of services and by the users for the acquisition and use of services. The technological sub-domain corresponds to the notion of the digital or software ecosystems from the literature.

*The social sub-domain.* The daily activities of the people that require the use of services take place in a particular social context, which is shaped by social structures, common experiences, cultural elements, as well as the physical environment. For instance, in SD logic value creation is approached as a ‘value-in-social-context’ phenomenon and *all economic entities* are ‘social actors’ that integrate resources to create value [23]. The social sub-domain is relevant to the notion of the ‘network society’, as today social structures and activities tend to be organized around online networks. The social structures (e.g. friends or peers in groups and communities) can support or enhance the use of services provided by business providers or provide alternative services, which may complement or compete the business services.

*The institutional sub-domain.* The role of institutions in service ecosystems is emphasized in SD logic [23]. Institutions are humanly devised rules, norms, ethics and beliefs that enable and constrain action and make social life practical and meaningful. Hence, institutions and the institutionalization process are keys to understanding the structure and functioning of service ecosystems.

Figure 1 shows the interrelated nature of the different sub-domains as service processes require input from several or all of these sub-domains. The multilateral interaction between the different sub-domains increases the complexity of service ecosystems. For instance, technologies are used for the development and provision of service in the business sub-domain, the use of service by the user, the operation of the social structures (especially the online ones), while institutions govern the use of technologies in all these domains and social attitudes affect the development and use of technologies in business processes, in social processes and in life practices. Likewise, business processes and models are enabled by technologies, shaped by the preferences of the customers and adapted to the social impact and the institutional requirements. In general, the inter-relationship between the elements of the different sub-domains can be supportive or restrictive. For instance, institutions and technologies affect service development in the business domain supportively or restrictively; or social structures can support, impede or even compete the business organizations in the development and provision of services.

It is important to notice the customer-centric service ecosystem is an abstract conceptual structure for the analysis of service relationships and service value from the user’s point of view. If we wished to analyze a particular occasion of service usage by a particular user, then the analysis would refer to the particular parameters of service provision and usage at a particular context (e.g. usage circumstances, technologies used by the user and the provider, accompanied or support services, social interactions, institutional arrangements, etc.). Similarly, if we wished to analyze a particular business service model from the user’s point of view, then the analysis would refer to the particular usage patterns and the particular impact of the technological, social and institutional parameters.

## 4 A Conceptual Model of the User-Centric Service Ecosystem

Following the working definition of the user-centric service ecosystem presented in the previous section, we gather the user perspective on service ecosystems contains several concepts, which can be grouped in six categories: a) service actors, b) service processes, c) inputs and resources, d) service (offering), e) service value, and f) rules and social standards.

The *service actors* are the entities that participate in the service processes. We distinguish four basic types of service actors: service users, service providers, social actors and technology providers. The service users are the individuals who use services in their life practices in order to achieve personal goals. We prefer the term ‘user’ –rather than ‘customer’– to emphasize on the actor who uses services for personal benefit. The service providers are business entities that develop and provide services to the service users in order to support them in their life practices and in their effort to achieve personal goals. The social actors are other non-business entities that can have a role in the effort of the service users to achieve their personal goals. The technology providers possess technological resources that are used to enable or support the service processes of the other service actors. Hence, technology providers are different from service providers, as they do not develop and provide directly service offerings, but support the service providers in their processes.

The *service processes* refer to activities that are performed by the service actors. We distinguish three main types of such service processes: service development, service provision and service usage. Service development refers to the production of service; service provision refers to the offering and delivery of service; service usage refers to the use of service in the daily life practices of the individual. Service development and provision are the typical activities of service providers that are performed with the support of technology providers. Social actors and service users can also participate in service development and provision, when they are co-producing, supporting or enhancing these processes. Service usage is the typical activity of service users, who can be supported in addition by technology providers for the acquisition and use of the service and social actors (e.g. peers). The idea that the service value is co-created and manifested as value-in-use [22, 23] is based on this collaboration of the service actors during service usage.

*Service inputs and resources* include any kind of physical (e.g. equipment), digital (e.g. software) or mental (e.g. knowledge and skills) input of the service actors to the service processes. As an example, service usage requires the user has some basic knowledge and skills about how to choose a service and how to use it properly. In addition, it may require some particular technological resources for the acquisition and use of the service (e.g. for location-aware services, it is required a GPS equipment, software, online connection, etc.) and contribution from social groups, such as advices and guidelines.

The *service*, or *service offering*, is the output of the service development and provision processes and the input to the service usage process. The service is described by its functional and non-functional characteristics. According to these, the service offering has some value potential and conveys a value proposition to the user.



The *service value* is the outcome of the service usage process, or in other words it is the value that is created when the service is used by the user. The service value is based on the value proposition of the service offering (and hence on the functional and non-functional characteristics of the service), but it can vary from it, because it is shaped from the way the service is used by the user and depends on the knowledge and skills of the user, the contribution of other service actors, contextual parameters of the life practices of the user, etc. The service value can be of different types, such as functional, social, emotional, aesthetic value, etc.

The *rules and social standards* include a variety of norms that influence or regulate the service processes. They include elements of the social context and the institutional context, such as rules, norms, common experiences, cultural elements, ethics and beliefs.

In figure 2 we provide a conceptual model that describes the structure of the main concepts and relationships of the user-centric service ecosystem as a UML class diagram. The model aims at the better understanding of the relationships and the characteristics of the service ecosystem. Therefore, the model classifies the major actors, resources and service processes in service ecosystems and portrays the concept of service value and how it derives. In addition, the model can serve as a metamodel that guides the analysis and design of service systems.

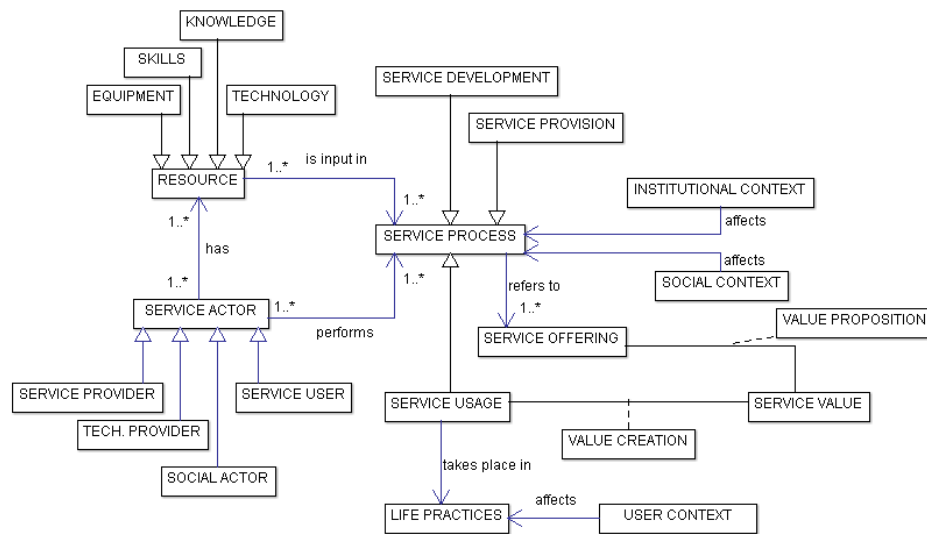


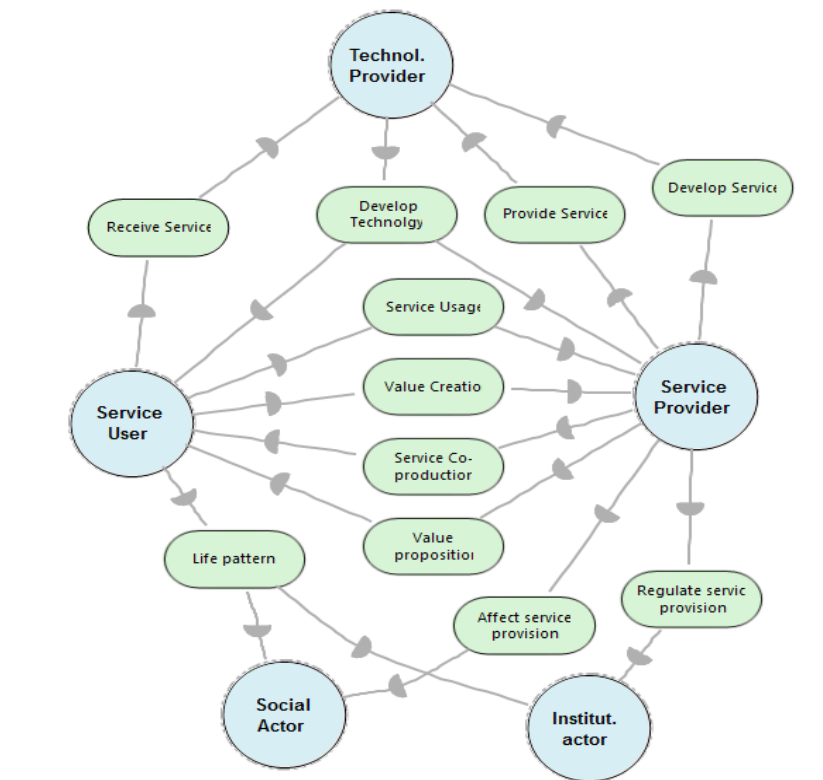
Fig. 2. A class diagram of the user-centric service ecosystem

## 5 A Goal Model of the User-Centric Service Ecosystem

The concept of ecosystems underscores the symbiotic relationship and the interdependency of the actors in achieving their particular purposes. The analysis of the intentions of the actors with the development of goal models is important for the

better understanding of the system requirements and the design of successful systems [26]. A goal model is a high level abstraction that describes the intentions of the actors ('why'), even without specifying their exact actions ('how'). Especially for the analysis of service ecosystems, we consider goal modeling as particularly important because it can explain the complex structure of the service ecosystem and the multifarious influences by individual behaviors, business practices, institutional arrangements and social structures. In figure 3 we provide a strategic dependency model of the goals of the main types of actors of the service ecosystem. We use the i\* modeling framework, which has been used for the modeling of software ecosystems [27] and for social modeling in information systems [28].

The model provides a high level view of the major goals of the actors and their interdependencies. The actors are depicted with round shapes (in blue color) and their goals with oval shapes (in green color). According to the proposed user-centric service ecosystem, next to the service user and the service provider, who have the principal role, we have technology providers, social actors (e.g. social structures) and institutional actors (e.g. regulatory bodies).



**Fig. 3.** A goal model of the user-centric service ecosystem

The service user has several goals. The major ones are the usage of service and the creation of service value (in fact these goals are interrelated, as service usage takes

place in order to create service value. This means-ends relationship can be further analyzed in a ‘strategic rational’ model in the i\* framework. By the same token, value creation is not a stand-alone goal, but a means for the satisfaction of personal needs in the realm of the daily life practices). The model shows the user ‘depends’ for the achievement of these goals on service providers (i.e. curved arrows showing at the direction of the service providers). Another goal of the user is to receive service, which depends on technology providers. The user’s life practices are affected by the life patterns (social norms, institutions, etc.) that are formulated by social actors and institutional actors.

Service providers perform service processes with two major goals: to develop service and to provide service. The achievement of these goals depends largely on the resources provided by the technology providers. In addition, service providers have the business goal to make a value proposition to the users, the acceptance of which depends on the users. Service providers may wish to involve users in co-production service processes, the outcome of which depends on the willingness, the effort and the skills of the users. Lastly, service providers depend on the goals of the social and the institutional actors to affect and regulate respectively the service processes.

Understanding the interdependencies of the actors of the service ecosystem is important for the better understanding of certain key service concepts. For instance, in the goal model we can see clearly the interdependency between service users and providers. First of all, service production can be a collaborative process (‘service co-production’) between the user and the service provider. However, reflecting some recent approaches of the literature [9, 23], the provider does not create value, but only makes a value proposition to the user, which is based on the service offering. If the user accepts the value proposition and uses the service offering, then value is created by the user – based on the provider’s service input and contribution. As a general term, the user depends on the provider for the use of services in his life practices.

The structure of goals can be more detailed and further analyzed with ‘strategic rational’ models in the i\* modeling framework. In any particular model, the structure of goals should contain the particular idiosyncratic variables for each user/ actor and the contextual parameters of each situation.

## 6 Conclusions

In this paper we presented a multi-disciplinary approach for the study of service ecosystems that combines business aspects for the provision and use of service and the creation of service value with technological aspects for the requirements analysis and design of service systems. The study of service ecosystems was approached from the user’s point of view that emphasizes on what users are doing with services in their life practices, rather than how providers develop and market services in their business practices. The paper aims at the better understanding and the modeling of service ecosystems – from the user perspective. We explained the rationale and the key ideas of the user perspective in service ecosystems and developed a conceptual model and a goal model that help visualize, analyze and understand the structure of the concepts, the intentions and the interdependencies of the actors in the service ecosystem. These

models can support for the design of service systems. The user perspective in the analysis and design of service ecosystems suggests the need for a comprehensive analytical framework that incorporates the technological, the business and the user concerns and takes into account the social and the institutional context. The concurrent analysis of all these concerns will provide insights for their relationships and interdependencies. The emphasis on service usage can reveal the real value of services for the users – that can be different from the designed value that derives from the functional and non-functional service attributes. Such knowledge can help the providers to understand better their customers and their service offerings and develop alternative services or alternative technological and business models.

As service ecosystems are complex structures that accommodate various actors with different goals and concerns, it is extremely important for future research to develop methodologies that incorporate all these concerns in the same analytical framework. This paper presented some ideas and an initial approach for this. Future research can seek the further development of the modeling approach for service ecosystems both at methodological, conceptual and practical level. Methodologically, the development of a multi-view modeling procedure that explicates the use of the underlying conceptual knowledge for the development of structural and intentional models and analyzes their interrelationship and transitions between them can be important for the requirements analysis of service ecosystems. Equally important is the development of approaches for the exploitation of the knowledge of requirements analysis for the exploration of alternatives in the design of service systems. At the conceptual level, particular views of the proposed conceptual and intentional models (e.g. conceptual models that emphasize on certain services processes; intentional models that emphasize on specific goals and on their strategic rational) can provide in-depth knowledge and support the better understanding of service ecosystems. Moreover, particular models that derive from case studies can improve the modeling process by relating the abstract modeling knowledge to the real world requirements of the life practices of the users and the business processes. At practical level, particular models that derive from particular service practices and instantiated models that take into account the particular requirements of system implementations can support the development of technological solutions for service ecosystems.

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