Towards an Ontology of Economic Value: a Preliminary Analysis

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Abstract. The notion of value and of value creation has raised interest over the last 30 years for both researchers and practitioners. Although several studies have been conducted in marketing, value remains and elusive and often ill-defined concept. A clear understanding of value and value determinants can increase the awareness in strategic decisions and pricing choices. Objective of this paper is to preliminary discuss the main kinds of entity that an ontology of economic value should deal with.

Key words: value, ontology, enterprise modeling

1 Introduction

The concept of value and value creation process have raised the interest of economists for more than 30 years, spanning from disciplines such as strategic planning to accounting and marketing. Nonetheless, value remains "perhaps the most ill-defined and elusive concept in service marketing and management" [8, p. 2], becoming "one of the most overused and misused concepts in the social sciences in general" [19, p. 428]. As a result, a broader understanding of its meaning, both from the organization and customer perspective is needed.

In the economic literature, the process of value creation has been mostly understood from the point of view of the *value producer* (typically an organization) focusing on notions such as *profit* or *revenue*, either current or potential, or again as *utility* or *quality*. On the other hand, marketing studies have privileged the *consumer value* point of view, focusing on perceived value and customer experience. We believe that a proper analysis of value needs to take both perspectives into account, aiming at a broader understanding based on primitive, general notions that can ground the meaning of the various value-related terms used in the business practice. This analysis, beside the theoretical relevance, is also particularly relevant in practice. Indeed, as stated by Anderson [2, p. 17], "a theory of value should help us rationally guide our actions". In other words, a value theory should help us in the definition of which actions is more appropriate to perform, i.e. it is the premise for a *theory of rational choice*. In order to actually provide insights for the decision making process, it is useful to account not only for revenues but, more in general, for value. Value-related information is used by organizations to (a) increase the awareness in strategic decisions or (b) for pricing purposes. For a proper understanding of value-related notions

enterprise modeling is crucial, which can be regarded as the construction and use of conceptual models to describe, analyse, and (re-)design organizational action systems (e.g., business processes, organisational structure, resources) and information systems (IS) [5]. However, the literature on value modelling is still in its infancy, and we can't say nowadays that value modeling is well integrated with more traditional enterprise modeling activities such as process modeling and organisational modeling. The relevance of the concept of value requires a broader understanding. As previously stated, the notion of value is often "ill-defined" and "misused". Thus, in order to exploit the benefits of value analysis and avoid communication problems, a precise and rigorous conceptualization is needed. This is achievable by means of a foundational approach apt at the development of a core ontology. The aim of this research project is to provide a well-founded ontology (the artefact) to integrate value modeling into enterprise modeling, with special reference to service systems. In order to do so, we follow the design science approach [14, 1]. This methodology implies the identification and motivation of the problem, the definition of the possible solution (*Relevance cycle*), the adoption of grounding theories and methods at the state of the art (*Rigor Cycle*) and the design of the artefact and its evaluation (*Design cycle*). In particular, this work is concerned with the relevance cycle and the rigor cycle of the process. The evaluation will be performed against the competency questions that will be defined starting from the literature analysis.

The research project is currently in the rigor cycle. After having outlined the motivations of this work and clarified the role ontologies could play, we shall focus here on some first ontological choices (Section 3). These choices are the result of an analysis of the literature in economics (Section 2) and are set up on foundational ontologies such as the Descriptive Ontology for Linguistic and Cognitive Engineering (DOLCE) [16] and the Unified Foundational Ontology (UFO) [10]. The need for an ontology of value is better clarified in Section 4, where we compare the existing approaches on value modeling against the identified primitives. Finally, in Section 5 we draw our conclusions.

2 The notion of value in economic literature

Among the years, several authors discussed *value* and *value creation*. Nonetheless, most of these works result ambiguous in the definition of *what is value* and *which are its determinants*.

In microeconomics a dichotomy has been outlined between value as the sum of the resources used for the production and value as the utility of products. The latter is strictly connected to the approach followed in marketing, whose emphasis is on value perceived by customers. For this study, we will focus on perceived value, that, as stated by Sanchez et al., "implies an interaction between a subject (the customer) and an object (the product); it is comparative, personal, and situational (specific to the context); and it embodies a preference judgement" [19, p. 439]. The motivation of this choice lays on its relevance for strategic decision purposes and on the recursive nature of the microeconomic notion of

value, which also does not contain enough information. With recursive we mean that, if we follow this approach, we have to keep calculating the value of every single resource that compose the product, then the resources of the resources and so on. With respect to the latter point, an example can be given by products where the brand acquire a huge relevance, whereas brand is not quantifiable as the mere sum of the resources used. In marketing, several works have been devoted to the analysis of customer perceived value, though without reaching an agreement. Consumer value has been seen in some works as uni-dimensional, i.e., value has some antecedents (or determinants) such as quality, price, brands, etc., and in others as multi-dimensional,. i.e. value is a complex concept that embeds several factors [19]. The first branch includes the price-based approach, first developed in 1979 by Monroe, who states that value originates from a trade-off between perceived utility or quality and sacrifice. Later on, Dodds et al. stated that the "cognitive trade-off between perceptions of quality and sacrifice results in perceptions of value" [4, p. 308]. Also other factors have been encompassed as antecedents of value, such as social value, time and effort spent, sacrifice, benefit and personal preference. Among the multi-dimensional approaches, there is the *utilitarian and hedonic value theory*, in which not only the instrumental and functional aspects are accounted for, but also the hedonic ones, i.e., the emotional or non-instrumental responses to the consumption of a product. Another approach has been defined by Woodall [25] with a taxonomy of customer value (V_C), highlighting the concept of *derived* V_C, concerning the experience of use and strictly connected to the notion of use value. In marketing research and, in particular, in service science, special emphasis has been also put to the concept of *value co-creation* [8]. However, for the purposes of this paper, we will focus only on the general notion of economic value, without considering the implications of the co-creation process. In this case, the problem – partially addressed by [8] – of understanding what "value creation" means arises.

3 Some first ontological choices

As a first step towards an ontology of economic value, we present here a preliminary analysis of the main kinds of entity such a theory should deal with. This is just a rough inventory of the inhabitants of the "value world", with the purpose of listing and understanding the main ontological choices we have to make. On a first attempt, we could say that value is a relational notion: something *has* a value for somebody in a context, that is agents ascribe value to entities, such as objects and events. It seems plausible, therefore, to think of value as a *relational quality* of an entity, i.e., a quality that is not intrinsic to the entity, but is existentially dependent on an agent's mental attitude. Consistent with this approach is the definition proposed by Zuniga, who suggests that value is "a significance attached to a good resulting from a conceptualization of the good in terms of a desired end. Such a conceptualization can be characterized as an interested evaluation, since the agent perceives a causal connection between the possession of the good and the fulfilment of an end" [26, p. 306]. A refinement

along this suggestion can be done by distinguishing between the value of objects and the value of events (including processes). Regarding this distinction, particularly relevant is the preference theory developed by Sen [22], in which he distinguishes between *culmination outcomes*, where only the final outcome of a certain process determines the value judgement, and *comprehensive outcomes*, where the process that brings to the outcome is considered as well. This distinction clearly emerges from the fruit choosing example discussed in [21]. The example shows how an individual that, in general, prefers mangos to apples, in specific social conditions can choose apples instead of mangos because there is only one mango left: it is not the outcome per se that drives the choice of the individual, but rather a series of conditions affecting the decision process (e.g., num. fruits available, social circumstances). Nonetheless, the same individual would still appreciate if somebody would give him the mango, without asking him: so the value of an object (the mango) is clearly different from the value of a event (a decision process) involving such object. Related to this aspect, it is worth noticing the difference between the value of a product or a service and the value of the action performed to obtain it. In the previous example, the mango has the same value regardless of the external circumstances (who is choosing, how many mangos there are, etc.), what changes is the value of the action needed to acquire its possession and disposition. The beneficiary action is more strongly related to the context, and, as such, also to ethical concerns. The previous example brings to light the need to discern who is performing the action, i.e., whether it is the beneficiary, the provider or a third person. For our purposes, we shall adopt the comprehensive outcome perspective while dealing with the value of events, since it seems plausible to assume that, in general, the process involved in the delivery of products and services affects also customer choices. In addition to the previous considerations, we have to treat in a different way the context, according to when value is perceived. For instance, value assigned before the purchase can be partially or totally independent from the user preferences. So there is a non-context dependent value and a context dependent value, which is the one that affects the costumer choice to buy a product. The latter is perceived and factored in when the product is bought or when the purchase is feasible. In the opposite case, the customer will assign a potential value, connected to the practical purposes of the product and how much these purposes are valued in the society. Thus, both customer preferences and products functionalities need to be modeled. To clarify this aspect, let us think about a house on sale. One agent (a) is not looking to buy, while the others – (b) and (c) – are. Walking in front of the house, they will all assign some kind of value to the house. Since (a) is not interested in acquiring a house, is perception won't be affected by his budget or by specific personal requirements, but it will be more general because he has no interest in going more in detail, the evaluation happens outside of the intentional to possess or dispose of the house. Instead, (b) and (c) will take into account more factors, and specifically the ones related to their requirements. The comparison of these expectations and the experience of consumption or use gen-

erates the a posteriori value, which is the focus of customer experience analysis and on which complaints are based.

We can assert that each object has one or more functionalities, meaning with functionality an "epistemically objective" [20, p. 14] function, i.e., a function that is not just a matter of the user's opinion, but it is somewhat accepted by the society, i.e., it is not an absolute objectivity. The notion of function is useful to define the derived value or use value as defined in [25], functional value, as defined in the consumption value theory, and utilitarian value. In this case, the functions of the product and its ability to fulfill them should be compared to the desired goals of the customer. Thus, also the notion of *achievement* as defined in [16] should be included. Let us think at guns; they have a socially accepted value (they are sold, they are given to policemen for public defence, etc.), but this value is different from the value assigned by each individual, who – for instance – could associate a negative value to guns, due to ethical concerns. Following from this, we can state that this kind of value is similar to the notion of market value and sometimes they may coincide, but it is not always the case. This difference is related to the resource shortage and to its importance. This can be clarified if we think of water; society assign a high value to water, but the market value is low because it is available and it is a basic need. These considerations are in line with Nunes et al. [18], who states that customer preferences can be seen as the result of goals and constraints. Yet, preferences are determinants not only of functional, use and utilitarian value, but also of hedonic value. Indeed, hedonic and emotional value imply the analysis of preferences not only with respects to products' functions and features, but also to aspects connected to the emotional and social sphere. In general, goods and services have a set of qualities (e.g., temporal and spatial qualities) through which the context can be defined. Indeed, some products get different values depending on the place or the time at which they are used. This is the case, for instance, of water in the desert. From the provider point of view, a broader analysis of the organization is needed, as well as of the different kinds of costs that the customer will bear. In other words, the provider has to evaluate the action that constitute the service offered (e.g., the actions of the customer service unit or for the warranty) and the actions that the customer has to perform in order to use the product or service. Thus, it is necessary to take into account the departments involved or eventually available in order to exploit the commitments related to the product. The analysis of the organizational structure and behaviour allows to understand whether it exists a help desk, the possibility to customize products/services, etc. These aspects constitute additional services, with respect to the product, offered by the organization. From the customer perspective, they are perceived as a bundle offer (product plus services), therefore the organizational structure per se is not relevant for the customer. Instead, from the provider point of view, its analysis and comparison to the bundle product is useful in order to evaluate the offer feasibility and to better understand which costs impact on the price. With costs we do not mean only monetary costs (including, but not limited to,

the price), but also non-monetary costs (such as psychological costs, time, effort) and opportunity costs. The primitives are listed in Table 1.

4 Related works and comparison

Two main approaches have been developed in value modeling literature, namely the Resource, Event, Agent (REA) Ontology, developed in 1982 by McCarthy [17], and e3value, developed by Gordjin and Akkermans [6], who proposed a multi-viewpoint approach for the business model development, accounting also for a value viewpoint for value creation and exchange process.

The REA ontology describes economic transactions and internal processes by means of some basic constructs related to organizations, such as resource, event and agent, with the aim of developing Accounting Information Systems (AIS). Although REA is concerned with business transactions, the value of the resources and exchanges is not accounted for. The main notions described in REA are resource, event and agent. The original model has been extended [15] in order to include also concepts such as commitment and claim. However, several issues have been identified in this approach [13], such as the lack of a temporal dimensions of events and of the definition of the notion of role

e3-value is an ontology-based methodology for defining business models for business networks [6], commonly used for the modeling value exchanges. It adopts the economic value perspective by representing what is exchanged and by whom [7]. The e3-value ontology is based on the principle of reciprocity emphasizing the dual character of business transactions. This "give and take" approach denotes that every actor offers something of value, such as money, goods, services, etc., and gets a value in return. However, e3-value focuses on the exchanged value among actors, leaving out the analysis of why value is exchanged, thus stakeholders' goals [24] or other aspects such as commitment, organizational structure, and so on. It defines in an abstract way value objects, without further analysis concerning their nature or the one of the actors that exchange them.s

5 Discussion and conclusions

This work investigates the notion of value, largely discussed in literature, under several points of view, but yet not adequately defined and often misused. In socio-technical systems value analysis, and in particular the analysis of perceived value, can be highly beneficial, since it can help in decision-making processes such as which products to offer, at which price and so on. In this sense, a value theory can be seen as the basis of rational choices. However, the shaping of value aspects requires a broader analysis, that can be provided by enterprise models, which offer an abstraction over organizational elements. The misuse and the lack of a general definition of the concept of value, calls for a precise and rigorous conceptualization. This can be achieved by means of a foundational approach apt at the development of a core ontology. With this general aim, we

Table 1. Value related primitives

Primitive	Type	Definition
Value (and subforms)	Relational quality	Quality of a product or resource as perceived by an agentive physical object
Good	Endurant	object that can be traded and transfered
Service	Perdurant	complex temporal entity, not transferable, consisting of a service commitment and the corresponding process [9]
Product	Role	"role of the good or service [...] that is offered for sale by a vendor or agreed to be exchanged by the vendor with the actual customer in a sale" [23, p. 32]
Resource	Role	role of an endurant that participates in an action [23, 11]
Customer	Role	agent who buys a product or request a service and pays for it
Consumer	Role	agent who is beneficiary of the product
Preference	Mental individual [11]	Mental state of a customer that is more inclined to specific characteristics
Goal	Proposition [11]	"propositional content of an intention" [3, p. 182]
Constraint	Role	restrictions on the use of a functionality
Function	Role	observer-relative feature assigned to a product by the society
Price	Abstract quality	monetary amount assigned to a product by the provider
Cost (and subforms)	Abstract quality	A sacrifice – monetary or not – endured by an agent in order to obtain a product
Commitment	Social moment [11]	promise of an agentive physical object towards other agents
Person	Agentive physical object	
Market segment	Non-agentive social object [16]	segment of customers to which the product is directed
Atomic event	Event	"event that happens instantaneously". [12, p. 358]
Complex event	Event	event resulting from the composition of other events [12]
Process	Complex event	complex event made by events in sequence [12, 16]
Achievement	Atomic event	atomic eventive occurrence [16]

perform an interdisciplinary analysis of literature based on value theory and on marketing. Based on the existing literature, we perform a preliminary analysis of the main kinds of entity that an ontology of economic value should deal with. Part of these kinds of entity (e.g., event, complex event, atomic event, process, achievement, goal) are already defined in foundational ontologies such as the Descriptive Ontology for Linguistic and Cognitive Engineering (DOLCE) [16] and the Unified Foundational Ontology [10]. The other kinds of entity were connected to notions already defined in these ontologies. Finally, we compare

these enitities to the ones available in e3value and REA. It emerged that, only some of the concepts are defined and the ones available need further investigation investigation. Indeed, the literature on value modelling is still in its infancy, and value modeling is not well integrated with more traditional enterprise modeling activities such as process modeling and organisational modeling. Future works will move towards the general objective, i.e., to provide a well-founded framework to integrate value modeling for services into enterprise modeling.

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