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Designing a value Co-creation language

Master Thesis Information science

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Declaration

I, Harvinder Singh, hereby declare that this thesis titled “Design of Value co-creation language after checking the suitability of existing languages” has not been previously submitted in this university or any other university for any purpose. I also declare that neither the part of the thesis or the whole work has been published anywhere except the quotations and the references which have been duly acknowledged in the concerned places.

Harvinder Singh
Nijmegen,
5/8/2017

Abstract

The study is in parts supportive to the Designing of a value co-creation language that would support the Development of a new modelling language. The shift in the economy from "goods dominant" to "service dominant" forces organizations to think in terms of value co-creation, this means that the customer is not a target of a value rather he is the co-creator of the same value in the service-system. This thesis is in the early stage of the development of the modelling language, here we have constructed general ORM (Object role model) for value co- creation cases, which is all fictive but realistic, based on the proposed ontology, that offers a multidisciplinary glossary of value co-creation's constituent concept, by University of St.Gallen, and also assessed its suitability with the existing modelling language like ArchiMate and e3value to see if these languages can relate to the co-creation concept. This later helped to capture the relevant elements from the existing language to support the modelling concepts for the co-creation language (newly needed ones). The result of the study presents an extended concept to the proposed ontology and would also make the concepts more clear towards reflecting S-D logic in IS analysis and design.

Acknowledgements

Not much in mind but with desperation to start a work, I would firstly like to extend my gratitude to my supervisor Prof Erik Proper. I thank him for the fact that I was really struggling to find a ‘work of novelty’ and he helped find me the right topic to work on. It has been a tremendous journey knowing that I am a part of a group working on the same task and my inputs are very much accepted.
I know that it’s not easy to maintain a timely communication when distance really matters, and so is your, Prof Erik, important role in the field. But I am happy that I always have had replies, even for the slightest hints I been expecting from you. The best experience in the whole making was to know that if you are really determined to work then the same work is meant to be done. Lastly, I would thank all the friends around who kept on asking me about the work I have been doing and even fed me with ideas that helped my sluggish moment to a conclusive outcome.

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Nijmegen
5/8/2017

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Study Approach

The study follows an extensive review of the literature, which includes the current knowledge about the topic Co-creation and service-dominant logic and also other theoretical and methodological contributions to the concept. *"So, in essence, it helps to understand what has been done in the specific topic, which the researcher intends to research"* (Raju, 2013). The literature helps us in finding the missing contents that this research intends to fill or support the facts that the literature ought to claim.

For the review the supporting sources were the primary and the secondary sources;

Primary sources;

Conversation with supervisor

Reports

Research dissertation

Secondary sources;

Articles

Books

Micro forms :Audio/Video.

1. Introduction

Economic scholar Frederic Bastiat once stated that "the great economic law is that 'Services are exchanged for services'… It is trivial, very commonplace; it is, nonetheless, the beginning, the middle, and the end of economic science". What he meant with this is that for an economic exchange, actors display skills of competence than gets reciprocated with skills of another actor. To make it even more explicit, it says that the competence in a competitive market is based on the exchange of service among actors to benefit each other.

There is a shift in focus from the products to services that have been defined in the marketing literature as being a transaction from a good-dominant logic to a service-dominant logic (Vargo & Lusch, 2008). The word dominant symbolizes the way the enterprise carries their business and makes a profit. Service dominant logic states that all the economic actors make the value in co-creation. This is because he/she mobilizes knowledge and other resources, and this effort influences the success of a value proposition, the customer becomes embedded in the service offering and ultimately is responsible for the value added to the process (Vargo & Lusch, 2004). The value here is the "comparative appreciation of reciprocal skills or services that are exchanged to obtain utility; value [means] 'value in use'" (Vargo & Lusch 2004, p. 7). The value is realized in the usage /experiences of the good not mere the exchange of good. For instance, in the automobile industry, Audi is not just selling cars; it is providing mobility services through the cars that they manufacture (Adam, 2012). "This also holds, for instance for the whole IT cloud industry as well as web-based spreadsheet and word processing services" (Clavier, 2012). There are increasing numbers of manufacturing companies that have developed their business based on the service. Supplier of products from diverse industries such as information technology system, aircraft engines and telecom system have succeeded with this approach by delivering innovative combinations of products, technology and services as high-value unified responses to their customer's need.(Davies et al., 2006). "Therefore, in S-D logic, service is a "perspective" and a "mindset" about economic exchange rather than a category of market offering that defines service as an activity

compared to goods" (Grönroos, 2008).

According to the service logic, the customer creates an effect to the value proposition with the use of the service and not mere with the exchange of the products. The classical concept of good-logic supports the economy in the production, distribution and sales of goods, the need for control entails of the production-flow e.g., in porter's classical value chain (Porter, 1985), but in the new S-D logic, the provider can only make value proposition and the customer should determine its value in the co-creation. Therefore, the crux of the S-D logic is the quality of the value co-creation which helps in improving the value proposition throughout its whole co-creation time.

This approach came to the light in 2004 and is a fantastic principle for the product marketing. The service logic has taken up the pace after the advent of the internet. Before the internet, the companies preferred to market to their customers and after the internet, the companies prefer to market with their customers (Adams, 2012). This means that the co-creation with the service dominant logic is valid because of the information that can be exchanged/shared, so to predict the changes in the services, so as to make the product more reliable, responsive and usable/interactive to the beneficiary. This shift in focus has received the attention of Informatics, Jonsson (2010) points out that the field would benefit from the additional studies of the IT-enabled services. The IT-enabled services are increasing the product marketing, even after the purchase of the product the marketing never ends, S-D logic helps to create interaction with your customer where you didn't necessarily see benefit (Adam, 2012), So, it can be inferred that these services are probably be based largely on the utilization of the new Information technology, it is predicted that the mix of technology and knowledge will attract the customers (Berggren & Bergkvist, 2006). The broad paradigm shift from closed, hierarchical and static systems to open, networked and dynamic systems signifies a move from centralized, siloed, proprietary and monolithic enterprise information systems to peer-to-peer, service-oriented, standards-based and modular inter-enterprise composite applications (Korhonen, 2010).

The S-D logic in the business and economy looks at the service to service exchange which in essence is an intangible competitive exchange among customer and the provider. The S-D logic is much toward the service which is in contrast with the product offering. The focus on competencies and processes in S-D logic is consistent with the thinking of the word

computing as a verb or a service rather than the word computer as a noun or a good (Yoo 2010). S-D logic involves applying the capabilities and skills of the actors in the enterprise to the needs and desires of others; very simply, it is "service" centric and not "firm" centric (Khoshafian 2007; Vargo and Lusch 2008b).
According to the service logic, products are merely a medium of the delivering the service. This means that all the product innovation is a service innovation and this paradigm is possible in the digital era.

1.1 Intended audience

It is expected that this thesis would help business analysts, requirement engineers, software architects and system developers to understand the concept of the value co-creation which tries to bring the important role of feedbacks or information from the beneficiary that feeds back to the providers and make the service system very customer oriented, and also to know what existing language tries to explain the same concept and to what extent. The results would be used in the designing of the reference language which would further help in making value-based information system.

1.2 Outline

This thesis consists of seven chapters as follows:

1. Introduction: this chapter introduces the theory behind the term service and its exchange which is coined into the economy based market as Service-Dominant logic.

2. Research Motivation: this chapter carries the question in the form of the design challenges and the aspect required to make the revised concepts which are the facet of the thesis.

3. Theoretical background: this chapter describes the overview of the literature related to the thesis that includes the proposed Ontology of core-concepts and its relationship. These relationships define how the core concepts reflect the information centric, network centric and the value centric focus.

4. Methodology: this chapter presents the research methodology of the thesis. The methodology discusses the procedure of making the ORM cases keeping in view of the concepts from the glossary of core-concepts and the proposed ontology's relations. This would help in knowing and analyzing about the working of the core-concepts in different markets, and understand the domain in terms of the concepts. The cases become an example for the existing language, ArchiMate ande3value, to know how to relate to the co-creation.

5. Suitability check with the existing languages: This chapter examines and relates the existing modelling language by reviewing their elements and relates it with the glossary of core-concepts. This helps in two objectives: first, to see if the existing languages can cover the concept of value co-creation, and second, to know what additional concepts are derived from the existing languages to further elaborate the core-concepts and properly display the proposed ontology.

6. The revised concepts of the value co-creation: this chapter describes the additional concepts that are being supportive to the co-creation and the designing of a language. It has the extended ontology on the basis of which a new language can be developed.

7. Conclusion: this chapter states the answer to the research question, provides some observations, and some discussion for the future work.

2. Research motivation

The research motivation is totally a fascination with the digitalization, and moreover, the aspect of value when described by the value co-creation needs more clarity in a way how actors; both the provider and beneficiary make use of the value before and after experiencing the value.

2.1 Purpose of the research

The purpose of the work is in the line of development of a new modelling language that would support the design of value co-creation process. The shift in the economy from the good-dominant logic to service-dominant logic requires a new language that could be helpful in describing the design challenges and the modelling languages that are already in the market are not able to cover all the aspects required to design the domain like the Business canvas that describes the business models, ArchiMate and CIMOSA that describe general enterprise modelling and e3value that does the value modelling. Nevertheless, (i) they do not systematically account for the concept of value co-creation— particularly not as conceptualized in S-D logic, so we would be checking these existing language and see how close these are in describing the value co-creation, and (ii) The existed concepts still need a rework since it doesn't show where and how does an experienced value end up.

Let's illustrate the concept again with an example of an aviation industry, so to make it more apprehensive; the airline companies are not looking for buying expensive aircraft or the jet engines. They want to have maximum air-time so that they can use that air-time to transport passengers and cargos. This means that the builders of airplanes and jet engines should re-think from just delivering the goods to providing "air time" as a service, continuously tuned to the needs of their client (E. Proper, personal communication, April 28, 2017), and none of these available modelling languages can model the complete co-creation with service logic.

2.2 Research progression

To continue the research work, there are several steps in a contiguous manner that would help in designing the new language. The first requirement is the making the ontology which has already been proposed by the University of St. Gallen. It has not accepted by the ECIS[1] but still we are keeping it here as reference ontology, so that we could see what it implies and what is missing in it. The ontology gives the glossary of the core-concepts since ontologies are a direct foundation of modelling languages (Verdonck et al., 2015). So, a revision of the concepts is required. In the revision, the basic concepts are studied, and with those concepts, some concepts based cases are created. For conducting experiments, we have captured the real world but fictive cases in terms of the generic domain model (ORM) based on the concept of the co-creation, and then relating the result with the proposed ontology of the domain of the co-creation. The cases would help us to understand and describe what has not been mentioned in the glossary of the concepts. Afterwards, the suitability of the existing languages such as ArchiMate, and e3value is to be assessed to see if these have the relevant elements, as describe in the cases, to relate to the value co-creation. And, if not then this would help in realizing what sort of dedicated modelling concepts, either from the existing one or the newly needed ones are necessarily required in more specific modelling language (E. Proper, personal communication, April 28, 2017). So, we need to develop the concept of the purpose or the domain specific language based on the need of actual cases. We could achieve the purpose after we Re-conceptualize the examples using these more specific concepts, thus forming the first examples in the need-driven and case-based domain specific modelling language.

[1] ECIS- European Conference on Information System

3. Theoretical background

The Information system community is already working on the perspective of the service-dominant logic. The implication of the use of IS[2], based on the co-creation with service-dominant logic is discussed in prevalent IS literature (Lusch and Nambisan, 2015). These implications include, for instance, novel aspects of IS that would generate or constrain diverse forms of resource integration; novel mechanisms of IS that enable identification, dynamic construction, and wide dissemination of resources; as well as novel ways of developing digital resources that trigger value co-creation (Lusch and Nambisan, 2015).
At the moment, the ontology of the value co-creation based on the SD perspective has been proposed, by St.Gallen, which is describing the inherent relationships and concept of the domain. This endeavour started with specifying the core concepts of value, actor, resource, service, institutional arrangement, and service ecosystem as well as enumerating their subordinate concepts and relations. The extant research uses the notion of ontology as a pragmatic approach to structure and codifies knowledge about the concepts, relationships, and axioms/constraints pertaining to a domain (i.e., value co-creation) (Kishore and Sharman, 2004).
The goal of this work would be supporting the 'ValCoLa' (value co-creation) project of LIST, which is looking to establish a value centred reference language to enable the analysis, modelling, and design of new generation of information system i.e., value-aware information system (VAIS)

3.1 The Ontology's core concepts

Ontology is used for the exchange of information and described in some specific natural language. It is a description of components and their relationships that describe the nature of a 'domain of discourse' (Chandrasekaran. et.el, 1999). The proposed ontology is based on the core concepts and the relation between the concepts of co-creation. In the value co-creation, the interaction is between the customer and the provider for the exchange of the service. The ontology would further help in the terminology clarity regarding the co-creation which has been described by various scholars in different domain like business and technology. The

[2] IS- information system

ontology's core concepts are described in the table-1; these are the definition of concepts collected from the literature review that delineates the paradigm shift from goods logic to the service logic. The ontology would give a shared understanding of a given domain and can be used by researcher and practitioner.

Concept	**Definition**
Value	As opposed to G-D logic in which value is fundamentally derived and determined in exchange (i.e., embedded in a firm's output and captured by price), in S-D logic value is fundamentally derived and determined in use (i.e., the integration and application of resources in a specific context) (Vargo et al., 2008, p. 145). As such, in S-D logic, there is no value created until goods or services are used—that is, experience and perception are essential to value determination (Vargo and Lusch, 2004, 2008, 2016). Example – Jet propulsion at optimal efficiency.
Actor	In S-D logic, actors are any social and economic agent with varying sizes (e.g., individual organism, family, firm), who provide input to the value creation processes for the benefit of the other actor (Spohrer, 2011; Vargo and Lusch, 2011). Compared to G-D logic, S-D logic thus posits a "generic actor" (Vargo and Lusch, 2016, p. 3) abstraction that disassociates actors from pre-designated roles (e.g., "producers" and "consumers"). As such, the role of actors is to co-create value through resource integration and service provision in a network of other actors (Spohrer, 2011; Lusch and Nambisan, 2015). Example- Passenger, airline, airport, jet turbine producer.
Resource	While in G-D logic resources have historically been viewed as tangible things that humans use for support, often natural resources that are fixed or limited in supply, S-D logic, however, refer to resources as anything an actor can draw on for support (Vargo and Lusch, 2004; Lusch and

	Nambisan, 2015). As such, S-D logic underscores that resources comprise not only tangible, natural, and static resources, but also intangible and dynamic functions of human ingenuity and appraisal. Furthermore, they can be internal to actors and under their control or external to actors but capable of being drawn on for support (Akaka and Vargo, 2014). Example- Fuel, turbine, flying skills, maintenance skills, sensors.
Service	In S-D logic, service is the fundamental basis of economic exchange, which refers to "applying specialized competencies (knowledge and skills) through deeds, processes, and performances for the benefit of another actor or the actor itself" (Lusch and Nambisan, 2015, p. 158). While in GD logic service refers to a unit of output in exchange for another good (e.g., money), in S-D logic service refers to the processes and activities of applying specialized competencies for the benefit of and in conjunction with another actor (Grönroos, 2008, 2011). As such, in S-D logic, service is exchanged between actors to access, adapt, and integrate resources among themselves (Edvardsson et al., 2011). Therefore, in S-D logic, service is a "perspective" and a "mindset" about economic exchange rather than a category of market offering (Grönroos, 2008, 2011). Example – Airtime
Institutional Arrangement	Being central to understanding human systems and social activity in general (Vargo and Lusch, 2016, p. 7), institutional arrangements are fundamental in understanding the structure and dynamics of value co-creation. They refer to sets of interrelated humanly devised rules, norms, and beliefs that enable and constrain actors' actions and that make the exchange of service in their respective ecosystem predictable and meaningful (sometimes referred to as institutional logics) (Ibid., p. 7). Example- Aviation rules and regulations, guidelines.

Service Ecosystem	As opposed to G-D logic that underscores a dyadic process of value exchange in traditional supply chains (i.e., neoclassical industrial perspective), S-D logic re-conceptualizes the supply chain as a collaborative process of value co-creation in service ecosystems (i.e., network-centric perspective). A service ecosystem is "a relatively self-contained, self-adjusting system of mostly loosely coupled social and economic (resource integrating) actors connected by shared institutional logics and mutual value creation through service exchange" (Lusch and Nambisan, 2015, p. 162). Example – Aviation ecosystem

Table-3.1 Value Co-creation's Core Concepts from the S-D Logic Perspective (Blaeschke, et.el. 2017).

3.2 The ontology relationship

Based on the glossary of the core-concept and the latest version of S-D logic's foundational premises and axioms (Vargo and Lusch, 2016), the relationships of the value co-creation core concept are shown in the UML diagram in figure.3.2. The relationship among the element is shown as R# and these relations are gathered by the LIST. The UML diagram is the proposed ontology by the St. Gallen.

If you look at the figure, the value is always determined by the actor who is supplied with the value R1. For the value realization, the provider makes the resource integration with other actors shown as R2, and every actor before exchange their service for service as R4 needs at least one operant (operant is the intangible resource like skills, competencies etc…) resource shown as R3. A service creates value once it is used by an actor R5. R6 shows the rules called the institutional arrangements devised by the actor R7, for the configuration and enabling of the service exchanges. These rules determine the actor's interpretation of the value R8. The actors in the ecosystems are connected with the shared institution logic and co-creation, which govern and evaluates the logic of emerging ecosystem R9.

Eventually, service ecosystems are composed of at least two loosely coupled actors (R10).

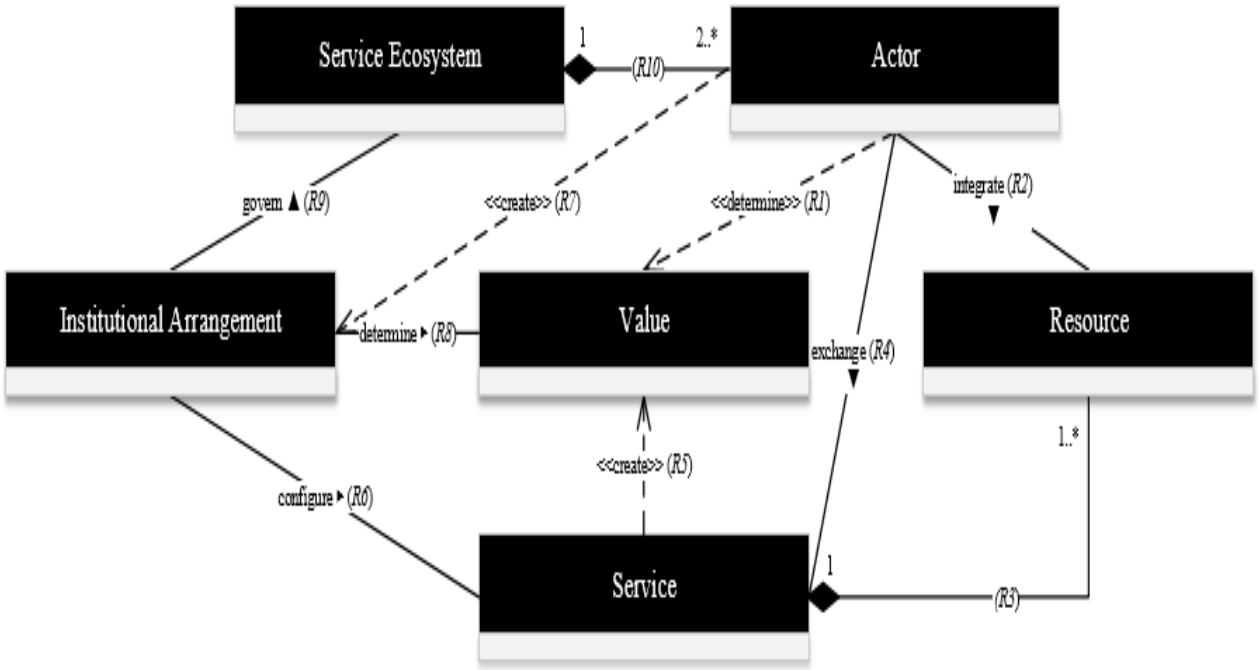


Fig.3.2 shows the ontology of the co-creation based on concepts and foundational premises.

3.3 View point on the value based information system

From the above discussion about the concepts and after looking at the proposed ontology, it has been realized that the information systems are required to be re-designed in the way of re-conceptualization of business and economic exchange that is based on the value realization. The service value and co-creation together will bring the concept of service innovation and it would be seen as an in-timely delivered change or improvement innovation, no longer are innovations (and even the ideas from which they emerge) developed from within the confines of an organization; instead, they evolve from the joint action of a network of actors ranging from suppliers and partners to customers and independent inventors—that is, a network-centric focus (Chesbrough 2003; Nambisan and Sawhney 2007b).

Further, the information content is the new focus for the innovation so all the standalone intangible sources with high information input is valuable, that is, an information-centric focus (Glazer 1991).

“Service Innovation in the Digital Age,” suggests the need for a broader conceptualization of service and the development of new ideas and frameworks to explain the potential impact of IT capabilities on how people experience and innovate with service (Lusch & Nambisan, 156). Based on the core-concepts and the proposed ontology, we have made the ORM cases for the analysis of value and network centric information systems in the next chapter.

4. Methodology

This chapter follows the core-concepts of value co-creation described in previous chapter and also shows the method used in the making of the cases to exemplify the concepts better with the natural language. These cases would showcase the relationship of the core-concept as described in the ontology fig.3.2, keeping in view that it gives the assertion of value co-creation, which is information and network oriented. The cases further helps in idealizing how the concept can be based keeping in view the value co-creation and notice the way of relating the core-concepts. Based on the cases, which would act like a blueprint when doing the suitability check in the next chapter, it would be easy to relate the core concepts with the elements of the existing languages.

4.1 ORM

Object Role Modeling (ORM) simplifies the design process by using natural language, as well as intuitive diagrams which can be populated with examples, and by examining the information in terms of simple or *elementary facts* (Halpin, 2001).
It is a conceptual approach to modelling and information semantic in a business domain. It describes the underlying facts of the interest and all the facts are verbalized in a way that a non-technical user who belongs to the same domain can understand it (Terry, n.d.).
The reason for using Object role modelling for the value co-creation concept is not a complex term to understand at this point. This is because the ORM defines the object role with the other object in the model in a graphical and textual way, and it is really helpful to see things at the conceptual level so that its meaning gets clearer and the Purpose too. By expressing the model in terms of natural concepts, like *objects* and *roles*, it provides a *conceptual* approach to modelling (Halpin, 2001). Another conceptual approach is provided by Entity-Relationship (ER) modelling. Although ER models can be used once the design process is finished, they are less suitable for formulating, transforming or evolving a design (Halpin, 2001).
The conceptual design scheme has following procedures known has the (CSDP).

Steps	**Descriptions**
1	Transform familiar information examples into elementary facts, and apply quality checks
2	Draw the fact types, and apply a population check
3	Check for entity types that should be combined, and note any arithmetic derivations
4	Add uniqueness constraints, and check arity of fact types

5	Add mandatory role constraints, and check for logical derivations
6	Add value, set comparison and subtyping constraints
7	Add other constraints and perform final checks

Table.4.1 –CSDP (conceptual schema design procedure) (Halpin, 2001)

4.2 ORM cases

The cases include the fictive but real world cases to describe the concepts at the conceptual level. There are 4 different cases used to conceptualize different market domains. These cases are made keeping in view the relationship of concepts in the proposed ontology which is information/value and network oriented.

4.2.1 Aviation case

The value co-creation based on the service-dominant level can be described with the object role model if the object roles are represented in terms of experiencing the facts, and this would help to build the understanding of the domain. Let's take the real world case of the value co-creation of 'aviation industry'. The role that object is playing in the value co-creation should describe that the relations are built in terms of usage and that means, the relations should never build with a 'has' role or any similar role (the actors don't own each other, the resources are not own by a single actor only the exchange of the service is realized by using the resources). This can further be explained by saying that the 'has' role is suitable if the role is making a proposition of possession whereas the co-creation makes a proposition of experience. Moreover, this was just to make things clear before we look at the foundational premises by Vargo and Lusch (2016, p. 4) that would help us to understand the verbs used in defining the concepts.

The different objects that are included in the aviation industry includes-

1-Turbine

2-Aircraft

3-sensor

4-RMS (Remote monitoring system)

4-pilot

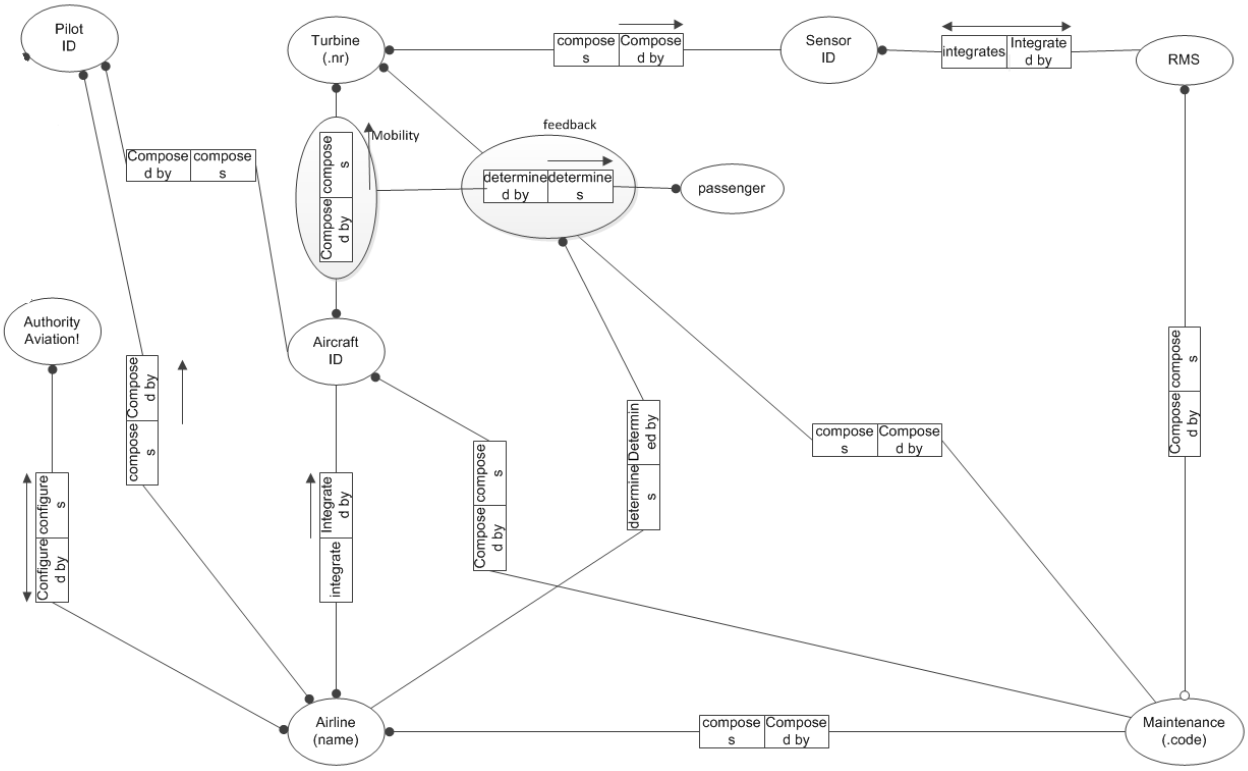
5-passenger

6-Airline

7-Airport

8-Regulations
9-Maintenance

The value in use can be related to the qualities that the service offers and the actors experiencing it. For instance, for an air passenger, the value is not achieved alone by flying in a comfortable aircraft, but, the on-time flights are another factor as a quality of the airline's service. So, this way the value is made if the qualities are matched. Another example of value in use, the maintenance provides a value if it is taking actions beforehand in case of a major fault. The sensors role creates a value by providing predictable information in the functioning of the turbine which is then reported to the Remote monitoring system. If we combine all these smaller roles adhering to their qualities then the overall outcome of 'air time' as a value proposition is achieved. This shows that objects and the roles are in a cycle or a loop with each other which is run by continuous information exchange (Information-centric). The information can be translated in a way of looking at the functioning of the objects, and then the information is acted upon based on the needs and changes. What I mean by information exchange and by the translation of information as function is that if the turbine is propelling at the optimal efficiency then it states its function, and the information is received by the pilot through the information system placed in the aircraft, this information is further exchanged between the aircraft information system and the airline through IS (network-centric). So, the functioning of the Information systems in the service system realizes the value in context, as well. A lot of roles in the ORM are made mandatory, so, to show and make it sure that the objects are doing what these are supposed to.



ORM on value co-creation of Aviation industry.

Fig. 4.2.1

Now, describing the objects and their role in terms of the concepts of the value co-creation, the value proposition is the “availability of air time”, and this would be achieved when the actor such as passengers, airlines, pilot, authority, maintenance would be exchanging service in terms of described roles. There is one thing to notice that the service offeror, which in this case, is the turbine producer, is also a beneficiary like the way, we say, that the airline service offeror is a beneficiary as well. This is because in the value co-creation, the value is in a cycle and the services and actors are networked. This means that for value to remain effective it is required to be experienced by the actors that mean the offeror experience it also after the target beneficiary, the target beneficiary is the customer in most cases experience the value and creates value in use.

The context of service in exchange can be seen when the sensors (that looks into various changes in the turbine; from temperature inside the turbine to the vibration and other important factors, and record minute changes that are very helpful in predicting any near future fault) reports to the RMS, the inputs, about the condition of the turbine, so that, the RMS can alert the maintenance in case of making a change to the parts of the turbine before a

major fault can happen. The maintenance is used by the airlines and allows the arrangements for changing the parts that could be of fault, this way the future faults are controlled, beforehand, without even letting the passenger know about it thus maintaining the “airtime” as the value proposition.

In co-creation, the mightiest is the continuous information exchange that leads the way for the value to continue, and for the better, can be improved. This could be realized when we see that the key beneficiary of the whole service, the passenger makes a feedback after determining the mobility, and that feedback is an important value for the actor; airline, who is a value creator but can be seen as a beneficiary here, now. It is important to know that in service-dominant logic, the value proposition is completed after the customer provides a feedback for the service experienced by him. The ORM Fig.4.2.1 looks like a process-based, but the value is realized when the sub-processes that include actors and the subpart of the value proposition accomplish the part of the proposition in terms of service exchanges. This means the value, per se, as a whole is achieved with the subpart achievement of the value in the process. But, to mention here, I would say one more thing that for a value to be created there are two main players (Actors) required; one is a creator and another is the consumer. They are not really seen as the beginning or the end of the value determining. Around these two actors, other actors act in such a way to make the exchange of value realized in a continuous and growing manner. These other actors are providing the service in exchange for the value to remain continuous if you look at Fig 4.2.1. The maintenance provides the service (maintenance is a subsidiary of the value creator, turbine producer. Maintenance is seen an integral part of the producers, which is the turbine producer. As airlines prefer renting the expensive turbines, so that, those can be taken care by the producers, and, the service logic is much suitable in scenarios like this) in exchange for the service of airlines to meet the value proposition “airtime”, or the authority is providing the control to the airlines, (rules/regulations) in the service exchange, to use the airports for internal (tickets, security, luggage holding) and external (flights) operations. The continuous relation provides a chance of updating/improving the aspects required for value proposition; like the passenger rating about the journey/ food/comfort/timings describes the need for change or not. The passenger determines the value when they experienced the mobility in the air. The passenger’s input is important to determine the service logic, and that’s why a black dot is marked with the role in the Fig 4.2.1, this black dot describes the mandatory role of the passenger. The Information cannot be delayed in the co-creation, as it would slow the service logic, and eventually, end

up the co-creation in the ecosystem. That is why, all the actors and their services roles are defined with the black dots that states the must have duties, seen as a condition in the ecosystem.

4.2.2 Tourism case

Service-Dominant Logic (S-D Logic) allows greater competitive advantage by recognizing the active role of tourists in the creation of their own experiences (Juan, Arturo & Agueda 2015). Tourism providers need to create 'experience environments' in which to compete, integrate resources and develop superior competencies in order to co-create high-value experiences and improve the way in which this process is managed (Andreu, Sa´nchez, & Mele, 2010). The establishment of an effective value proposition or tourism experience proposition (TEP), therefore, requires the analysis of tourists' perceptions and assessments in order to identify the key resources. This different scenario would help us to build the object-role model with the conceptual level of the proposed ontology of the domain, and see if it really relates to it.
The value proposition, in this case, could be providing "leisure time" by the service providers but this proposition is experienced by the tourist. When designing the ORM, the objects are
1-tourist
2-hotel
3-Cruise
4-Portal (web)
5-maintenance
6-Authority
7-Consultant
8-Feedback

The Tourism industry is already a service based industry, but to see if anyone coming into the network approach of the industry experiences the co-creation, and eventually support the service-dominant logic from different spatial context. Here the goods are not sold, but services are sold, and the value shown is realized by the beneficiary (tourist in this case). The beneficiary provides a rating to the service that he/she experience, and the value they realize. This helps the service provider to realize the value of the experience they are providing to the beneficiary.

Note that, a lot of objects playing a mandatory role in Fig 4.2.2. The mandatory role is represented by a black dot attached to the object with the connector, is a must-have factor for the value in exchange to happen between actors and service providers, and also, between service providers and resources. Notice that, all the roles show an experience by not using any of the verbs that describe the possession of the object (The similar rule applies here as well that we applied in the aviation scenario), the verbs are describing the use/experience with the object which is shown by verbs like "determines" in the role rectangular box.

The portal refers to the web-portal (Two different portals are shown in the Fig 4.2.2. One is shadowed and other is not. There is no difference between the both, It is just a way to show an object at multiple places), which is used by the beneficiary as service, and exchanges the service with the service provider. When the tourist integrates the portal, it means that the tourist is describing the experience that he wants. It is rather a value on the service-providers' side that they can actually provide the experience that the beneficiary wants. Hotels/cruises are the services that the service provider, travel agency, integrates and wants the beneficiary to experience it. But even here, the services are needed to have qualities that the beneficiary want to experience; like the comfort in the hotel/cruise, food should be of the expected taste and quality, the timing of the cruise should never be unscheduled and various other added factors. But the service provider is already aware of the experience that the tourist wants from the service integration with web-portal, and this is the first step for the service exchange between a tourist and the service provider for the service value, i.e., "leisure time".
The hotel/cruise keeps the use of the maintenance, which is an operant resource, to maintain the experience that they provide to the beneficiary in terms of retaining the time-oriented quality. The beneficiary/tourist rates back the service he/she experienced to play part in the experience of co-creation of the service. In this respect, we can state that the market feedback or the results achieved through the development of stable relations are closely linked to customer loyalty (Bigne´ et.el, 2001). And, loyalty is one way to know the beneficiary, who would most likely stay in the co-creation.

Resources here are the combination of tangible and intangible resources, and these are the object shown as the hotel, cruise and maintenance. The beneficiary uses it as a service by the service provider, who is mentioned as the agency. Service exchange starts with the web portal usage by the beneficiary/tourist and ends the cycle with the feedback of the service for the agency by the beneficiary/tourist. The cycle of services may be completed with a beneficiary experiencing the value, but the cycle of the service never ends as long as the value is created

by experience or the presence of the actor co-creating in the ecosystem. And like this, all the co-creation of experiencing the value happens in a similar way with the different beneficiaries. In general, tourists' loyalty is an important resource, and it is a key predictor of future travel demands (Yoon & Uysal, 2005). The object, Authority role, in the ecosystem is to regulate the objects like hotel, cruise and agency in a way, that their services should not degrade the quality that has been set by the authority or any other factors that are against the tourism ecosystem, and the beneficiary uses this maintained quality by the service provider to create the value of experience in the ecosystem.

Relating the Object roles.

The hotel and cruise compose the resource maintenance to make it the part of the service. The service provider, agency, integrates the hotel and the cruises to make it a part of the service provider, and thus, beginning the service in exchange. The presence of the institutional arrangement like the authority configures the roles of the service providers and their offerors, so, to maintain the consistency of the quality by enabling or constraining the required service in the ecosystem with certain rules and policies. A service system is composed of the actors but all the relations are effective if the information exchange is not delayed that means the information system equipped with the roles of response should keep the exchange of the response effective and continuous, so that, the necessary actions can be taken to retain the roles and relations in the service-dominant logic. These responses between the actors help in determining the value in the ecosystem.

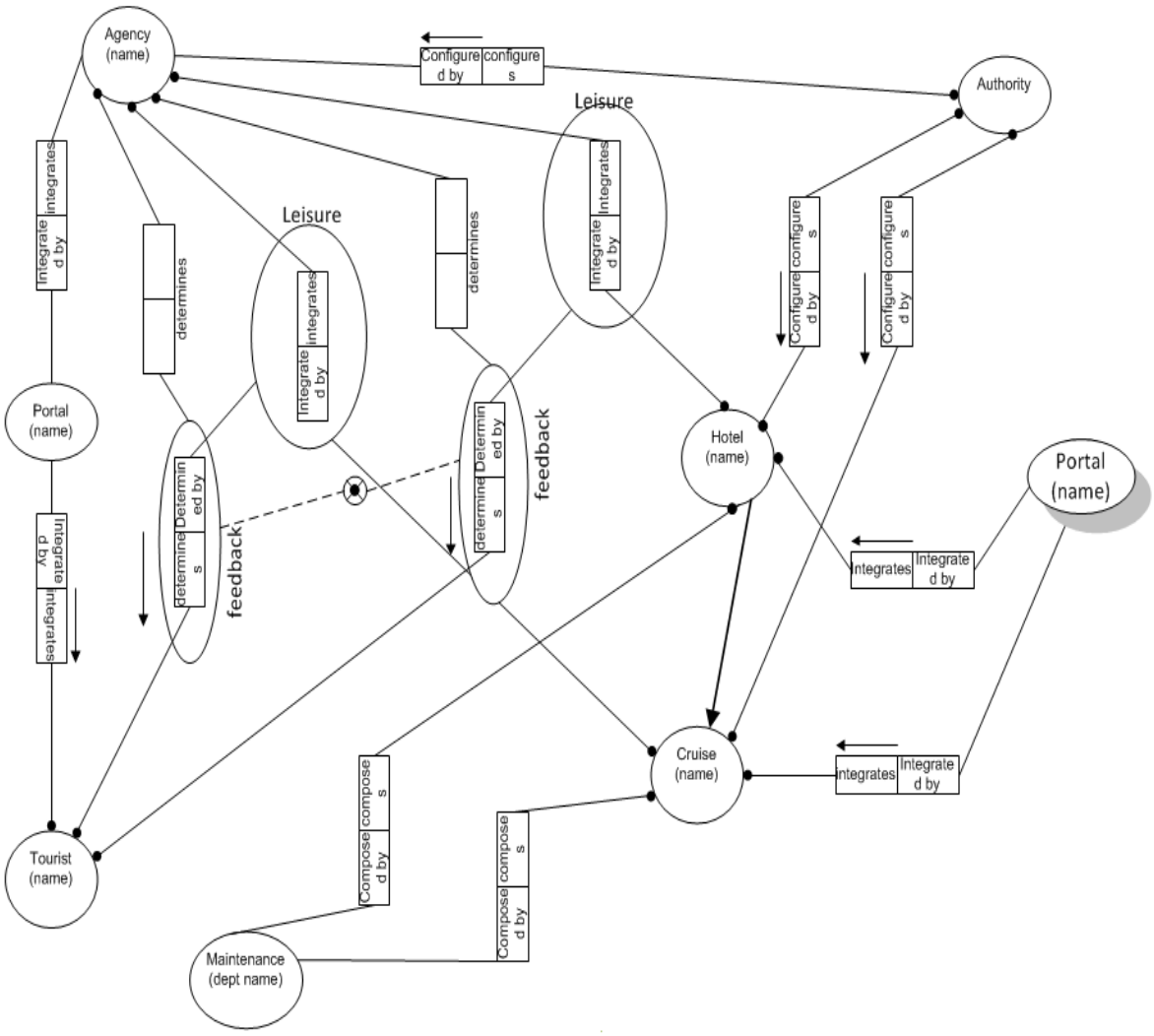


Fig. 4.2.2 ORM of value co-creation based on the Tourism industry.

Note- maintenance has Remote monitoring systems (RMS).

4.2.3 Retail case

SD logic gives a framework of actions and reactions of actors collaborating during resource integration with the aim of creating experiences (Rasid, Sadiq 2016). The experiences are incorporated into SD logic by focusing on "experiential nature" of value by changing the paradigm from production to outcomes and how those outcomes are contextually and exclusively perceived and experienced by individuals (Rasid, Sadiq 2016). The ORM in the case of the Retail Industry, Fig 4.2.3, shows the conceptual modelling in the case of the co-creation with service-dominant logic. Like the other two scenarios, this would also, let us examine the scenario with the concept of the domain. The value Co-creation with the service-dominant logic here states that when the consumer is buying from the retailer, he is looking for the experience that includes the availability of product on the shelf always, varieties and prices. So, the consumer has a self-created experience that he wants to value. The retail is not selling a product; they are exactly selling shopping experience that proposes the time-saving experience of buying stuff and its availability with different ranges that are available in one place, and this is exactly, what a consumer wants to experience.

The objects in this model are

1-consumer
2-Product
3-Feedback
4-Supply
5-Producers
6-Retailer
7-Logistics
8-Maintenance
9-Authority
10- Sensors

If you look at the figure, the consumer, who is an actor, is creating the value by experiencing the product whenever he/she wants. Consumer determines the product by rating the same product, and after this rating, the value proposition is achieved in the ecosystem. This rating is then taken as the feedback that creates the value as the Retailer determines the Feedback for the determined product by the consumer. The feedback has a big role in the co-creation because it describes the active participation of the consumer who experiences the end product

of the co-creation, and also provides an opportunity for the actors involved in the creating that environment for the consumer to be maintained and improved if required.

The retailer is mainly different from other network actors, by the fact, that his integration with the customer is direct (Rasid, Sadiq 2016). The retailer is another actor, and in itself, a service provider to the beneficiary (consumer) and the retailer integrates with other service providers to initiate the service exchange and realizes the value in exchange. In this case, the integrated service providers are the producers of the product. The two actors exchange service after retailer integrates the producers to realize the part of the value proposition. The service also composes of an operand resource, called the Logistics, to support the service provision (Pels and Vargo, 2009, p. 374). The retailer keeps the retail informed of the product in stock or not, so that, a timely delivery should help in maintaining the experience of the consumer.

The producer, retailer, and logistic compose maintenance which is seen as the operant resources to act as a fundamental source of competitive advantage (Vargo and Lusch, 2008, p. 7). The maintenance is required in every industry and it is seen as an integral part of services, maintenance keeps a time ahead check with the information system involved in the service ecosystem, so that, it can repair things before a major fault can occur that may cause delays in the services. The producers are able to maintain an efficient production; the logistics are able to provide timely deliveries (the logistics are equipped with sensors/tracker that helps the logistics in case of unknown halt. The help is provided by the maintenance and the failure in the service exchange is avoided) and the retailers are able to maintain the experience they want the consumers to achieve.

Finally, there exists the institutional arrangement known as the authority in the retail co-creation scenario to govern the actor's coordination, and maintain the service exchange in the ecosystem. The role of all the actors like consumer, retailer, producer has been assigned a mandatory role that can be seen by the black dot linking to the object, for e.g. the consumer has to rate the product, so that, the value can be realized in terms of the rating. Feedback is one of the most important co-creation facts that the consumer exchanges as a service with the retailer to realize the value proposition in the S-D logic. Till now, it has been observed from the three cases that the feedback from the end beneficiary, like a consumer in retail industry or a passenger from the aviation industry or a tourist from the tourism industry, is seen as an

important aspect that can be seen as a service from the end beneficiary for the overall exchanges in the service ecosystem.

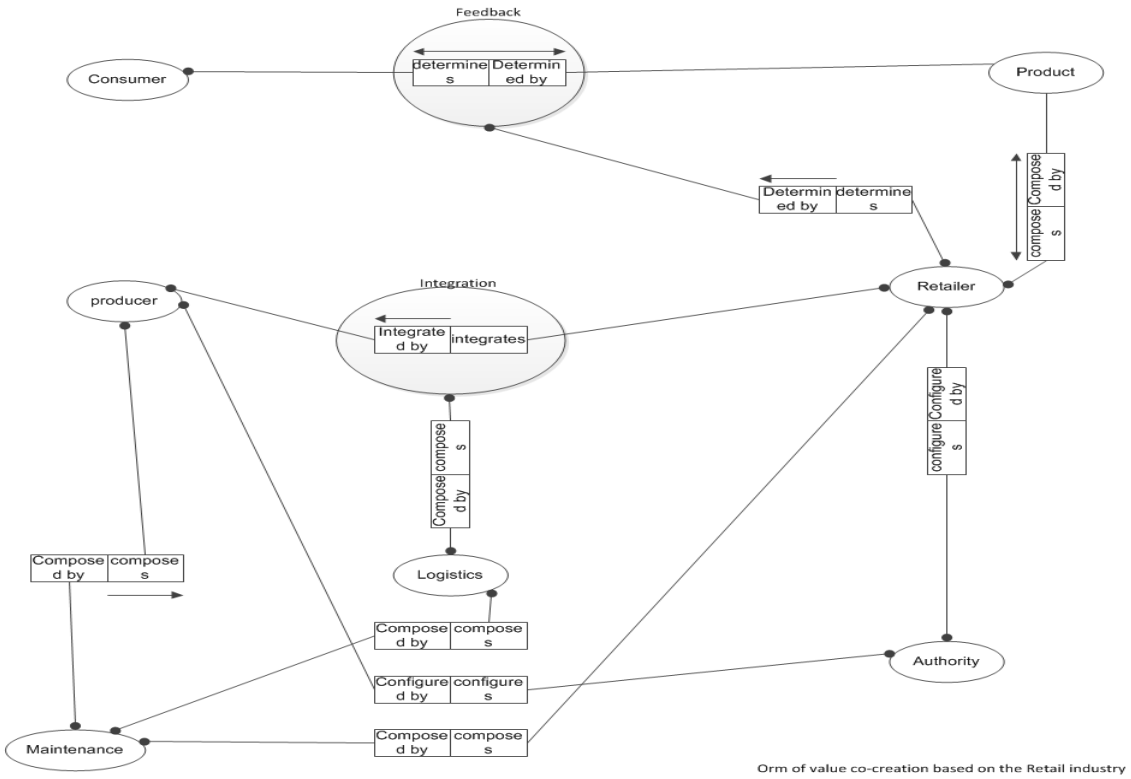


Fig 4.2.3 ORM of value co-creation based on the Retail industry.

4.2.4 Health sector case

The role of consumers is now extending beyond being passive health care recipients and even active participants in their own care to the involvement in innovation and value co-creation in health care - from being "users and choosers" to becoming "makers and shapers" of services (Janamian et al, 2006). The use of co-creation involves embedding the approach across the whole health care system – from the micro system level to the mesosystem level and the entire macro system (Janamian et al, 2006). Satisfaction is the core outcome measure for healthcare service which can be used to evaluate the performance of healthcare providers, enhance service training programs, and obtain insights into management strategies (Zhang et.al., 2015). The value in the health sector is seen as the health outcome which is also an

analogy to the beneficiary's satisfaction. The role of this information age is helping the customer to co-create the health system that is based on the service-dominant level. S-D logic is the logic of togetherness, where actors use their applied knowledge and skills (competencies) to provide benefit to another and to benefit themselves. S-D logic is based on relationships, mutual trust, and win-win exchange (Joiner & Lusch, 2016). This is the reason that the all the objects in the object role modelling are having a mandatory role.
The objects in this model are
1-Hospital
2-Food Dept.
3-Mobile care
4-Pharmaceutical
5-Doctor
6-Technician
7-Patient
8-Medical authority
9-Maintenance
10-Engagement (A feedback)

In the Fig 4.2.4, the hospital is the service provider that integrates with other services providers like the pharmaceuticals, technician, mobile care and food dept. All these service providers are exchanging their services to support the value proposition. Hence, these are the major value economy services. The cycle of the value proposition gets completed after the patient experiences the health system and provides a feedback mentioned as an 'Engagement'. This engagement involves various digital equipment that helps the patient to integrate itself with the health system that provides better outcomes, and these outcomes are seen as a value by the service providers as an extended part of the value proposition which would further help the providers to improve the co-creation with the consumer with such value. The outcomes are even helpful for the patient as it describes the patient's wiliness to be the part of the co-creation, and it keeps track of the health or act as a reminder if there is a problem, and would even act as a reactive agent for the patient in case of emergency.

The roles are described mandatory because the service-dominant logic is framed with mindset, terms such as adapting, facilitating, stewarding, co-creating, revealing, improving, supporting, promoting, elucidating, learning, and more capture what the patient-provider

dynamic should reflect (Joiner & Lusch, 2016), and these mindset are an uninterruptable chain in the value co-creation.

The maintenance is always an important resource in the ecosystem. Every service providers are composed of maintenance with a mandatory role. The food dept. gets the necessary support with the information systems and other electronic equipment that describes the demand and also notifies the maintenance time ahead for the failure recovery.

The mobile care is an active service and starts when a patient first experiences the service and agrees to be the part of this co-creation with its active engagement.

The pharmaceutical dept. gets integrated into the ecosystem and remains active service provider with the demands and request made as per the patient's engagement.

The institutional arrangement, which is the medical authority here, configures the service providers, so that, they maintain the service they are providing for the value proposition that they want the beneficiary to experience. The whole ecosystem is an integrated service system with a mandatory role realizing the value in a continuous and uninterrupted manner, in a simple language performing their services in exchange and making the value realized.

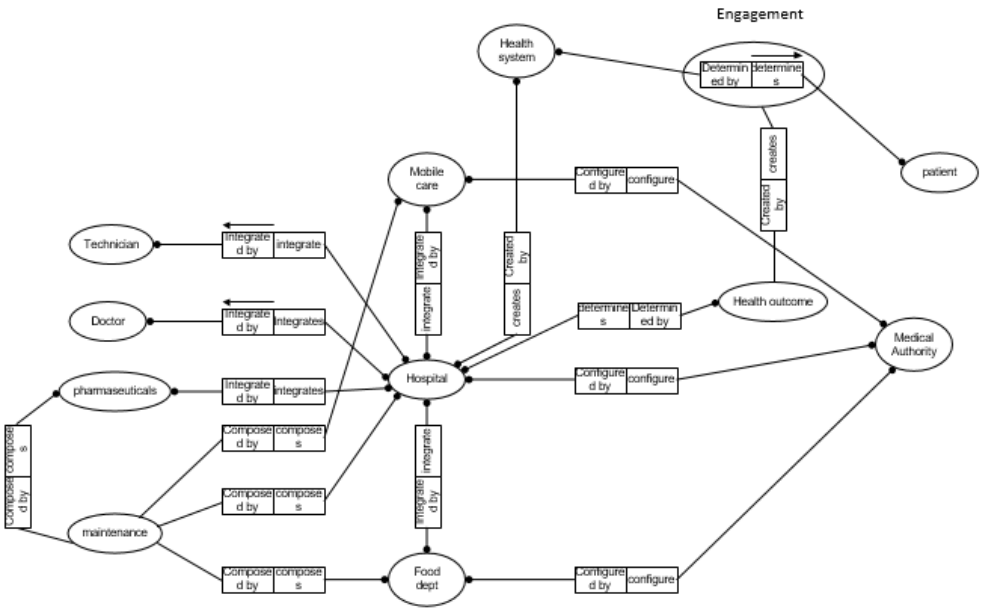


Fig. 4.2.4 ORM of value co-creation based on the Health industry.

4.3 Outcome of the cases

It has been widely noticed that to make the value realized, the systems are made aware by the help of information that makes the actors design the similar or better experience in the service environment, this mean the IS are having a continuous information-centric and network--centric focus to achieve the value-centric focus. If you take the Aviation example, the passenger is considered as an active Actor in the co-creation, and the value-based information system is developed to realize how this actor can remain an active creator. The Actor: the service provider first introduced the value of the service. After the other actor experiences the value, then the actor is kept informed of the value-based system that keeps an active check on the online activity of the similar actor for the similar experience he is looking for. The Actor is flooded with offers that push him to keep experiencing the value of the service that he is part of. The biggest plus point here from the beneficiary side to realize the value in the co-creation is to provide a feedback in every case to make the service provider consider the service exchange between the beneficiary and the provider. A feedback is the only and the major contribution from the beneficiary to be an active part of the co-creation, and making the economy a value based. Else, the ecosystem would be a service based only, but it would be missing the co-creation.
Note- The integration of various service providers allows a collective improvement after the beneficiary provides the feedback. The co-creation concept with service-dominant level could be seen as the continuous evolvement of the service providers for the betterment of service, which is valued by the beneficiary and not just a good exchange for a final product.
Regarding the Institutional arrangement: these are the actor created roles to enable or constrain the actor's action, these are seen as important guidelines that take not all, but relevant part of the information of the service systems to know if providers are abiding the rules and norms. It is even better on the provider's side to make the institutional arrangement a part of the service to avoid all the penalties or any fine that may levy on them, if, they intentionally or unintentionally step over the norms. This means that the 'Aviation authority' can be seen as a service provider and their exchange is maintaining the context in the whole ecosystem, which further allows the service providers like the 'airlines' to improve and achieve better values.

The concept of value can be seen that it is achieved when the information is flowing in the network and connects each role with this networked approach. A change leads to the change

that is beneficial for the overall experience; the change would be initiated by those who experience the value. The beneficiary is the major role in initiating the change because the change is meant for the value that the provider wants for the beneficiary. From the ORM, we have noticed that the concept of co-creation exists, if the beneficiary creates value, and for that value, the input from the beneficiary is required. Now, the important question here is that in service-dominant logic, can a beneficiary still be considered the part of the co-creation if he doesn't provide any sort of feedback on which the concept of value is based? The answer is a simple no, but can a system be made in which the beneficiary is made to provide the feedback for the existence of service-dominant logic in the co-creation. For the latter question, the answer is a yes, but the system is not pushing every customer in a way that not every customer realizes the value that they are co-creating with their experience. But this experience is getting valued day by day as the new beneficiary or the loyal beneficiary is getting the return value of the experienced value that they co-create with their experience. The simple example is the big data that helps a company to do customization of your likings from the time after you experience the first good of the company, and later, become the part of the overall ecosystem. All the four cases were considered to express the concepts with different industries to realize how the concepts, based on the co-creation proposed ontology, relate to each other and what those relations further extend to. Now, based on these analyses, we have come to realize, how the value and the network centric approach in the co-creation works. Now, these analyses would let us express the existing language in a similar way, and then we could figure it out if they can or not. And, if they are not able to present the concept then what are they missing? And, if they could then what are those concepts that we could be added in the proposed ontology to make it more expressive, so that, it could possibly show all the concepts and their relations, as per the S-D logic and co-creation?

5. Suitability check with the existing language

The Suitability check requires the understanding of the elements from the existing languages and comparing it with the glossary of the core-concepts of value co-creation as described through the ORM cases. The elements from ArchiMate and e3value were read and compared closely with that of co-creation, and only those elements were picked that closely relate to the concepts of value co-creation. After the suitability check, the outcome would give an answer to a questions like; whether these language can relate to the concept of value co-creation or what dedicated modelling concepts are necessary for a more specific modelling language. To find out the answer, we have to see the existing language in the light of a question that's how closely the existing modelling language like ArchiMate and e3value can describe the concept co-creation as exemplified with the ORM cases. The result of this chapter would help us to know both ArchiMate and e3value, and see how these can relate to the co-creation concept.

5.1 ArchiMate's suitability

The ArchiMate as per 'the open group[3]' describes that the ArchiMate core language defines a structure of generic elements and their relationships, which can be specialized in different layers. There are three layers that are defined within the ArchiMate core language and these layers help in describing the different architectural domain and relationship to integrate the layers. These layers are as follows:

1. The *Business Layer* depicts business services offered to customers, which are realized in the organization by business processes performed by business actors.

2. The *Application Layer* depicts application services that support the business, and the applications that realize them. The application layer can be seen as providing integration between the business and the technology layer.

3. The *Technology Layer* depicts technology services such as processing, storage, and communication services needed to run the applications, and the computer and communication hardware and system software that realize those services. Physical

[3] The Open Group is a global consortium that enables the achievement of business objectives through IT standards

elements are added for modelling physical equipment, materials, and distribution networks to this layer.

All the Elements used in the ArchiMate have the same general meaning even within different layers, this means that they reflect the similar behaviour but with different layers because the layers describe the different architectural domain. We are, in particular, using the business layer for the fact that this layer is not that complex in understanding the relations from the visualization of the notations. Below, we are defining the elements used from the ArchiMate language in describing the co-creation concept from the aviation case and shown in the fig.5.1.

Business Interaction- It is a collaboration of multiple roles that share the responsibility for performing the interaction. A business interaction may access business objects. A business interaction may realize one or more business services and may use (internal) business services or application services. (Open group)

Business service – it exposes the functionality of one or more business roles or collaborations to the environment. It provides the behaviour that is meaningful from the point of view of the environment. These services are of two types; the external one that is facing the external environment and the internal one that is facing the internal environment. (open group)

Business roles- The business actors are simply the human, departments and business units. These actors can have one or more roles. These actors perform the behaviour with the kind of roles they have been assigned.

Business process- this is the internal behaviour of the role being performed. The process is a kind of flow of activities that are triggered by the behaviour element. The business process can have potential many to many relationships with the business functions. (open group)

Business function- These are the collection of business behaviour based on the chosen criteria assigned to an organization but is not necessarily governed by the organization. It also describes the internal behaviour performed by the internal role. A business function typically groups behaviour based on required business resources, skills, competencies, knowledge, etc. (open group)

Business event- it is a behaviour element that denotes the organizational state change. It can trigger other behaviour element and it is instantaneous. The event may originate from the environment of the organization, but also internal event may occur generated by other processes. A business event may trigger or be triggered (raised) by a business process, business function, or business interaction. A business event may access a business object and may be composed of other business events. (open group)

Business object- A business object could be used to represent information assets that are relevant from a business point of view and can be realized by data objects. Business objects may be accessed (e.g., in the case of information objects, they may be created, read, written) by a business process, function, business interaction, business event, or business service. (open group)

Drivers- These are the stakeholder's concern which is defined by the TOGAF[4] framework as "*the key interests that are crucially important to the stakeholders in a system, and determine the acceptability of the system. Concerns may pertain to any aspect of the function, development, or operation of the system, including considerations such as performance, reliability, security, distribution, and evolvability.*"(TOGAF))

Assessment- It helps in analysing the enterprise affair and reveal strength, weakness, opportunities and threat. "Strengths and weaknesses are internal to the organization. Opportunities and threats are external to the organization. Weaknesses and threats can be considered as problems that need to be addressed by goals that "negate" the weaknesses and threats. Strengths and opportunities may be translated directly into goals."(TOGAF)

Resource- It is an asset owned by an individual or an organization, and it is considered as the sources of competitive advantage to an organization. Resources can be tangible like the financial resources, intangible like the physical resources and human assets like the skills. The resources are realized by the active or the passive structural elements. (TOGAF)

[4] The Open Group Architecture Framework (TOGAF)

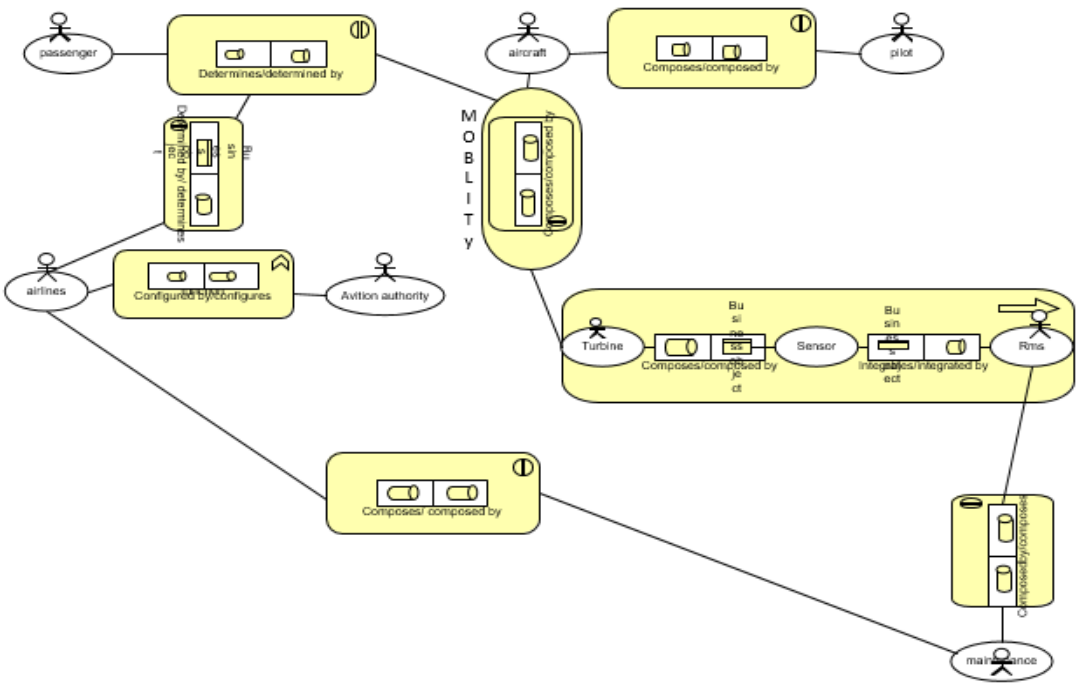


Fig 5.1 ArchiMate model describing the aviation case.

The elements used for the business layer of the ArchiMate to describe the co-creation concept are the following in this example case; business interaction, business role, business object, business function, actors, business services, and business process. It can be observed from the fig, the role which the responsible actors held for specific behaviour involves the interaction of another actor for the specific behaviour (the open group). It is quite visible that all the actors here are interacting with the other actors to perform a specific behaviour. The specific behaviour on the interaction describes the concept of the service of the co-creation.

Though the passenger is an external actor but it has been taken as an active structure element actor with in the business layer after it becomes the part of the co-creation (note- the external actor, like passenger in case of value co-creation, should be considered as an active internal

structural element which is not possible in the present ArchiMate's notation. This is because, if the customer is the co-creator than he is actively participating by experiencing the behaviour that the business provides, like the business service, after the interaction of two active structural elements). The mobility can be seen as the external behaviour element that is why it has been described as the service. This behaviour is meant for the external environment. So, the beneficiary comes into the category of external environment before he gets included in the co-creation experience, and once he experiences the external behaviour from the interaction of two actors; aircraft and turbine, the passenger becomes the internal active element.

The business object which is the sensor here because it represents the information asset that is relevant from a business point of view and can be realized by data objects, so it means that, any information passing asset is a passive element on which an active element like one with the roles can perform their behavior. It could be realized that a value co-creation ecosystem is made of these passive business objects that exchange the information between actor's interactions and also among actors interaction for specific behavior. The interaction is an internal behavior of active structure elements which can be seen as the interaction of two different actors. To explain it in terms of the case, the turbine link with the sensor and the sensor link with the RMS are described as a process, which further describes the internal behavior of individual structural element which is the turbine producers at the beginning. Since we already described in the case of aviation while building the ORM that the turbine manufacturers make it sure that the functionality of the turbine is checked remotely with the help of sensors that would act reactively with maintenance to avoid a major fault that can disrupt the value in the co-creation. The maintenance is also an active internal structural element that has an internal behavior towards the other actors such that its behavior is reactive to the interaction among other actors (like the service providers) and maintains the outcome of the interaction for internal structural element and an external element. Another passive object is the feedback that the passenger provides to the Airlines after the collective behavior between the passenger and the other two structural elements (turbine and aircraft) are performed. The passive object forwards the behavior to the airlines and provides new behavior that helps in the value co-creation. Thus, behavior of the elements, which in the ArchiMate sense is a function, can reflect the concept of 'service' of the co-creation in the ArchiMate. This service is exchanged on the interaction because the outcome of the service exchange is not the exchange of the good that the service system wants, rather it is the

exchange of competent knowledge for the collective behavior to be performed and valued. This collective behavior finally becomes an exposed behavior for the beneficiary, and marks the start of the co-creation after the beneficiary experience it. Thus, the value is the exposed behavior that is needed to be valued by the external actor, and this value actually becomes the conceptual value of co-creation after the beneficiary becomes an active internal element by describing his behavior towards this exposed behavior. The creation of feedback which is the result of the exposed behavior interaction can be called as a business event which is instant, in a way that it is initiated after the service gets exposed to the external environment. This event is a beneficiary's generated event, and this event creates new interaction between the beneficiary and the airlines that would generate new behaviors based on the event. The business event provides additional concept to the existing concepts of co-creation, and this can relate to the service exchange. Since, the services exchange creates new behavior and these behaviors are meant for other services. The event marks the initiation of the behavior after it has been created and requires a further processing of the event for another behavior. The event ends after the final behavior ends, this way, the check on the behavior is made with the advent of an event that gives a new purpose to the system for the behavior. Example of this event can be seen as a change required in the service to provide the value that an organization things and the beneficiary expects. The moment the beneficiary makes a mark about the expected change in the service, the service system can create an event if the behavior required to the change is sufficient to resume or improve the value of the service. The event can be kept into the category of service ecosystem, as this element can describe the initiation of a behavior that gets created through service exchange and requires a further processing of the same event for another behavior.

The role of the aviation authority is to configure the other actors in the ecosystem, so that, the value is maintained. What does the authority mean by maintaining the value, is that, the authority configures the services, so that the exchanges between them (services) and the resources integrated for it could be enabled in the light of value proposition. From the elements of ArchiMate, the authority can be represented as a function which is a collection of behaviour based on specific criteria (these could be the rules), such as required resources, competencies, or location. The competencies and location further elaborate the role of the authority that configures the service providers as it exchanges services with different actors over different locations at different times for the same value proposition.

Two additional elements of the ArchiMate known as the Driver and the assessment can provide another conceptual support to the present Core-concept ontology of the Co-creation. These motivational elements of the ArchiMate would further help in realizing the co-creation while designing the concept in the enterprise. Both of these motivational elements can help during the feedback phase of the concept, where the beneficiary values the experience with the feedback, and this feedback could act as the state of affair analysis of the whole enterprise towards the value proposition. If the beneficiary talks about the certain things in the feedback then that particular service is alerted to the change and the driver element would help in change. The drivers are the concern of the stakeholder and the concern of the stakeholder is initiated every time after the beneficiary makes an assessment about the value he experienced. So, there are some new concepts that the ArchiMate has provided that can be supportive to the value co-creation. These concepts are the elements named; assessment, driver, and event.

The assessment can be put into the category of the resource, as it triggers or initiates to produce an effect rather than being operated (Vargo and Lusch, 2004). To elaborate the assessment, it can be seen as an operant resource, as it could possibly contain the skills of the beneficiary to define the changes or values that he seeks in the product, and the same assessment includes the skills of the service provider since he acknowledges the input of the beneficiary as valid or not valid.

The driver can be kept closely into the concept of services, as “in S-D logic, service refers to the processes and activities of applying specialized competencies for the benefit of and in conjunction with another actor (Grönroos, 2008, 2011)”, the driver is the key of new competencies for the benefit of and in conjunction with another actor. But the driver is a service that is created and exchanged after the beneficiary value the last service he exchanged with the provider.

5.1.1 ArchiMate's derivation rule & Suitability outcome

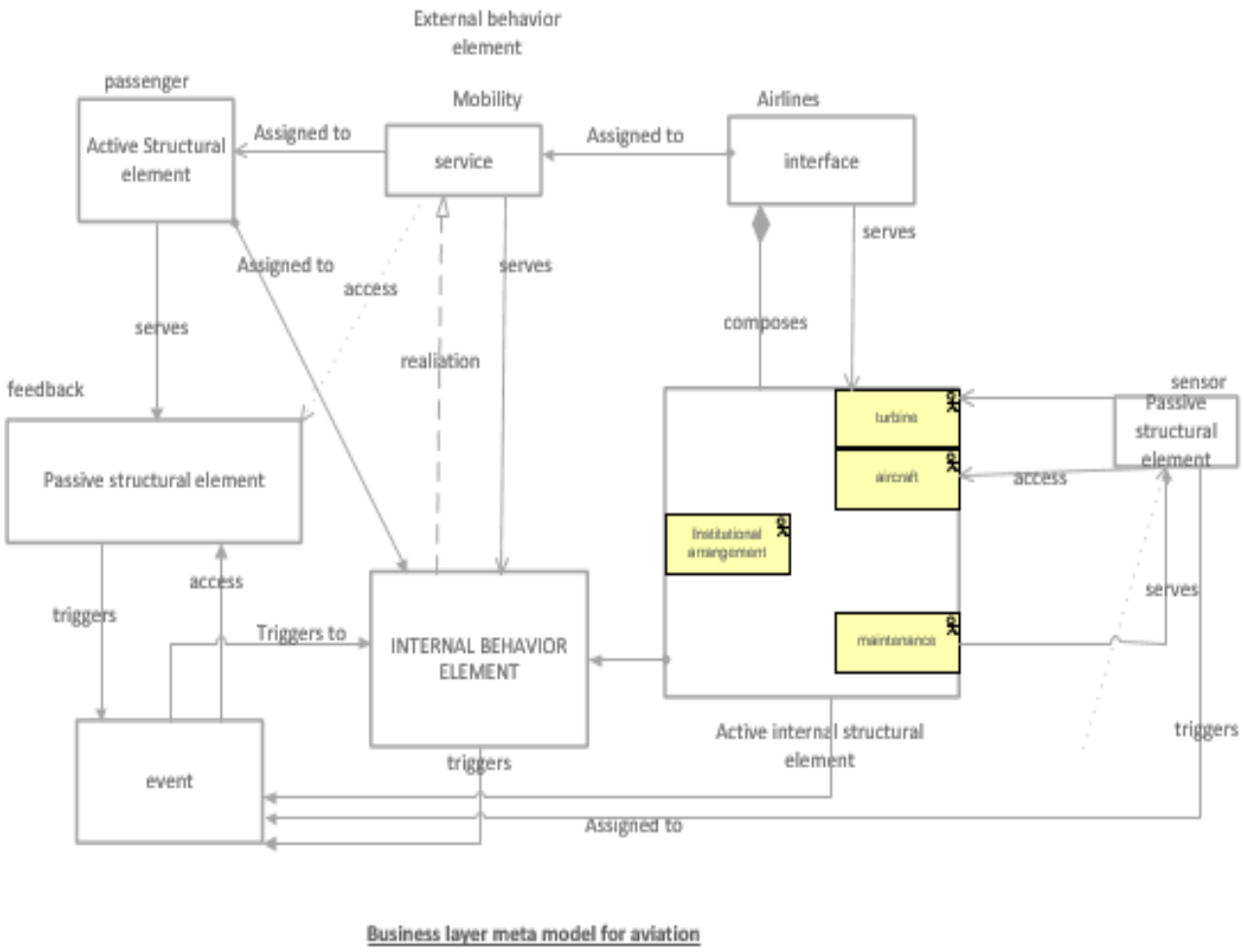


Fig. 5.1.1

The derivation rules in the ArchiMate for the relationship can define some relationships to the value co-creation from a service logic perspective and also gives some additional elements that could elaborate the concepts. The meta-model of the business layer with co-creation perspective gives a perspective of how the relationship can be represented with the ArchiMate, look at the fig.5.1.1. Mentioned in the diagram, are the different actors having the active structural behavioural element that relates to their internal behaviour and corresponds to different passive elements that trigger to events and those events triggers to the behavioural element. What can be inferred from it is that, the functional meaning of the elements is the same but the relationships are a bit different when the event is triggered from inside and when the event is triggered from the outside environment. Overall, after a beneficiary becomes a

part of the co-creation then he stays in the internal environment as long as he creates the value in the service system.

But there are still a lot of relations and behavior that an element is not able to describe especially when it comes to the institutional arrangements, which are totally out of the control of the internal actors and this environment is hard to predict, and any change in the regulations, rules can constrain the whole services system and may bring changes in the service for the same value proposition that they are having before. If we see it from the case, the aviation authority is configuring the airline which has all the service relations with the other service providers and their resources, a change in the outer policies can bring a sudden change in the service system and in that case the value proposition can get affected. Though the institutional arrangement is made by the actors, these are to be formed/reformed very actively keeping in view the value should not be affected by any new policies and rules, since, the external environment is not predictable and it may hamper the value co-creation phenomenon with any sudden influence.

Another element is the expansion of the service system, which is based on the value experience. The expansion element is not a pre-hand active internal element, but it could be seen as an experimental component for realizing the missing ingredient to enhance the value. The ingredient could be new actors suddenly invited for the service exchange to resume the value. For example, if the beneficiary experienced the value and realizes, for instance, that the certain elements are required to enhance the mobility that he experiences during the airtime then the provider would add the missing element, so that, the beneficiary would remain the co-creator of the value. ArchiMate graphical language shows the structure of the element and their relationship that assist to describe the concept of the co-creation but not in detail when it comes to the value that has to be realized with the changing environment which is not a part of the internal environment. And, most importantly, ArchiMate describes the whole service in the service system as one service, because this graphical language is a process model, though the value proposition till its experience is with the exchange of services, so, the ArchiMate shows nothing in return to the service exchanged which should be a part of value assessment or a value acknowledgement for the overall value.

5.2 e3value suitability

Understanding the context of value (information) and service (network) of the co-creation from the concepts of e3value, and seeing how much of those can be easily defined by the existing e3value model. The overall goal of the e3value can be described as supports to people to explore and articulate activities and solutions, its implications are seen as it helps to understand in the e-business cases from the consumer and the profit perspective, so that, people can work effectively (Johannesson, n.d). While defining the network of business enterprise it assumes a global perspective.

The e3value helps in formulating and answer a lot of questions regarding the actor, value and exchange of value between actors. The questions that are raised and described by the e3value are like; which organization or actors are needed to offer products or services to other actors, or what kind of value they offer to each other, or what are the actors doing and with whom they really cooperate for the value (Johannesson).

The e3value helps in evaluating the business ideas with these kinds of questions, which further elaborates the former question in a different way, like, what happens if the beneficiary values the product differently, then we could get one clue from here, that, if the service providers in a service system are not sure about what value it is because the value is with the usage of the product, then the beneficiary would never get it correctly and the experience that the value requires, based on the value proposition that supports the co-creation process, would never be achieved. This means the value has to be first defined in a way of exploring the right value and then making sure that the same value proposition is exchanged between the beneficiary and the service provider. Further, we could add that when creating the value, the asset involved should work for the value that takes customer knowledge value as a trigger to service innovation.

- There's an another question for the sake of example, that the e3value can help in raising, and it could be; what happens when we shift the activities from one actor to another since the activities are performed in the value co-creation to realize the context for the value exchange. The context is to provide the beneficiary with the experience and the outcome of the experience is the economic value to the provider. The shifting of activity is an event after the beneficiary does the value exchange, like the feedback in the case of the 'aviation industry'. This activity may involve a change in improvement or an expression of satisfaction for

staying at the same level of performance to deliver the value.

The e3 value can express the S-D logic view that says, all the actors in the co-creation are resource integrator, including firm and consumers (Lusch, Nambisan, 2015). The reason for that, as described by the author, the resources cannot be used in isolation. The resources are grouped together or bundled to be valuable, for example, if you see a customer making a request then it is an information resource and this resource is integrated with the corresponding information technology for a quiescent commercial value (Xie. et.el, 2016) Secondly, innovation is often the result of recombining existing resources. For instance, IT is combined with other resources (e.g., actors' skills, knowledge and other interactive indulgences with the resource integrated) to allow information to be transmitted and repackaged in different contexts for new service exchange and innovation opportunities (Xie. et.el, 2016).

Before we further relate the aviation cases to describe the e3value suitability, we can describe the main terminologies of the e3value which are to be used in describing the co-creation concept.

Actor- An actor is perceived by his/her environment as an economically-independent[5] (and often also legal) entity. Enterprises and end-consumers are examples of actors. A profit and loss responsible business unit, which can be seen as economically independent is an actor, although such a unit needs not to be a legal entity.(Gordin, 48)
The actor described in the e3value is the similar actor known as the service beneficiary and the service offeror described at the glossary of the co-creation concept.

Value object- A value object is a service, a product, or even an experience, which is of economic value for at least one of the actors involved in a value mode (Gordin,50). The objects are valued by an actor and they can value it differently and subjectively, it depends on their own value preference. (Holbrook 1999).
The value object can be related to the service concept of the co-creation because it can be described as the fundamental basis of economic exchange, which refers to "applying

[5] Ability of an actor to be profitable after some reasonable time, in case of enterprise. In case of consumer, it refers to increase value of him/herself

specialized competencies (knowledge and skills) through deeds, processes, and performances for the benefit of another actor or the actor itself" (Lusch and Nambisan, 2015, p. 158). The value object can be related to another concept of the co-creation called the value because the value is fundamentally determined in use in the S-D logic, so, experience and perception are essential to value determination after the usage of the product (Vargo and Lusch, 2004, 2008, 2016). The reason for describing this term with two concepts of the co-creation is that value object actually represents an experience offered by one actor to another for his experience.

Value port - a value port is used to interconnect actors so that they are able to exchange value objects. It can be seen as a service system that provides "a dynamic configuration 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" (Maglio et al., 2009, p. 399).

Value offering - it simply refers to what an actor offers or an actor request from its environment. (Gordin, 52). It could be seen in the context of the value proposition that establishes relationship and connection among service system (Vargo et al., 2008, p. 148). The value proposition is used to facilitate value co-creation, and the value-offering in the light of the value proposition should match and offer the same value proposition.

Value interface - value interface groups one in-going and one out-going value offering. It shows then the mechanism of economic reciprocity (Gordin, 52). This is what the service exchange means in the co-creation that it is a basis for economic exchange and is a learning process towards value co-creation (Vargo and Lusch, 2004, 2008; Vargo et al., 2008).

Value exchange - it describes the actual exchange between actors. It represents one or more potential trades of value object instances between value ports (Gordin, 53). In the co-creation glossary, the Value in-exchange occurs when the offeror offers a value proposition to the beneficiary or a service system offers a value proposition to another service system (Vargo and Lusch, 2004, 2008; Vargo et al., 2008).

Value transaction - A value interface prescribes the value exchanges that should occur

between two or more actors (Gordin, 54). It can be related to the part of the service being used in the service system since for the service system to exist there's a service that requires work in the reciprocity. Value transaction could actually mean the context of the service which actually is a value usage.

When you look at the fig. 5.2a, there are a number of actors namely; Passenger, Airlines, turbine, aircraft, authority and maintenance. The value exchange between the actors shown as the blue lines is not been explicitly expressed. The most of the value exchanges are represented as feedback and experience, this is because if we working with the service-dominant logic then we have to show the exchange of a value and a service. The value in use has two aspects; one aspect is the usage on the beneficiary's side and the other aspect is the usage on the provider's side, which is after the experience. For example, if we see the exchange between airline and passenger then the airlines is providing a service, which is based on the usage and the value is experienced afterwards the passenger would provide the airlines with a feedback/information necessary to complete the value cycle in the exchange. The beneficiary and the provider integrate the resources in different ways. A customer: who is the beneficiary, integrates social network resources and individual resources (e.g., their knowledge) to participate in value co-creation. So, the feedback is much about the knowledge defined here (Lusch, Nambisan, 2015). It is stressed that the customer's ability to create value particularly depends upon the amount of information, knowledge, skills and other operant resources that can be accessed and used (Payne et al. 2008). This means that the providers have to make sure the exact value proposition. Further, the feedback and experience are a kind of dialogue that the service provider and the customer provide, as an input on the basis of the interaction and involves shared learning and communication (Prahalad & Ramaswamy, 2004). This shows that how much the return value from the customer is beneficial to the providers because it improves the overall value in the service system.

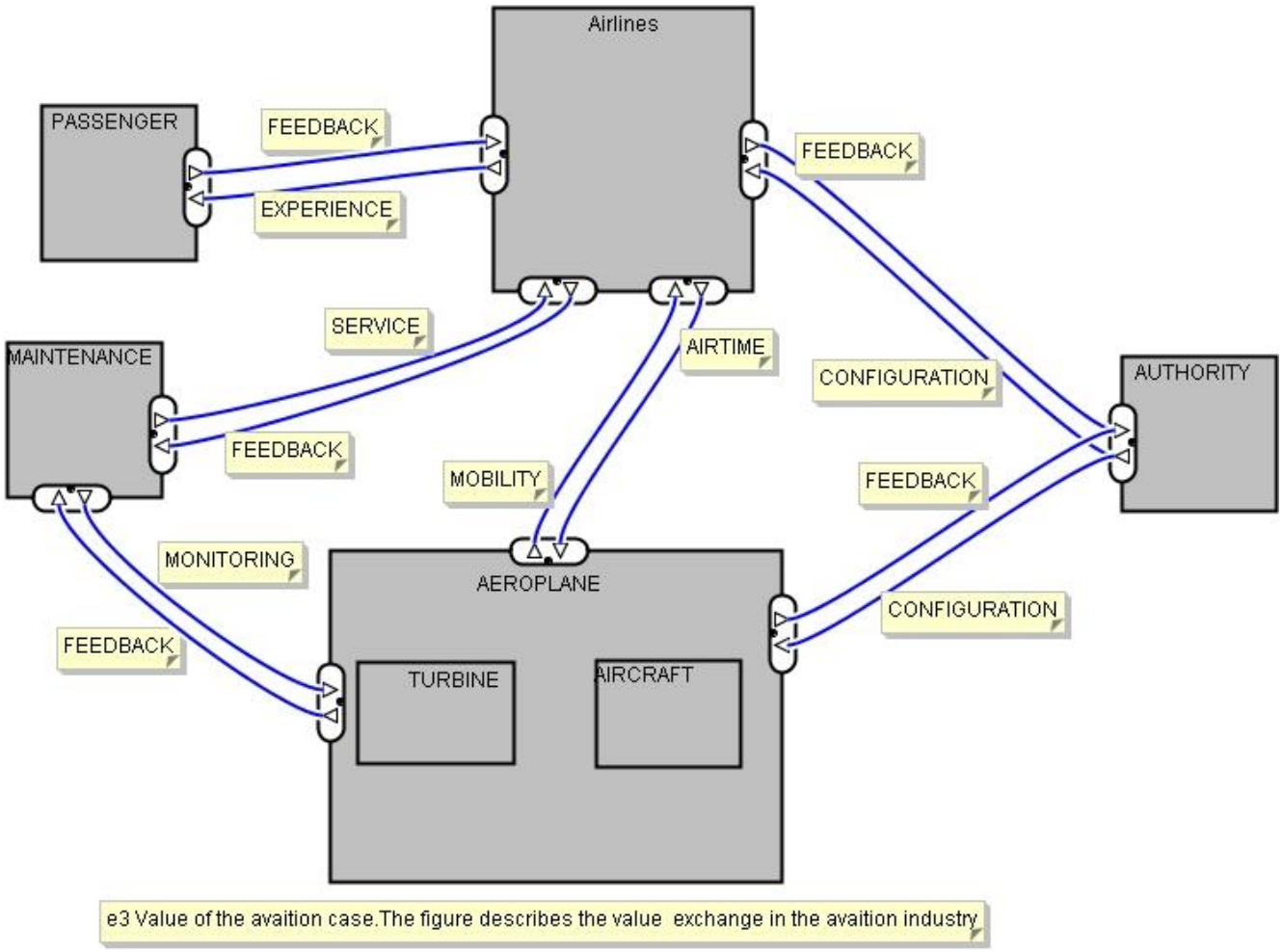


Fig. 5.2a

In the S-D logic, the economic value is not merely the money exchange but the experience too. So, none of the value port (shown as a small triangle in a cylindrical rectangle attached to the actor) are shown as exchanging the value offering in terms of money and goods in this case. These value ports are offering a service and receive the experienced value in return. The offering among the actors are seen as a value object, and also with it, the value activity within an actor could be seen as a value object as well. The value activity is seen in this case, when a service provider creates value for the beneficiary and the other service provider like airlines provides service to passenger and part of the value proposition to turbine manufacturer, since, we know the basis of value exchange is always economic exchange.

But the value activity in another case is much of an actor's composition for the other actor, and the idea is to offer something of economic value. In the case when the maintenance can

be the part of the turbine production in the actor's composition then the value offering among each other is not really a value object because it is an activity based on the process flow, but an important one in the co-creation. So, the combination of activity from an actor can be represented as a value activity and it has to be different than the value object. Another exchange between the global actors is the authority and the airline, or the authority and the airplane (we know it's a different actor but working in conjunction with airlines). Like the others, this exchange is represented by the value interface, which is the economic reciprocity. It is not very obvious to have a value exchange in the terms of the institutional authority making rules because these authorities are part of service system, but these authorities can be seen as an uncontrolled environment though existing in the same ecosystem. But in this case, it has been described in the idle environment and so it exchanges value among other actors.

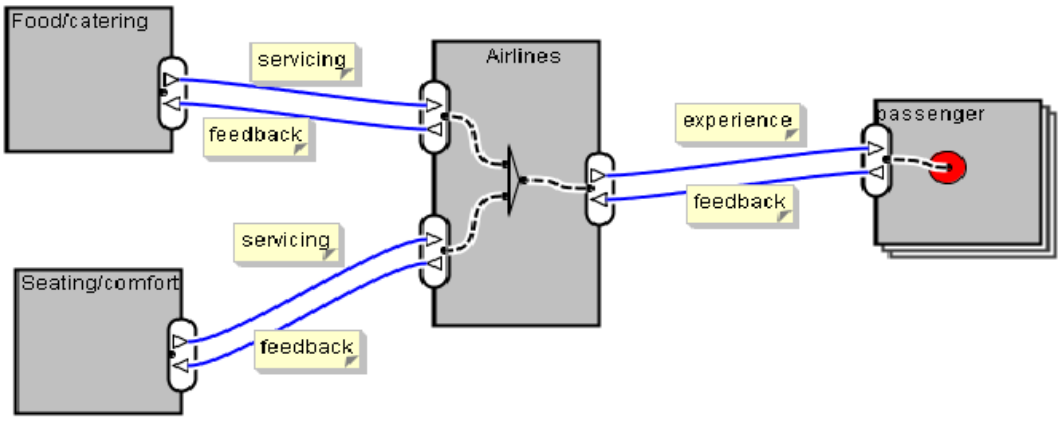


Fig. 5.2b OR case describing the multi-party transaction.

The concept of the value transaction from the e3value is an interesting concept that easily adds-on to the co-creation concept of value proposition and exchange. This is because the transaction shows how exchanges actually happened, the multi-party transaction that can happen when a value is exchanged between the beneficiary and the provider, and the changes based on the received value by the service provider don't have to follow a process of flow but can act like a transaction to different actor depending on the what sort of change and where is

it required for maintaining or improving the beneficiaries' experience. To exemplify it by describing a scenario, look at fig. 5.2b, that after the airlines receives an input from the beneficiary then the input value is analyzed, and if it says, that it requires changes in the seating arrangement in the aircraft or the food variety then the airline makes a new value exchange between actors and does a multi-transaction. This means the new value offering will involve every actor working in the context of the seating and food. We can use an 'OR' join and split merger from the use case maps of the e3value to describe this value experiencing and enhancing the situation.

5.2.1 Outcome of the e3 suitability check

The graphical notation of e3value is an expressive language to define the value proposition and the activities (the exchanges). And, also manages to describe the actors and the services. E3value also helps to know the right value of the service provider in a service system that can support the value proposition. From the fictive scenario, it is quite appearing that the e3value describes the way the value could possibly be exchanged between different actors and how it even enhances the service providers to actively receive their contribution in terms of the experience that the beneficiary gets.
In the terms of a drawback, the interface that the e3value provides sees the value with two different ports. One provides the service and other takes the value of the service. But the value that the co-creation talks about is the value of experiencing the service, and in return is a service to the service provider. But the e3value doesn't see the value this way. The e3value see the exchange of value for the money. E3value doesn't focus on the co-creation but on the exchange. The case explained above takes the whole value as an experience to the exchange and not just describing it in terms of money and service. E3value should look on the exchange of the intangible benefits, which include the development of knowledge related to the network exchange of the service.

5.3 Understanding the difference of e3value and ArchiMate-process model.

E-modelling and process modelling are both forms of conceptual modelling, both are necessary for good business design, but they differ in several significant ways. A business value model shows the essentials (the strategic intent) of the way of doing business in terms of stakeholders creating and exchanging objects of value with each other, while a business

process model shows decisions regarding the operationalization of a way of doing business (Gordijn. et.el., 2000) The main goal of e-business modelling is to reach agreement amongst stakeholders regarding the question "who is offering what of value to whom and expects what of value in return", and this clearly helps in knowing the value as an exchange of service through the activities, but the exchange of value is different than the exchange conceptualized in the value co-creation. In contrast, an important goal of process modelling is to reach a common understanding about how the process should be carried out (Gordijn. et.el., 2000).

The notion of the value is an important concept in the e-business modelling and it is pointed out in terms of the benefits and revenues. Consequently, the main design decisions to be represented in a business model are: (Gordijn. et.el., 2000)

1. Who are the value adding business actors involved;
2. What are the offerings of which actors to which other actors;
3. What are the elements of offerings;
4. What value-creating or adding activities are producing and consuming these offerings;
5. Which value-creating or adding activities are performed by which actors.

The business process on the other side says, how the process is carried out but doesn't state about how the value creating activities are carried out which relies on the exchange. A business process model shows decisions regarding the operationalization of a way of doing business, but this model lacks the phenomena of co-creation that depends on active responses that reflect the right exchange of services for the right value proposition.
Other goals of business process modelling are (Gordijn. et.el. 2000):

1. Creation of a common approach for work to be carried out,
2. Incremental improvement of processes (e.g. efficiency),
3. Support of processes by workflow management systems,
4. Analysis of properties of a process (e.g. deadlock free).

Both these languages can't relate to the concept of co-creation, as seen in the proposed ontology; individually and completely, but instead, give new inputs that are studied and can be added to the proposed ontology for better expanding the meaning of the value co-creation.

6. The revised concepts of the value co-creation

From both languages, it has been cleared that they cannot relate completely to the concepts of value co-creation, so there'a need for a new language. But apart from this, from these languages some additional concepts are being realized that can additionally be supportive to the designing of a language by extending the concepts with all the core concepts in the value co-creation. The ArchiMate gives some new concepts of service drivers, service events, which can be a part of the service concept and another concept of assessment that can be considered as an operant resource. On the other side, e3value gives the concept of value object which is the operant resource and also gives the concept of the multi-value transaction and both concepts are thereby used by the actor. What has been observed from the nature of these elements is that these elements from two different modelling languages can be concatenated in a way that it can exactly add the required inputs to the existing concepts of the value co-creation which can help to understand the proposed ontology in terms of the value created and determined. The following concepts which are the concepts of the ArchiMate and e3value, combined together and are shown, in the fig 6a, as a flow-based, the fig describes that the assessment is the value object created after the value is experienced and then based on the assessed value, which acts as a driver for new events among the service providers.

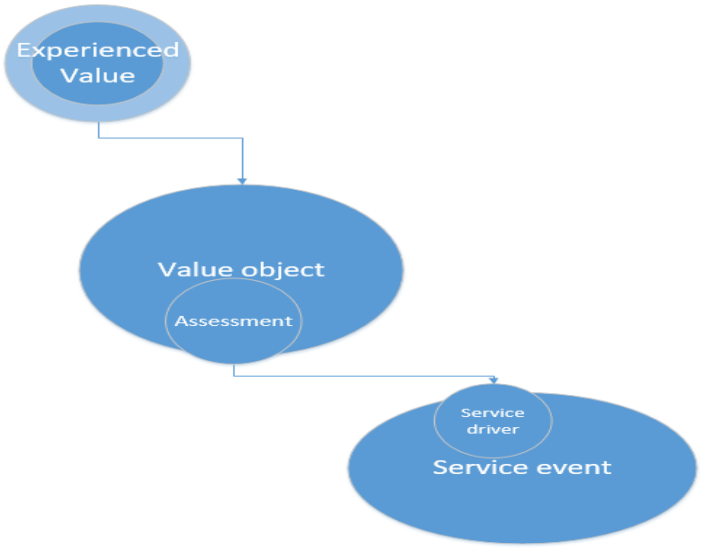


Fig.6a showing a simple flow of the extended concepts

Service	**explanation**	**Example**
Service driver	Concern that matches the aspect of the service after the assessment.	Qualities or conditions that match the qualities filled in the survey form or feedback, and then needs improvement.
Service event	State changing behaviour triggering other behaviours in the service system. Events are seen as creating a new obligation to the actors.	The change required for a particular service of the service system after the driver figured it out.
Operant resource	**explanation**	**Example**
Assessment	Human knowledge for the description of the value experienced.	Actor filling the survey form after experiencing the value, eg. Air mobility experience.

E3value

Value object	The information sources that could provide value to the service provider which could be of economic value.	Feedback is a value object to the service provider. Sensors are a value object to the maintenance.
(Service Context)		
Value Transaction (Multi-party transaction)	The value is exchanged between the beneficiary and the provider, and the changes based on the received value by the service provider don't have to follow a process of flow but can act like a transaction to different actor depending on the what sort of change and where is it required for maintaining or improving the beneficiaries' experience.	An input from the consumer that signals the changes required in the seating arrangement or the food quality or any other benefits that they would like to experience with the product. The input would signal to the service providers about the changes or new additions. This way the new value is made.

Table-6, Extended concepts to the value co-creation

The Extended ontology

The Fig. 6b is the extended ontology to the existing one with the addition of the value object that is created after the value is realized by the beneficiary. The same value object triggers an event which is determined by the service provider/service offeror for the specific service. We noticed two different kinds of events occur in terms of the value aspect; the one is called as the exchange event, which normally includes the exchange of the service among actors, and the other is known as the conversion event, which emphasizes new changes or improvement in the service system. The latter event is the value event that was missing from the glossary of the core concepts which the actor determines and again creates value in the cycle of the co-creation. These two new concepts explain the missing extensions in real co-creation with the service logic, this is because before this ontology the concept was more towards the beneficiary's side, the customer, and it was hard to figure out what does that experienced value holds for the service providers, back in the service system. Now, the same experienced value goes back to the service provider and act as a confirmation of the experiences that the whole service provider units can reflect again after resuming the similar value or the improved one or the added one, so this proves that the actor creates the value and the beneficiary determines it, and it work both ways. Apart from this, the other relations described are the same as described in the proposed ontology in section3.2. The extended concepts in the fig 6b describe a phenomenon on which a new reference language can be developed.

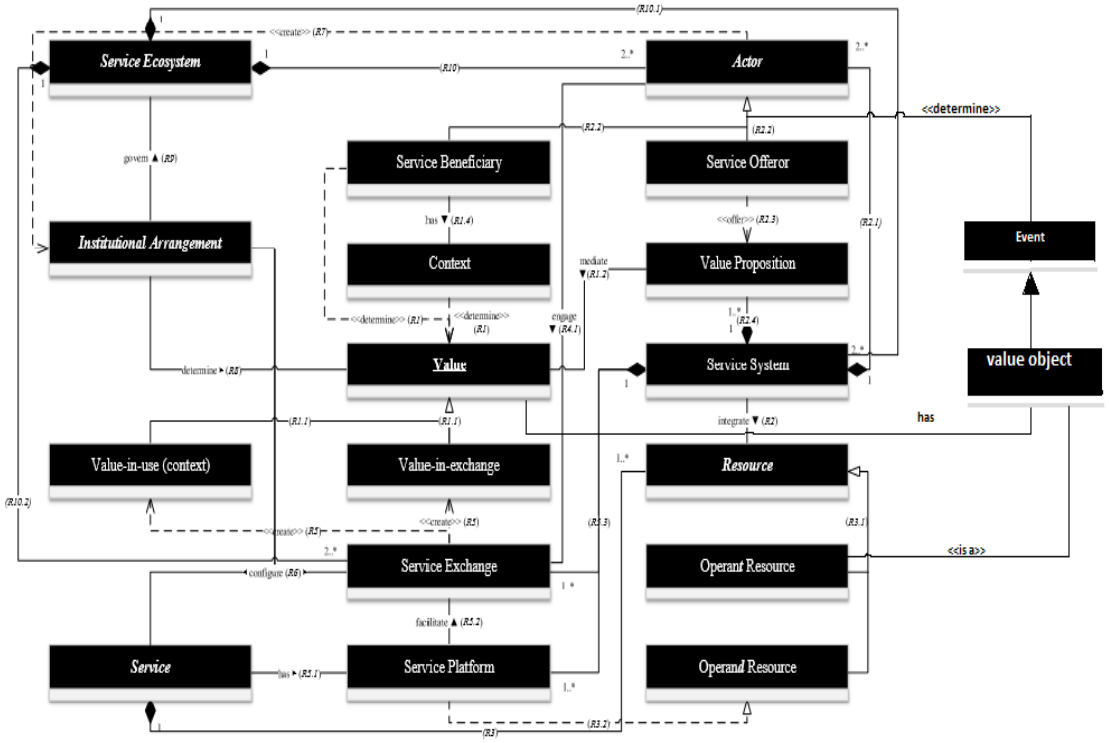


Fig 6b The extended proposed ontology to value co-creation.

7. Conclusion

The study starts with the insights into the service-dominant logic and further describes the existing work on its proposed ontology for the IS from the S-D logic perspective. The proposed ontology presents the logic of service-dominant into a glossary of co-creation concepts. The glossary of concepts is studied again with the motive of adding missing content of the concept. The existed concepts of actor, value, resources, services, institutional arrangement and service ecosystem are considered and based on these core concepts, the study has been further moved into conceptualizing the concepts with the help of simple ORM based fictive cases. The cases helped to know how the concepts can describe the relations in a graphical way, so that, the abstraction can be seen with a meaning.

After getting the idea opened up with the help of natural language concepts in terms of objects and its roles, the study further focuses on checking the suitability of existing modelling language and sees, if those are capable of defining the concept of the value co-creation in service-dominant logic. So, the study simply compared the elements from the existing languages with the co-creation concepts and tried to draw the relationships as per the proposed ontology described in the ORM cases. Since the languages are not able to relate to the concepts of the value co-creation completely, so it got clear that a new language is required. Later, we integrated the concepts from the existing languages that would additionally enhance the glossary of concepts, It has been called as the 'extended concepts' mentioned in table 2. The extended concepts that have been taken out from the ArchiMate and e3value completely help in describing the value in co-creation which acts in a cyclic manner and added in the extended ontology. This value can be seen as a value giving value back to the service provider after the experience and continues the loop of acknowledgement of the experienced value which again goes into the service system and helps to maintain the expected quality of the value. The new concepts added, the value object, triggers an event in the service system which is related to the specific service provider or all the service providers. Based on the extended ontology, a new modelling language can be developed. However, it has been observed and briefly described in the thesis that the institutional arrangement in the whole service ecosystem can get influenced by the external environment (political, economic, social…)[6], and, since it has been created by the actors and for the actors, the only trouble in the service system can be a short period of a shift to regulate the actors

[6] Pestle – political, economic, social, technical, legal and ecological

according to the external influenced behavior. This means the whole exchange would be the same but there can be a delay because of regulating every service provider according to the new affected policies or laws. The context is important for the value and this means that the institutional arrangement should work based on the context to have the favourable outcomes, for example, bringing a favourable political decision based on the context would act as a catalyst to the context. This reason behind this is very simple and clear, since the service system is based on exchanges and the resources are all shared, so the big delays due to implementations are not possible and not at all affordable.

At last, I would add that it has been observed from the thesis that the value co-creation system is a system of services and responses. The service provides the value and the response in return acknowledges the value. The same process works in the whole service ecosystem even after the beneficiary receiving the value, experiencing it, and forwarding a response that is acknowledged as an input back into the service system. The e3value is a good modelling language that can define the concept of the co-creation very closely than the ArchiMate because ArchiMate follows a process flow which is not able to describe the concept of exchange openly. Additionally, ArchiMate described some of the concepts like the event and drivers that further brought the understanding between the 'event of exchange and event of conversion'. Finally, it is observed that the important addition that the e3value requires to express closely in terms of the value co-creation is to broaden the concept of exchange in it, which is merely an exchange of service and money with the providers. If the concept of response be added to the e3value, as it has been described in the fig.6b, then it can very closely reflect the concept of value co-creation.

Appendix

Tools used in the work

1. White boards (for better conceptualizing the case before moving to the software tools)
2. Microsoft Visio.
3. e3value editor.
4. Microsoft Word.

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