







Conceptual Model of the Ecosystem Value Balance

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Abstract. Despite the growing interest in ecosystems, research on ecosystem-level value distribution is still scant. Value creation and different value dimensions have a relatively wide knowledge base in the context of dyadic relationships and networks. However, the existing ecosystem literature does not recognize these dimensions at the ecosystem level. This article proposes an initial framework for assessing the value, particularly at the ecosystem level. Furthermore, the majority of the existing literature focuses merely on financial and functional values. This framework denotes also social, emotional, and epistemic dimensions of value. The framework is built as a constructive process. This study presents a theoretically founded iterative design phase followed by the first empirical test with one case ecosystem. The findings indicate the value balance exists in a case ecosystem, which is in a stable and established state. The article also proposes the next steps to develop the framework further. These include e.g. testing the framework with ecosystems, which are in more volatile phases (i.e. pioneering or renewal phase) and developing a measurement regime for evaluating the importance of each different value dimension.

Keywords: Ecosystem · Value · Value co-creation · Value balance

1 Introduction

Ecosystems, like any other complex systems, are difficult to design as they are open to the effects of their environments, and hence their behavior is difficult to understand and predict [1, 2]. The flows of resources, nor the value proposition, do not necessarily follow the intended design of the system when companies and people are interconnected and the business models of the companies may overlap [3]. Thus far, ecosystems do not have the tools to evaluate the quality of their value proposition nor the value balance on the ecosystem level.

For an ecosystem to be viable its' actors need to find the value sharing equitable and the effort they invest in value co-creation to be in balance with the value they can

capture in the ecosystem [4]. Value co-creation refers to a principle where the customer participates in the value creation process together with the supplier [5, 6]. The co-created value should be sustainable and unique, and the co-creators should trust each other [7]. Innovating new business models based on co-created value propositions is an ecosystem-wide challenge requiring an understanding of the real-time and future needs of the actors [8].

Mutually shared value propositions have been found to be pivotal to the attractiveness of an ecosystem [9]. These value propositions are also the core elements of a successful business model [10], hence essential for the success of the ecosystem. However, frameworks for evaluating multilateral ecosystem-level value propositions require more scientific attention. For example, an ecosystem business model design tool, for describing the distribution of financial value has been introduced [11]. The model, however, omits the other value dimensions. Also, there is a framework for the IoT ecosystems, where one of the categories used is ‘benefits’ [12]. The deficiency in this model is, it assumes value creation to be a one-way process. Consequently, it omits the ecosystems’ fundamental principle of co-creation and mutual value sharing.

This study addresses the insufficient body of knowledge of evaluating the ecosystem level value proposition by proposing an initial framework for assessing an ecosystem level value balance. The framework is built through a constructive process, including the first empirical test with a case ecosystem.

The article begins by summarizing the theoretical background, followed by the description of the research method. Next, it presents the proposed framework and the case example. It concludes with a discussion chapter and the proposals for future research.

2 Theoretical Background

Designing the framework requires an understanding of ecosystems, the importance of value within the ecosystems, and the different dimensions of value. This section summarizes the theories of these concepts.

2.1 Ecosystem

This study follows the ecosystem definition where “ecosystems are groups of firms that must deal with either unique or super-modular complementarities that are non-generic, requiring the creation of a specific structure of relationships and alignment to create value” [13]. Ecosystem as a concept was first introduced by Moore when he coined a metaphor from ecology in the business context in the mid-1990s [14]. As in ecology, also in business, the actors of the ecosystem share their faith and their success relies on co-evolution and winning their rivals together [14]. Ecosystems consist of loosely interconnected [15], a multilateral and mutually consistent set of actors [16]. Ecosystems can either emerge non-predictively or be decisively designed, but in both situations, the core of the ecosystem is a value proposition [4].

The core of an ecosystem is the final value proposition, which can be co-created when all required complementary components are in place [17, 18]. During the past few years, scholars have been increasingly interested in value co-creation. However, this

does not guarantee higher appropriation by the ecosystem actors [19]. Value is defined by the customer [8], i.e. the actors of the ecosystem the value is offered to.

2.2 Value

Value is the benefit one gains, compared to the sacrifice one needs to invest in the process [18]. Value is the desirability of a thing, often in respect of some property such as usefulness or exchangeability; worth, merit, or importance [20]. Valuation as such is a continuous process, not a single activity [21]. The values and preferences, along with financial resources and needs of the customer, perpetually affect their perception of the value [22], thus, it is essential to understand the customers' expectations – and in ecosystems, the understanding needs to be multilaterally on the ecosystem level. As 'being valuable' is a subjective and relative view measuring it scientifically accurately is difficult – if not impossible [17].

The current literature on value has focused on financial value, considering e.g. price as a primary driver of customer value (see e.g. [23]). Seems that thus far scholars have paid less attention to other value dimensions, like social and emotional value, particularly in multilateral ecosystem contexts. This omits e.g. the provably successful databased platform business models e.g. Google is using, where the users capture emotional, social, and epistemic value, the platform financial value, and the enterprise using the users' data captures epistemic, and potentially, financial value. Without one side, the others could not capture value.

There are five *value dimensions*: conditional, emotional, epistemic, functional, and social value [24]. The conditional value describes the alternative, which often depends on the situation. Typical conditional values are offered e.g. with seasonal products or services related to a certain situation like fairs. The emotional value actualizes when the customer experiences positive feelings like charity may cause. The epistemic value is based on the feeling of novelty or learning something new. Epistemic value includes all data, information, and knowledge-related aspects. For example, collaborative filtering offers an epistemic value. The functional value is a customers' valuation of the characteristics of the goods – including services. These perceptions include e.g. usability and availability of the service or quality of the good. Social value is addressed when the customer values to be identified into a group (or avert that). Being a part of a fan club is an example of social value. Financial value was added in 2005 to the dimensions [22]. It is impossible to explicitly list everything included in a certain value dimension but Table 1 includes examples [25–27] to clarify the diversity.

Some values may have more than one dimension. For example, co-design has social (interaction) and epistemic (new product or service) aspects.

In ecosystems, all its actors should participate in the co-creation of the value aiming to maximize the value for the ecosystem as a whole [4]. Compared to networked firms the target also is to share the value with all actors, not just maximize the value capture for the leader firm [4]. The actors are interdependent, which enables more value to the customer than none of the actors could offer alone [28].

Table 1. Examples of types of value per value dimension

Value dimension	Examples
Emotional	Motivation, risk reduction, sensory appeal, loyalty, wellness, nostalgia, aesthetics, fun/entertainment, self-actualization, badge value, cultural fit (e.g. ethics), stability, responsiveness, achievement, attention, fame, trust
Epistemic	Data, information, knowledge, novelty, learning, insight, innovativeness, transparency, interesting, collaborative filtering
Financial	Make money, reduce cost, increase brand value, gain investors
Functional	Time savings, simplicity, usability, convenience (reduce effort, avoid the hassle), quality, integration, security (e.g. data security), accessibility, customization, scalability, meeting specifications, flexibility, availability, durability
Social	Reference, interaction, sense of belonging, group identification, engagement, status, network expansion, reputation, social responsibility

3 Research Method

The research topic has both high practical relevance and theoretical interest. Therefore, this study was conducted as constructive research, which is one of the design-oriented research frameworks available and applicable particularly in the context of management science [29]. The seven-step procedure [30] was conducted as follows:

- 1) Finding a relevant problem:
An ecosystem-level understanding of value distribution is insufficient. A tool for assessing the viability and sustainability of ecosystems is required.
- 2) Selecting the target organization
An ecosystem led by Palpa (Suomen palautuspakkaus Oy) was selected, as it has sustained its viability. Therefore, it was able to demonstrate value co-creation and sharing on the ecosystem level.
- 3) Obtaining deep understanding
A theoretical understanding of ecosystems and value was acquired by conducting a literature review. The review was based on a Scopus literature search (ecosystem AND “value proposition”), which gave 199 articles between 1987 and January 2021. A full-text review was conducted from the most recent ones backward in six-month sets. This was done to complete the review when new descriptions of the value propositions cease to emerge. In total, 57 articles were reviewed. The descriptions were classified into the dimensions identified from theories. There were no descriptions related to conditional value in the ecosystem context, hence it was not included in the framework.
- 4) Develop a construction
The construction was developed in five iterations, based on three main constructs identified in prior literature: 1) values captured, 2) potential value, and 3) sacrifices needed in value creation. In addition, the construction was required to describe the value distribution across the ecosystem.

5) Implement and test the solution

The framework was tested with the packaging recycling ecosystem lead by Palpa Oy. The value propositions and sacrifices were collected through interviews [31] and publicly available information. The testing is described in more detail in Sect. 4.1.

Steps 6) Pondering the scope of applicability, and 7) theoretical contribution are elaborated in the Discussion and conclusions chapter.

4 Proposed Framework

The purpose of the framework is to elaborate on what kinds of value actors expect to have, what the other actors can offer, and are all expectations equitably met.

The framework demonstrates, have all actors been (and can they even be) satisfied with their value capture in the ecosystem. If an actor is making major investments in the value creation but receives only minute value, it is inclined to search for a more satisfactory ecosystem to join. On the other hand, if an actor captures value without a reasonable effort to value creation, it can be considered to be a “free-rider” and the ecosystem would not suffer from excluding it. The value potential is important information for the whole ecosystem [8] but especially for the ecosystem leader, as it helps to identify potential new actors to the ecosystem and, thus, improving the vitality and resilience of the ecosystem. An overview of the framework is presented in Fig. 1.

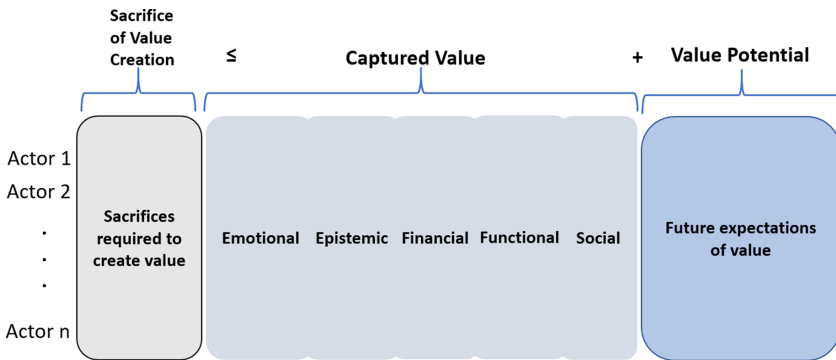


Fig. 1. The value balance framework

Each actor describes what they are investing in value creation, what value they capture, and what kind of value potential they see. The dimensions of value are included in the framework to emphasize the diversity of value.

Particularly, in the pioneering phase, mapping the value potential helps the ecosystem to find a viable value proposition. If the actors are listing plenty of new potential during the authority phase, the ecosystem leader can assume the ecosystem is approaching the final (i.e. renewal or death) phase.

4.1 Case Example

The proposed framework was applied to the ecosystem formed for the beverage package recycling in Finland to evaluate the balance of value creation and capture within this established circular economy ecosystem. The ecosystem consists of a wide variety of actors and organizations from multiple industries. The central actor for the ecosystem, Suomen Palautuspakkaus Oy (Palpa), was established in 1996, which can be seen as the beginning of the pioneering phase of the ecosystem.

It administrates and coordinates the operations within the recycling ecosystem and facilitates the collaboration between different actors. It is a non-profit company owned by the major brewery and retail companies. The ecosystem has reached one of the highest return rates (92% in 2016) in the world [32].

The value balance framework of the case ecosystem considering the different value dimensions is presented in Table 2. The table categorizes, by value dimensions, the benefits each actor of the ecosystem gains from participating in the ecosystem's activities.

As described in Table 2, all actors of the ecosystem participate in value creation and all of them also can capture value. Nearly all value expectations are met, which means the ecosystem is well in balance, as it should be as it was expected to be in the authority phase. This is also supported by the fact that the only retail chain outside the Palpa ecosystem had to join it (cans and glass bottles) due to customer pressure after few years of trying to manage its separate system. The comprehensiveness, high return rates, and efficient operations of the recycling system further validate our findings, which imply that the value balance of the studied ecosystem is adequate to enable long-term success for the ecosystem's operations. The value dimensions emphasize the social and emotional values, which are likely to stem from the ecosystem's circular economy-focused mission.

The financial value is often seen as increased revenue or increased efficiency. Palpas' case demonstrates that tax redemption can also be seen as an attractive value proposition, thus government can have a significant role in value creation.

The only new expectation, and identified potential to add value, comes from the consumers. They have proposed to develop the return system in a way, which enables giving the deposits to charity. The ecosystem has reacted to the demand. It has piloted with one nationwide charity community a donation raffle application included in the return vending machines. Also, in some retail stores, the consumers can donate the deposit receipt to a local association e.g. sports association or Scouts.

As expected, co-design was included in multiple value dimensions, hence it is likely to have more emphasis when evaluating the level of satisfaction of acting in an ecosystem.

Table 2. The value balance of the Finnish beverage package recycling system

Actor	Sacrifices in value creation	Captured value			Value potential		
		Emotional	Epistemic	Financial	Functional	Social	Value potential
Palpa	Administration, deposit management, standardization, facilitation of collaboration	Achievement	Laws and regulations	The ecosystem finances the operation	Return container management, collecting and returning, developing the machines, logistics service, consumers returning the packages	Environmental impact, co-design	
Government	Beverage packaging tax					Environmental impact, employment impact	
Breweries	Recycling fees and return package management	Badge value, cultural fit, trust	Standardization	Beverage packaging tax exemption, cost reduction	Package returning and collecting	Environmental impact, brand	
Retailers	RVM investments, management of the return location and its customer experience, co-creation of RVMs	Cultural fit, trust		Potentially more revenue enabled by well-managed return locations	RVM maintenance	Reputation, social responsibility	
RVM manufacturers	Product development, manufacturing costs		Standardization Co-design	Revenue	Co-design	Co-design, reference, reputation, environmental impact	
Logistic provider	Logistic costs	Cultural fit	Standardization	Revenue		Environmental impact	
Material processor	Process costs			Revenue	Raw material	Environmental impact	
Consumer	The effort of returning the deposit packages	Feeling of righteousness, cultural fit		Deposit	Convenience, availability	Environmental impact	Possibility to charity

5 Discussion and Conclusions

The framework strives to offer a clear picture of what kind of value is created and captured in the ecosystem. The case was assumed to be in the authority phase. This is supported by the balanced distribution of value. All actors participate in value creation and also capture value. These findings seem to confirm the original assumption. However, as the findings are based on a single real-world case, the results are mainly explorative. More real-world studies are needed to refine and validate the framework.

We identified four subjects for future research:

- (1) *Delineating a measurement regime*
The initial framework does not yet demonstrate, how valuable each of the value propositions is. When discussing, how valuable something is, there are no clear nor right answers as “beauty is in the eye of the beholder”. Nonetheless, more research is required to delineate a measurement regime for the value balance framework to be accurate.
- (2) *Addressing the ecosystem value balance in different ecosystem life cycle phases*
The value proposition is more critical particularly on business ecosystems that are in pioneer and renewal phases in their life cycle [14]. In these life cycle phases, not only the current value but especially the potential value may have importance in attracting ecosystem actors. Hence, ecosystems in these life cycle phases would particularly benefit from a better understanding of the total value balance, and the distribution of current needs and expectations of ecosystems’ potential. Future research should evaluate, how the value potential is addressed in less stable phases of the ecosystems.
- (3) *Addressing the ecosystem value balance in more diverse ecosystem cases*
The importance of value dimensions is likely to vary in different ecosystems. The significance of different dimensions may be related e.g. to the ecosystem’s mission and structure. Testing the proposed framework with more diverse cases is required in developing the model further.
- (4) *Addressing the value balance change over time*
As valuation is a continuous process the balance is likely to change over time. Especially, when the ecosystem develops towards fulfilling the expected potential and new potential emerges. A longitudinal study is required.

These aspects will be addressed as a part of finalizing the constructive process initiated during this study.

In an optimal situation when the framework is finalized, it should provide also a practical one. For it to be used by the practitioners as an ecosystem design tool without a researchers’ support a questionnaire, workshop concept, or other kinds of means to facilitate the application, needs to be designed.

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