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DIEGO GAMA AMARAL

USER-PERCEIVED VALUE AND NETWORK EFFECTS: A STUDY ABOUT
ENVIRONMENT-ORIENTED BUSINESS PLATFORMS

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Tese apresentada à Escola de Administração de Empresas de São Paulo da Fundação Getúlio Vargas, como requisito para obtenção do título de Doutor em Administração de Empresas.

Área de concentração: Gestão de Operações e Sustentabilidade

Orientador: Prof. Dr. Renato J. Orsato

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*É preciso ter o caos dentro de si
para gerar uma estrela dançante.*

Friedrich Nietzsche.

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RESUMO

O surgimento das plataformas de negócio vem sendo estimulado pela redução de custo do processamento de dados, assim como pela difusão da internet e do uso da tecnologia móvel. Tal progresso tecnológico, associado com objetivos socioambientais e o potencial escalável via efeitos de rede, se tornaram fontes relevantes para inovação de modelos de negócios. Enquanto a literatura sobre efeito de rede discute superficialmente o conceito de valor, os estudos sobre valor percebido pelo cliente são inconclusivos no que concerne à sua aplicação em economias digitais. De maneira geral, como ambos os campos de pesquisa se relacionam ainda permanece pouco claro. Por esse motivo, o presente estudo foca na relação entre as literaturas de plataformas de negócio, efeitos de rede, e valor percebido pelo cliente, em um cenário de sustentabilidade ambiental, com particular atenção aos impactos do desperdício de alimentos. A pesquisa busca responder a seguinte pergunta: Como usuários corporativos percebem valor na presença de efeitos de rede em plataformas ambientais? Baseado em múltiplos estudos de caso de plataformas brasileiras, os resultados demonstram que usuários de plataformas ambientais percebem valor por meio de nove dimensões de orientação econômica e cinco dimensões de orientação estratégica. De maneira geral, a orientação econômica oferece benefícios/sacrifícios pontuais durante cada transação, enquanto a orientação estratégica pressupõe um relacionamento de longo prazo entre o dono da plataforma e seus usuários. Em ambos os aspectos, benefícios precisam superar os sacrifícios para melhorar a qualidade de interação dentro das plataformas, resultando em efeitos de rede positivos. Os resultados fornecem evidências para donos de plataformas atraírem e reterem compradores e fornecedores por meio do estímulo a determinados benefícios e diminuição de sacrifícios.

Palavras-chave: Economia digital. Efeitos de rede. Modelo de negócios. Plataformas de negócio. Sustentabilidade. Valor percebido pelo cliente.

ABSTRACT

The emergence of business platforms has been motivated by cost reduction of data processing combined with the diffusion of the internet and mobile technology. Due to the potential to generate network effects, this technological improvement associated with sustainability goals became a key driver for business model innovation. While the literature about network effects addresses the concept of value only superficially, studies about customer-perceived value in digital economies are inconclusive. Overall, how these research fields relate to each other remains unclear. Therefore, this study focused on the interface of the literature about business platforms, network effects, and customer-perceived value, in an environmental sustainability scenario, with particular attention to the impacts of food waste. The research addressed the following question: How do business users perceive value in the presence of network effects on environment-oriented business platforms? Based on multiple case studies of Brazilian platforms, the results demonstrate that users of environment-oriented business platforms (called eco-platforms) perceive value through nine dimensions of economic orientation and five dimensions of strategic orientation. Overall, economic orientation offers one-off benefits/sacrifices during each transaction, while the strategic orientation presupposes a long-term relationship between platform owners and their users. In both aspects, benefits must outweigh the sacrifices to improve the quality of interactions within platforms (BPs and eco-BPs), which results in positive network effects. The findings provide evidence for platform owners to attract and retain buyers and suppliers due to the stimulus of certain benefits and minimization of sacrifices.

Keywords: Business models. Business platforms. Customer-perceived value. Digital Economy. Network effects. Sustainability.

LIST OF ACRONYMS AND ABBREVIATIONS

B2B – Business-to-Business

BM – Business Model

BPs – Business Platforms

CPV – Customer-perceived Value

CSR – Corporate Social Responsibility

CSV – Corporate Shared Value

Eco-BPs – Environment-oriented Business Platforms

FSC – Food Supply Chain

OC – Opportunity Cost

P2P – Peer-to-Peer

PSS – Product-Service System

RV – Relationship Value

SBM – Sustainable Business Model

TCE - Transaction Cost Economics

UPV – User-perceived value

WTP – Willingness to pay

LIST OF FIGURES

Figure 1: Comparison between one-sided and two-sided markets in the mobility industry	30
Figure 2: Value-in-exchange scheme in a supply chain	38
Figure 3: Synthesis of results.....	54
Figure 4: Traditional supply chain arrangement.....	56
Figure 5: Platform supply chain	57
Figure 6: User behavior on B2B platforms (BPs and eco-BPs)	64

LIST OF TABLES

Table 1: The definitions of SBM in the academic literature	20
Table 2: PSS categories and the maximization of resource efficiency.....	23
Table 3: Relationship between the literature of business model and sustainability	26
Table 4: Key differences between traditional business models and business platforms	28
Table 5: Conditions that influence network effects.....	35
Table 6: Three orientations of customer-perceived value	43
Table 7: The validation process of eco-platforms	45
Table 8: Categories of eco-platforms	46
Table 9: The three-step process of data collection	49
Table 10: Dictionary of codes	51
Table 11: Sources of inefficiencies by suppliers	59
Table 12: The dimensions of economic orientation in UPV (BPs and eco-BPs).....	61
Table 13: The dimensions of the strategic orientation in user-perceived value (eco-BPs)	63
Table 14: Relationship between UPV dimensions and user behavior.....	66

TABLE OF CONTENTS

1	INTRODUCTION	14
2	THEORETICAL BACKGROUND	17
2.1	BUSINESS MODELS AND SUSTAINABILITY	17
2.1.1	Business Model: How do companies operate?	18
2.1.2	Sustainable Business Model: Possible?	20
2.1.3	Product-Service Systems: Is servitization sustainable?	21
2.1.4	Shared Value: Good, green, and profitable?	24
2.2	BUSINESS PLATFORMS	27
2.2.1	The definition of business platforms	27
2.2.2	Differences between traditional business models and business platforms	28
2.3	NETWORK EFFECTS	32
2.3.1	Conditions that influence the network effects	34
2.4	CUSTOMER-PERCEIVED VALUE IN B2B MARKETS	36
2.4.1	Value-in-exchange: Value of goods and services	37
2.4.2	Relationship value: Value of buyer-supplier relationships	39
2.4.3	Value-in-use: The co-creation process	41
3	METHODOLOGY	44
3.1	PHASE ONE: DEFINITION OF ENVIRONMENT-ORIENTED BUSINESS PLATFORMS	44
3.2	PHASE TWO: IDENTIFICATION AND DEVELOPMENT OF CASE STUDIES	47
3.3	THE DESCRIPTIONS OF THE CASE STUDIES	48
3.3.1	The operation of platforms P.1 and P.2	48
3.3.2	The operation of platform P.3	48
3.4	DATA COLLECTION AND RESEARCH INSTRUMENTS	49
3.5	DATA ANALYSIS	50

4	RESULTS	54
4.1	THE EXPECTATIONS OF BUSINESS USERS REGARDING BPS AND ECO-BPS	54
4.1.1	Reduction of market friction	55
4.1.2	Reduction of inefficiencies at the industry and supplier levels	58
4.2	BENEFITS AND SACRIFICES PERCEIVED BY BUSINESS USERS	59
4.3	CONSEQUENCES OF USER-PERCEIVED VALUE FOR BPS AND ECO-BPS	64
5	CONCLUSION	67
6	REFERENCES	71
7	APPENDIX	89
7.1	THE ECO-PLATFORMS FOUND DURING PHASE 1 OF THE METHODOLOGY	89
7.2	INTERVIEW SCRIPT FOR PLATFORM OWNERS	91
7.3	INTERVIEW SCRIPT FOR BUSINESS USERS (BUYERS AND SUPPLIERS)	92

1 INTRODUCTION

Technological progress and affordability, as a result of cost reductions in data processing and the widespread adoption of mobile computing, allowed the development of new business (Casadesus-Masanell & Ricart, 2010). Business models based on Business Platforms (BPs) favor interactions of different groups of users through the flow of information and the interconnection between products and services (Gawer, 2014). The relevance of BPs in today's economy is represented by the iconic valuation (in the order of billions of dollars) of platforms such as Airbnb, Netflix, and Uber. Although these companies offer different value propositions, their potential to generate network effects – the additional value that a new user brings to the existing quality of interactions within platforms – is a standard feature.

In fact, network effects constitute a well-established field of research aiming at identifying the determinants of technological dominance (Church & Gandal, 1992; Katz & Shapiro, 1985; 1992; Suarez, 2004). From this point of view, the expansion of the user-base of a specific technology facilitates market standardization (Arthur, 1996; Cennamo & Santalo, 2013). Empirical studies have identified the conditions for such phenomenon to happen, such as social distance between users (Lee, Song, & Yang, 2016), conduct of users (Afuah, 2013), variety and exclusivity of applications (Cennamo & Santalo, 2013), and level of organizational support (David, 1985; Wade, 1995). Even though some circumstances influence the value created within the platform's interaction, how users perceive value is an open question. The studies of network effects do not provide such an explanation - a central subject around the literature of customer-perceived value.

According to customer-perceived value (CPV) literature, in a manufacturing economy, the value construct takes place in the technical quality of products and acquisition costs, in which CPV is based on transactions (value-in-exchange) (Lindgreen & Wynstra, 2005). With the servitization of the economy, value emerges from long term relationships between buyer and supplier, with quality becoming more relevant than acquisition costs (Grönroos, 1994). Lastly, resource sharing within business relationships shifted the source of value to buyers' use and the co-creation processes (Eggert, Ulaga, Frow, & Payne, 2018). In all perspectives, however, CPV refers to the trade-off between benefits and sacrifices of an offer, considering available alternatives in the market (Grönroos, 1997; Ulaga & Chacour, 2001; Woodruff, 1997). Studies about CPV in business-to-business (B2B) markets usually address the development of business models, from goods-centered dominant logic to service-centered dominant logic

(Kumar & Reinartz, 2016). Still, they do not discuss the elements of value perception in the business platforms-centered logic.

The possibility of creating value in a variety of ways justifies the motivation for business model innovation by companies (Casadesus-Masanell & Zhu, 2013; Chesbrough, 2010). Indeed, business models have been considered a new area of innovation, which complements more traditional innovation in processes and products (Demil & Lococq, 2010; Gambardella & McGahan, 2010; Yunus, Moingeon, & Lehmann-Ortega, 2010; Zott, Amit, & Massa, 2011). Sustainability and technological progress, in particular, emerged as key drivers of business model innovation (Nidumolu, Prahalad, & Rangaswani, 2009). While sustainability stimulates innovations with environmental and social purposes (Boons & Lüdeke-Freund, 2013; Porter & Kramer, 2011; Yang, Evans, Vladimirova, & Rana, 2017), technology enables companies to fulfill market demands with broader societal implications (Casadesus-Masanell & Ricart, 2010; Laukanen & Patala, 2014).

Such innovations may be fundamental to addressing one of humanity's "grand challenges", which usually involve various stakeholders, social and technical elements, and long-term consequences. According to the Food and Agriculture Organization of the United Nations (FAO, 2011), one-third of food produced for human consumption is wasted globally. The problem is primarily systemic, with technological inefficiencies within food supply chains as major contributors. Therefore, technology-based business models, which enable partnerships among companies, governments, and civil society, have the potential to improve the efficiency of food flow throughout the value chain in order to bridge the communication gap between waste generators and potential receivers (Ciulli, Kolk, & Boe-Lillegraven, 2019; FAO, 2019; Lipinski, Hanson, Lomax, Kitinoja, Waite, & Searchinger, 2013).

In light of this problematization, the current study creates an interface between the literature of network effects and customer-perceived value, with particular attention to food waste impacts. The research addressed the following question: *How do business users perceive value in the presence of network effects on environment-oriented business platforms?* This thesis pursued two objectives: (1) examine how users perceive value in specific cases of business platforms and environment-oriented business platforms (henceforth: eco-platforms or eco-BPs); and (2) understand the relationship between user-perceived value and network effects in BPs and eco-BPs. In terms of theoretical contributions, the study presents elements of value as conditions for improving the quality of user interaction within platforms. Also, it introduces

new dimensions of benefits and sacrifices perceived by buyers and suppliers as part of technological and emerging business models.

The relevance of the context for the research question and objectives ratifies the choice of the interpretative paradigm. The underlying assumption of this philosophical conception is the individual's understanding of the world, through the creation of meanings that are derived from day-to-day experiences (Gephart, 1999). The methodology was structured in two phases. The phase one was based on a secondary data search to point out the critical features of eco-platforms. In phase two, it was used the previous results to identify and develop three case studies of Brazilian platforms: Two eco-platforms and a third that aims exclusively for financial gains. The comparison between two different types of platforms (BP and eco-BPs) contributes to improving the internal validation of the research as a form of predict similar or contrasting results (Maxwell, 2013; Yin, 2018).

Primary data was collected via twenty-eight in-depth interviews with platform owners, business users, as well as twenty hours of non-participant observations. During the data analysis, the comparison between the elements of BPs and eco-BPs resulted in understanding how their (active, inactive, and potential) users perceive value, as a recursive method of data comparison of within and across platforms. While the within-case study analysis showed some patterns from each platform and evidence of generalizations, the cross-case analysis was carried-out to compare the characteristics of business platforms with eco-platforms (Eisenhardt, 1989). Data coding was performed through four different methods: structural coding, provisional coding, concept coding, and pattern coding (Saldaña, 2016).

The document is structured in eight sections, other than this introduction (Section 1). The theoretical background (Section 2) presents the discussions around the themes of business models and sustainability, the differences between traditional business models and business platforms, the relevance of the network effects phenomenon in technology-based competition, and the evolution of customer-perceived value in B2B markets. Section 3 shows the methodology, research strategy, and the process of data collection and analysis. Section 4 reveals the results based on the expectations of business users regarding BPs and eco-BP, the benefits and sacrifices perceived by them, and the consequences of users' perceived value for BPs and eco-BPs. Section 5 introduces the discussions, implications, limitations, and future research agenda, following by the references (Section 6) and the appendices (Section 7).

2 THEORETICAL BACKGROUND

Four themes compound the theoretical background section. *Topic 2.1. Business Models and Sustainability* introduces the relevance of technological progress and societal demands as critical drivers of business models innovation. Also, it presents the most relevant characteristics of socially and environmentally friendly business models, in addition to clarifying how they create, propose and capture value - as advocated by the literature on Sustainable Business Model (SBM), Product-Service System (PSS), and Corporate Shared Value (CSV). The topic *2.2 Business Platforms* presents four main differences between traditional business models and business platforms concerning the value configuration, the market set up, the economy of scale, and pricing. Such a comparison is necessary to clarify the criteria for classifying business models as platforms, in addition to reiterating the characteristics that make them innovative. Together, topics 2.1 and 2.2 advocate that technology-based business models and the addressing of social and environmental demands are trends in several industries included in companies' strategies. They also support the proposed concept of environment-oriented business platforms. Topic *2.3 Network Effects* presents the basis of competition between technologies. The literature review shows specific conditions that strengthen network effects, in order to increase the installed user base, and the propensity of a particular technology to establish itself as a market standard. Finally, topic *2.4 Customer-perceived Value in B2B* advocates that the dimensions of perceived-value are always based on a trade-off between benefits and sacrifices resulted from the combination of business models proposition and customer needs. This premise follows the changes in companies' offerings - from goods-centered dominant logic towards servitization.

2.1 BUSINESS MODELS AND SUSTAINABILITY

Discussions about the role companies play in society emerged in the early 1970s. Mainstream economic theory argued that a company's social responsibility needs to focus on job creation and profit for shareholders (Friedman, 1970). Two premises support this position: private organizations do not benefit from the supply of public goods, and market forces are the only drivers that guide actions for maximizing corporate profits (Berchicci & King, 2007). However, companies can redefine their business models in order to meet financial goals and, at the same time, address social and environmental demands (Hart, 1995; Porter & Kramer, 2011;

Porter & Van der Linde, 1995; Shrivastava, 1995). The current topic addresses this debate by introducing the concepts of business models and business model innovation, plus the link between business model and sustainability according to the three streams of literature: Sustainable Business Model (SBM), Product-Service System (PSS), and Corporate Shared Value (CSV).

2.1.1 Business Model: How do companies operate?

Why is it essential to study business models? In addition to symbolizing the operation of companies, business models (BMs) facilitates the description and understanding of several types of business. They represent ideal patterns for practitioners and academic theorists. It also provides a comprehension of the institutional context in which the company is embedded (economic, social and political) and the demands of distinct stakeholders - competitors, consumers, suppliers, and others (Baden-Fuller & Morgan, 2010; Dahan, Doh, Oetzel, & Yaziji, 2010). For Teece (2010, p. 191), business models reflect the “[...] management’s hypothesis about what customers want, how they want it, what they will pay, and how an enterprise can organize to best meet customer needs and get paid well for doing so.”

The key features of business models are value creation, value proposition, and value capture (Bocken, Short, Rana, & Evans, 2014; Casadesus-Masanell & Ricart, 2010; Kavadias, Ladas, & Loch, 2016; Lepak, Smith, & Taylor, 2007; Lüdeke-Freund, 2010; Magretta, 2002). Value creation is “a complex, interconnected set of exchange relationships and activities among multiple players” (Zott *et al.*, 2011, p. 1031). In addition to *what* value creation offers, value proposition refers to the way companies solve the customer's dilemmas; hence it is about *how* it is offered (Johnson, Christensen, & Kagermann, 2008), or “what value is embedded in the product or service offered by the firm” (Boons & Lüdeke-Freund, 2013, p. 10). By its turn, value capture is the difference between the price of the products and production cost (Bowman & Ambrosini, 2000; Brandenburger & Stuart, 1996; Zott & Amit, 2010).

The three dimensions of value are outcomes of the different elements regarding the business models. As a recognition of the operational advantages – the resources needed to deliver superior business performance (McGrath, 2010). As a balancing of choices and consequences to define the operation model of the company, and how to generate value to

stakeholders (Casadesus-Masanell & Ricart, 2010; 2011). As the identification of the elements of structure (the creation of links between activities), and governance (the definition of responsibility for performing operations) (Zott & Amit, 2010).

The possibility to create, propose, and capture value in different ways highlights the importance of companies to innovate their business models (Casadesus-Masanell & Zhu, 2013; Chesbrough, 2010). BMs have been addressed as a new topic of innovation, including processes improvement, development of new products, and recent forms of cooperation and collaboration to challenge conventional practices (Yunus, Moingeon, & Lehmann-Ortega, 2010; Zott *et al.*, 2011). From this point of view, business models are the focus of innovation, responsible for making radical changes in the *modus operandi* of the industry and the interactions between other companies, customers, and suppliers (Demil & Lococq, 2010; Gambardella & McGahan, 2010). In general, companies focus on two ways of business model innovation: novelty-centered business models and efficiency-centered business models (Zott & Amit, 2008; 2010). In the first case, the goal is to create new ways of conducting transactions either for groups that already transact or for new ones, through the disintermediation process - the replacement of traditional middlemen by new and improved methods for transaction support (Chircu & Kauffman, 2000; Sen & King, 2003). Efficiency-centered business models, in turn, aim the reduction of transaction costs by considering economic issues, attenuation of uncertainties, complexities, and information asymmetry, such as electronic intermediaries that make transactions partially or fully automated (Bakos, 1991; 1997; 1998).

The cost reduction of data processing and the widespread adoption of mobile computing allowed the development of new business models. Technological combination also contribute to the design of environmental and social-oriented business models to serve the base of the pyramid (Casadesus-Masanell & Ricart, 2010; 2011), to fulfill broader societal demands (Laukanen & Patala, 2014), to transform products into services, and to combine digital and physical offers (Nidumolu, Prahalad & Rangaswani, 2009). Although sustainability goals promote innovations for environmental and social purposes as a new source of competitive advantage, companies have been favoring value creation from a strictly financial perspective (Boons & Freund, 2013; Porter & Kramer, 2011; Yang, Evans, Vladimirova, & Rana, 2017). This gap highlights the importance of extending the debate about business models from the perspective of sustainability.

2.1.2 Sustainable Business Model: Possible?

In general, the literature refers to the term “sustainable” as a voluntary business movement beyond government regulations, aiming economic returns and the reduction of negative impacts for the environment and society (Table 1). Given this broad scope, Bocken, Short, Rana, and Evans (2014) proposed three groups of sustainable business models (SBM): (i) technical innovation component - eco-efficient organizations that use renewables and natural process to create value from waste; (ii) the social group - businesses focused on social innovation and new offerings to poor communities; and (iii) organizational group - companies that extend their responsibility beyond profit generation. What is in common between them is the presence of sustainable values, value network, and specific report model (Evans *et al.*, 2017; Hart & Milstein, 2003; Lüdeke-Freund, 2010; Lüdeke-Freund & Dembek, 2017).

Table 1: The definitions of SBM in the academic literature

Definitions of Sustainable Business Model	Key references
<i>“Innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organization and its value-network create, deliver value and capture value (i.e., create economic value) or change their value propositions.”</i>	Bocken <i>et al.</i> , (2014, p. 44).
<i>“A business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society [...]”</i>	Lüdeke-Freund (2010, p. 23).
<i>“[A business case for sustainability] deals with links between voluntary environmental and social activities and corporate economic success, and how these links can be managed, advanced, or innovated in order to improve economic success through voluntary social and environmental activities.”</i>	Schaltegger, Lüdeke-Freund, & Hanse (2012, p. 97).
<i>“[...] a model where sustainability concepts shape the driving force of the firm and its decision making.”</i>	Stubbs & Cocklin (2008, p. 103).
<i>“[A strong sustainable business model is] a description of the logic for an organization’s existence: who it does it for, to and with; what it does now and in the future; how, where and with what does it do it; and how it defines and measures its success.”</i>	Upward & Jones (2016, p. 98).

Source: References mentioned in the table.

Sustainable value refers to economic, social, and environmental balanced company concerns, resulting in value concepts (creation, proposition, and capture) driven by the imperative of sustainable development and social justice. In this sense, Stubbs and Cocklin

(2008, p. 113) suggest a new (and broader) approach of doing business, rather than concentrating on economic goals solely: "[...] profits are an outcome and a facilitator of environmentally and socially sustainable activities." This viewpoint is in line with the concept of tri-profit by Upward and Jones (2016, p.106): "Net sum of the costs (harms) and revenues (benefits) arising as a result of a firm's activities in each of the environmental, social, and economic contexts in a given time period [...]."

The second feature of sustainable business models, value network, is based on the premise that a single company is unable to aim for social or environmental sustainability if it does not involve other actors in its business ecosystem (Evans *et al.*, 2017). Companies are part of inter-organizational networks, supported by the involvement of multiple stakeholders. For instance, suppliers and focal firms work together to develop sustainable supply chains, while clients demand more environmental-friendly products (Boons & Freund, 2013). Sustainable business models need to align expectations and foster the engagement of stakeholders about the offer of products that reduce social and environmental impacts (Hart & Milstein, 2003; Stubbs & Cocklin, 2008). In line with this agenda, SBMs require new templates of stakeholder reports to expose with the same emphasis the economic, environmental, and social impacts of the company activities (Boons & Freund, 2013; Stubbs & Cocklin, 2008).

The literature about product-service system (PSS) also put the themes of business model and sustainability together. Overall, these studies advocate that service-centered offerings decrease the utilization of natural resources and the amount of waste generated, as mentioned in the following topic.

2.1.3 Product-Service Systems: Is servitization sustainable?

Products can be touched, stored, and owned (Roy, 2000). Services, in turn, are intangible and do not involve a transfer of property but "application of specialized competences (knowledge and skills) through deeds, processes, and performances" (Vargo & Lusch, 2004, p. 2). The transition from selling traditional products to customized services as a source of competitive advantage and the development of environmentally sustainable offerings is the premise of the three types of product-service system business model: product-oriented services, use-oriented services, and result-oriented services (Tukker, 2004; Tukker & Tischner, 2006).

Product-oriented services are similar to the traditional sales model, involving the transfer of product ownership and the additional after-sales service offer to increase durability, functionality, and product access, such as the maintenance and upgrade services proposals in notebooks sales. The extension of the product life is the primary of potential environmental benefits from this category of PSS (Heishanen & Jalas, 2003).

Use-oriented services explore the value of an idle asset via renting, swapping, or trading (Gaiardelli, Resta, Martinez, Pinto, & Albores, 2014). The sharing economy is the most representative example, encouraged by the internet democratization and the growth of environmental consumers' awareness (Cohen & Kietzmann, 2014). Three essential characteristics support this PSS model: (i) temporary utilization of unused assets without the transfer of property (Belk, 2014; Botsman, 2014); (ii) online operation, via website, mobile app, or a combination of them (Hamari, Sjöklint, & Ukkonen, 2015; Kumar, Lahiri, & Dogan, 2018); and (iii) as an outcome of a niche innovation strategy to challenge established socio-technical and economic regimes, e.g., the competition between traditional vehicle sales versus car-sharing model (Martin, 2016). In addition to less use of natural resources, use-oriented services reduce more energy consumption than product-oriented models due to the efficiency of idle resources and the decrease in the production of new goods (Tukker, 2015). Besides, this PSS model has the potential to mitigate the problems of income inequality, since sharing generates extra revenue for the owner, and accessibility for those who are unable to pay for a new product (Muñoz & Cohen, 2017). Although demonstrating some environmentally and socially positive impacts, consumers only adhere to use-oriented services when it is financially attractive, and have low-risk product scarcity (Hamari, Sjöklint, & Ukkonen, 2015; Lamberton & Rose, 2012).

Result-oriented services differ from other PSS categories by offering precise results to costumers, as in a 'pay-per-use' model of photocopying: consumers pay by each copy made not by acquiring the copy machine. In principle, due to the more flexible and low-impact system design, this PSS model delivers results closer to the customer's demands (Tukker, 2004). There is no incentive to sell tangible products (product-oriented services) or intensify product usage by different consumers (use-oriented services). However, the implementation of this business model needs radical changes in the operation of companies as part of its new responsibility in supplying, maintaining, taking back, and recycling the assets (Reim, Parida & Örtqvist, 2015).

Kjaer *et al.* (2018) suggest four potential product-service system enablers that reduce the utilization of natural resources: operational efficiency, product longevity, intensified product usage, and product system substitution. Each of them results in specific goals: (i) the minimization of the resource amount during product use; (ii) the demand reduction for new products; (iii) and detachment to resource-intensive systems (see Table 2).

Table 2: PSS categories and the maximization of resource efficiency

PSS enablers of resource reduction	Product-Service Systems (PSS) categories			Resource reduction goals
	Product-oriented services	Use-oriented services	Result-oriented services	
Operational efficiency	The PSS provider sells the product and supplement with after-sales services such as consultancy, user training, maintenance support, and equipment upgrades.	The PSS provider retains ownership of the product and is therefore usually responsible for maintaining the product and making sure that the product is operated efficiently.	The provider's responsibility is expanded to ensure that the product(s) needed to deliver the result are available. As the user pays for the results, the provider has incentives to ensure operational efficiency as it will directly increase their turnover by minimizing resource consumption.	The minimization of the resource amount during product use.
Product longevity	After-sales services aiming to support correct maintenance, caretaking, and potentially upgrading can enable not only operational efficiency but also lead to the products staying in use for a longer time, thereby prolonging their lifetime.	After-sales services might be intensified when the product is controlled and maintained by the provider. Furthermore, the provider can facilitate direct product reuse, for example, through re-leasing schemes.	Product longevity would ensure that fewer products are needed to deliver the result, which would maximize the providers' profit.	The demand reduction for new products.
Intensified product usage	Not relevant.	Renting the product in a use-oriented PSS setup may displace individual ownership and thereby reduce the need for producing the product.	The PSS provider might choose to intensify the usage of the products needed to provide the result to exploit unutilized product capacity.	
Product system substitution	The PSS provider might offer an after-sales take-back service, enabling that product parts and materials can enter into	Take-back options are even more profound since product ownership stays with the PSS provider. A use-oriented PSS often	The PSS provider has - in principle - the greatest control over the resources required to fulfill the user's need, which enables	The detachment to resource-intensive systems.

PSS enablers of resource reduction	Product-Service Systems (PSS) categories			Resource reduction goals
	Product-oriented services	Use-oriented services	Result-oriented services	
	new applications, where they substitute other products and materials.	changes the way users fulfill their needs and thereby substitute other product systems during the use stage.	shifting the products and technologies used to deliver the result.	

Source: Based on Kjaer, Pigosso, Niero, Bech, and McAloone (2018).

The literature of corporate shared value also discusses the relationship between business models and sustainability. In general, the studies advocate the possibility of aligning companies' strategies with social and environmental needs.

2.1.4 Shared Value: Good, green, and profitable?

Porter and Kramer (2006; 2011) coined the concept of Corporate Shared Value (CSV) as a critique regarding the gap between the practices of Corporate Social Responsibility (CSR) and business strategies. According to the authors, CSR actions are, in essence, reactive because they consider the demands of business and society as opposed. In contrast, CSV embeds social and environmental benefits (from now on called societal benefits) in the companies' value chain as a source of competitive advantage through the cost reduction of products/services and differentiation offerings. Some studies illustrate the relationship between the literature of shared value and business model. Micheline and Fiorentino (2012) suggest that CSV is a result of social and inclusive business models that require different value propositions compared to traditional companies. Lee, Olson, and Trimi (2012) proposed shared value as a goal of innovation and value creation for several stakeholders, including local communities. Spitzack and Chapman (2012) provide empirical evidence of shared value in a business model that aims financial, social, and environmental benefits.

Dembek, Singh, and Bhakoo (2016) found three distinct groups of shared value definitions in the academic literature. The first one uses the original concept of Porter and Kramer (2011, p. 66): "[...] policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates." The second refers to CSV as a generic and abstract definition, like a new way to achieve economic success (Dembek *et al.*, 2016). The third defines

shared value in terms of co-created value by businesses and communities for different types of stakeholders that lay on the balance of social and financial value creation (Pirson, 2012; Shrivastava & Kennelly, 2013; Maltz & Schein, 2012). What is in common among these groups is the pathway to implement CSV approach: (i) by reconceiving products and markets, through the understanding of non-traditional communities demands; (ii) by redesigning the logistics system to increase productivity and quality of suppliers; and (iii) by enabling local cluster development - the concentration of firms, related businesses, suppliers, and logistics infrastructure – to stimulate productivity and product innovation based on domestic demand (Porter & Kramer, 2011).

Several authors criticize the concept of Corporate Shared Value for its lack of originality. For example, the Stakeholder Theory had already proposed the influence of distinct stakeholders in improving the performance of the firms (Crane, Palazzo, Spence, & Matten, 2014; MacDonald & Marcoux, 2013). Similarly, Social Innovation studies proposed the reconceiving products and markets, as well as Social Business studies that advocate the balance of societal problems and the financial accomplishment (Dahan, Doh, Oetzel, & Yaziji, 2010; Thompson & MacMillan, 2010; Yunus *et al.*, 2010). Shared value is also seen as a naive concept by proposing win-win opportunities without the dilemmas and complexity of potential friction between business and societal objectives, and by addressing problems at the enterprise level as a source of problem-solving for capitalism as a whole (Aakhus & Bzdak, 2012; Crane *et al.*, 2004; Florin & Chimidt, 2011). At last, some studies consider general and broad aspects of the business as a way to measure CSV. It is crucial then to make the scope of the CSV clear, clarify the circumstances, and the stakeholders (Dembek *et al.*, 2016).

Despite the criticism, shared value is an umbrella construct that encompasses many concepts that are poorly interconnected, such as the bottom of the pyramid, social innovation, and social entrepreneurship (Crane *et al.*, 2014). CSV also proposes a business transformation model by raising social goals to a strategic level addressed by the utilization of new technologies, operating methods, management approaches, and new kinds of hybrid enterprises that blurring the profit/non-profit boundaries (Porter & Kramer, 2011; 2014).

In short, the studies about Sustainable Business Model (SBM), Product-Service Systems (PSS), and Corporate Shared Value (CSV) show similar ways for companies to create, propose and capture value in order to meet social, environmental and economic goals (Table 3). The

characteristics of businesses presented by these literature (sustainable value; value network; specific stakeholder reports; services over products; and alignment of business strategy with societal demands) as well as the development of a secondary data search, were the basis for defining the concept of environment-oriented business platforms and the identification of case studies (see topics 3.1 and 3.2).

Table 3: Relationship between the literature of business model and sustainability

Elements of a business model	Sustainable Business Model (SBM)	Product-service systems (PSS)	Corporate Shared Value (CSV)
Value creation	Balance of economic, social, and environmental goals.	Dissociation of economic growth from the use of material components (dematerialization).	Alignment of business strategy with societal demands.
Value proposition	<ul style="list-style-type: none"> • By reducing the environmental impact of the company's activities. • By creating social and environmentally friendly products. • By aligning the expectations of different stakeholders with the company's goals. 	<ul style="list-style-type: none"> • By increasing the product longevity with additional maintenance services (product-oriented services). • By stimulating the reuse (or sharing) of assets, instead of their acquisition (use-oriented services). • By offering solutions/results (result-oriented services). 	<ul style="list-style-type: none"> • Reconceiving products and markets. • Redefining productivity. • Enabling local cluster development.
Value capture	By offering cheaper and environmentally differentiated products/services to traditional and nontraditional markets.	<ul style="list-style-type: none"> • By offering complementary service to products and vice versa. • Pay-per-use model. 	By offering cheaper and environmentally differentiated products/services to traditional and nontraditional markets.

Source: The author.

Digital economy contributes to transforming business in more agile and expandable organizations, due to closer communication with customers and the impact of this interaction in innovations contents and assessments of products and services (Evans & Schmalensee, 2016; McAfee & Brynjolfsson, 2017; Wirtz, Schilke, & Ullrich, 2010). In this context emerged a new type of company, called Business Platforms (BPs), as explained in the following topic.

2.2 BUSINESS PLATFORMS

In practice, there are many examples of business platforms in numerous industries (Gawer & Cusumano, 2014). Hence, it is fundamental to clarify how the current study defines business platforms and highlight the differences compared to traditional business models.

2.2.1 The definition of business platforms

Business platforms (BPs) can be internal or external, according to the level of analysis. Internal platforms refer to the development of new products within a single entity, such as the automobile industry, where different car models share the same modular components in the assembly lines (Gawer, 2009). The primary goal of this kind of BP is to fashion production in line with a more flexible and dynamic response to market demands and trends (Thomas, Autio, & Gann, 2015). Academic studies look for understanding the process of development and management of these practices (Gawer & Cusumano, 2014).

External platforms operate in multiple companies within the same supply chain, aiming at the production efficiency and the speed of product development amongst all the partners (Gawer, 2009). The goals are similar to internal platforms in terms of flexibility, innovation, and cost savings through the reuse of components. The most noticeable difference refers to the platform's ownership, or "a firm that owns a core element of the technological systems that defines the forward evolution" (Gawer & Henderson, 2007, p. 4). At the supply chain level, the property of a platform can be shared by several organizations rather than owned by a single firm, as internal platforms.

Also categorized as external platforms, industry platforms connect groups of users that develop complementary applications, technologies, or services but do not necessarily belong to the same supply chain (Gawer, 2009). Industry platforms are responsible for orchestrating an ecosystem that focuses on facilitating the interaction and interdependence between at least two different groups of users. *Industry maker platforms* offer a diverse spectrum of tools, technologies, and infrastructure for content production, such as articles (Wikipedia) and videos (YouTube) (Moazed & Johnson, 2016). *Industry exchange platforms*, in turn, support the

interaction between buyers and suppliers, generating transaction leverage through the elimination of traditional intermediaries, e.g., eBay and Paypal (Thomas *et al.*, 2015).

Given the diverse types of platforms available, the next topic addresses the differences between traditional business models and industry exchange platforms, whose primary function is to make exchange feasible on a larger scale compared to the usual middleman.

2.2.2 Differences between traditional business models and business platforms

Although business platforms have the elements of value creation, proposition, and capture, they differ from traditional business models in four aspects, as shown in Table 4: value configuration model (value chain versus value network), market set up (one-sided market versus two-sided market), economy of scale (supply-oriented economy of scale versus demand-oriented economy of scale), and pricing (one-step pricing versus two-step pricing).

Table 4: Key differences between traditional business models and business platforms

Elements of a business model	Topics of differentiation	Traditional businesses	Business platforms	Key references
Value creation	Value configuration model	Value chain	Value network	Eisenmann, Parker, and Alstyne (2006); Nambisan and Sawhney (2011); Porter (1985); Stabell and Fjeldstad (1998).
Value proposition	Market set up	One-sided market	Two-sided market	Gawer (2014); Hagiu (2006); Rysman (2009).
Value capture	Economy of scale	Supply-oriented economy of scale	Demand-oriented economy of scale	Fu, Wang, and Zhao (2017); Parker, Van Alstyne, and Choudary (2016); Ruutu, Casey, and Kotovirta (2016); Suarez and Cusumano (2009); Zhu and Iansiti (2012).
	Pricing	One-step pricing	Two-step pricing	Bowman and Ambrosini, (2000); Rochet and Tirole (2003); Rysman (2009).

Source: The author.

Value configuration of traditional companies is anchored in the transformation of raw materials into products in a sequence of actions such as the assembly line, which has been referred to as linear or pipeline business. According to this view, companies can gain a competitive advantage in two ways: increasing the price of the product by a differentiation strategy or reducing the cost of production inputs (Porter, 1985). In contrast, business platforms are structured on the basis of a value network, which is associated with the ability of firms to mediate exchanges between distinct groups of users (Stabell & Fjedad, 1998). Instead of resource control, characteristic of traditional businesses, resource orchestration is the major asset of platforms. In other words, facilitating interactions and managing relationships is more important than internal optimization - a shift from firm-centric innovation to network-centric innovation (Nambisan & Sawhney, 2011).

One-sided markets have a clear source of revenue and costs as a function of the roles of suppliers, producers, and consumers (Eisenmann *et al.*, 2006). In two-sided markets, on the other hand, groups of users interact with each other via an intermediary, in which decisions taken by one group affect the other group, e.g., merchants and consumers from credit cards companies, and advertisers and viewers from websites (Hagiu, 2006; Rysman, 2009). In such a model, costs and revenues may incur in both groups: suppliers can also buy, and vice versa (Gawer, 2014). Figure 1 illustrates the difference between one-sided and two-sided markets in the mobility industry. Car2Go developed a platform where offers car rentals to only one group of customers. In such a case, the company assumes the role of service enablers and service providers as in the product-service system. In contrast, Uber connects and mediates the transactions of two different groups of users: service providers (drivers) and customers.

Figure 1: Comparison between one-sided and two-sided markets in the mobility industry
Source: The author.

Regarding economies of scale, traditional business models are based on production efficiency or the reduction of production unit cost as the total number of products increases (supply-oriented economy of scale). Companies that achieve this level of productivity can implement low-cost strategies as a way of gaining competitive advantage (Parker, Van Alstyne, & Choudary, 2016). Demand-oriented economies of scale, on the other hand, stem from the platform's effectiveness in being more valuable to users through features that foster positive network effects - when the increase in the number of platform users generates more value to existing ones. The higher the quality of the relationships within the platform, the greater the network effects (Ruutu, Casey, & Kotovirta, 2016).

Finally, pricing in traditional markets derives from price-cost markup, the overall marginal cost of producing an extra unit versus the willingness to pay of customers, based on an individual decision associated with the economic question and the subjective belief about the utility of a product (Bowman & Ambrosini, 2000). In two-sided markets, price decisions must acknowledge not only the demand and cost of one side of the market but also their impact on the participation and profits for the other side. Unlike traditional markets that must sell their products above their cost of production, platforms can choose a side that will generate profits (money side), while the other side will, at best, reach the break-even point (subsidy side) (Eisenmann *et al.*, 2006; Rochet & Tirole, 2003). The utility is also vital in business platforms, but the individual's participation in a network influences on a greater extent the technology

utilization. There are three common types of pricing in BP: (i) freemium: the offer of free basic functionality and the charge of enhanced access to all functions; (ii) charge for visibility on the platform (ad revenue); (iii) fee per transaction mediated (Evans & Schmalensee, 2016; McAfee & Brynjolfsson, 2017).

Business platforms are changing the dynamics of the economy, the criteria of competition between companies, and hence the parameters for competitive advantage through the phenomenon of network effects, as addressed in the next topic.

2.3 NETWORK EFFECTS

Studies about network effects deal with the market dominance of technological standards and their influence on levels of consumption (Cennamo & Santalo, 2013; Church & Gandal, 1992; Katz & Shapiro, 1992; Shapiro & Varian, 1999; Suarez, 2004). From this point of view, what protects a platform against competitors is the self-reinforcing mechanism between the size of the user-base and the benefits of adopting a specific technology (Lee, Song, & Yang, 2016). Stronger network effects stimulate technology dominance that charge maximum prices and increase the switching costs to customers (Brynjolfsson & Kemerer, 1996). In contrast, the ease of accessing competing technologies decreases the network effect, intensifies price competition, and speeds up the migration of users to a competitor (Landsman & Stremersch, 2011). Technological standardization can, therefore, be a trap for a sector when a dominant technology is inferior or even obsolete when compared with alternatives. For Farrell and Saloner (1985; 1986), although standardization brings social benefits, such as price reduction, it reduces technological variety. For users to switch, the advantages of the competing technology need to be very clear; otherwise, the technological superiority of the challenging offer may not be a satisfactory motivator.

Network effects literature also addresses the competition between systems – products that have their value increased when combined with other products (Katz & Shapiro, 1994). This complementarity characteristic results in demand growing in tandem (Oestreicher-Singer, Libai, Sivan, Carmi, & Yassin, 2013). For instance, Gupta, Jain, and Sawhney (1999) identified an interdependence between TV manufacturers (hardware) and programming-related features and ancillary services (software) within the American TV industry. As an outcome of network effects, software companies responded to the actions of the hardware manufacturers to enhance customer value and increase the adoption of technology.

Instead of monopolizing the market through core competencies, price, costs, and quality as in the traditional industries, companies that own dominant technologies difficult technological compatibilities solutions to protect the installed user base through the increase of switch cost – single home strategy (Arthur, 1996; Cusumano, Gawer, & Yoffie, 2019; Katz & Shapiro, 1985). Liu, Kemerer, Slaughter, and Smith (2012) showed that the adoption of digital converters reduced the impact of the installed user base and the price of a product if consumers and developers identify low switch costs in adopting a competing technology. Likewise, Rochet

and Tirolet (2003) studied this phenomenon with credit card companies. They found that when Visa reduced the percentage of its cost per transaction, Amex users switched to use it in preference, and vice versa.

Since business platforms deal with relationships, the quality of the interactions between the users influences the network effects (Van Alstyne & Parker, 2017). Network effects can affect the same group of users (direct network effect) or distinct groups (indirect network effect). The same-side network effect relates to the consequence of increment in the number of platform users to other users. Cross-group network effects, in turn, occur when the growth of one user group affects the other group. Network effects can also be negative when an excessive number of users reduces the value created by each of them by growing the marginal cost of transactions within the platform (Parker *et al.*, 2016). For instance, Asvanund, Clay, Krishnan, and Smith (2004) showed that the benefits generate by a new user in peer-to-peer (P2P) file-sharing networks decrease as soon as present speed problems in transferring songs and videos.

Network effects exist even before the business platform launch, as potential users may assume a wait-and-see attitude until the technology and its functionalities are made sufficiently clear by early adopters (Suarez & Cusumano, 2009). This chicken-and-egg dilemma illustrates the quandary that every platform owner faces in the initial stages: investments to increase the number of users A will stimulate users B to adopt the technology, or vice-versa. The problem not only concerns the number of users who join the platform but also how much each group contributes to value creation. After BPs implementation, network effects vary according to the business stage (Fu *et al.*, 2017). At the initial phase, platforms strengthen the network effect by deploying adequate technological infrastructure and service innovation. Next, in the expansion phase, the focus moves to the relationship between the platform owner and its users, as well as to fostering co-creation activities. Finally, at the maturity stage, the goal is to create a platform ecosystem.

While early studies demonstrated evidence regarding the success of technology and the dimension of its installed user base, empirical research shows that the size of the network alone is not a guarantee of competitive advantage. Overall, specific conditions influence network effects.

2.3.1 Conditions that influence the network effects

The social distance of users affects the size of the installed user base (Lee, Lee & Lee, 2006; Lee *et al.*, 2016; Shankar & Bayus, 2003; Suarez, 2005). The adoption of technologies is strongly related to the presence of groups with strong ties, rather than the overall size of the network. A great social distance between the members of a network limits the advantage of a dominant technology, which may facilitate the emergence of new entrants in the market. In comparison, small distance between users results in substantial difficulty to new competitors enter the market.

The choice of a technology by a community of firms either for technological compatibility or sponsorship encourages consumers to use it due to the perception of prestige associated with the solution (Wade, 1995). The rivalry between the DSK and QWERTY keyboard models is an example. Although the former made writing 40% more efficient, the latter became the standard because of its compatibility with other products in the industry and the support of key companies (David, 1985).

Three circumstances in terms of the conduct of users and their level of trust affect the strength of network effects (Afuah, 2013). Firstly, members of a network transact with each other when they trust the object of negotiation (product or service). Secondly, the opportunistic behaviors of the users reduce the value of the network. Thirdly, a high reputation network may prevent opportunistic behavior, with the fear of users in ruining future transaction gains.

The number of applications influences the value of a platform by users and developers. The simultaneous presence of direct and indirect network effects demands a certain level of governance in the applications offered. In such cases, platforms create value for users by limiting the variety of applications (Casadesus-Masanell & Halaburda, 2014). From the perspective of the users, if they are unable to observe the utilization of apps by others, it is unlikely that they will end up purchasing the same applications. For the platform owner, this scenario results in the availability of a large number of applications used by only a few people. Additionally, encouraging the development of exclusive applications and, at the same time, fostering competition between developers influence the network effect negatively, once generate benefits to the users solely (Cennamo & Santalo, 2013).

For Zhu and Iansiti (2012), two factors are essential for the success of new entrants in the platform market: the intensity of the indirect network effect and the consumer discount factor - the level of interest of users in the release of the future applications. According to the authors, when the intensity of the indirect network effect and the consumer discount factor are below a certain threshold, a new entrant with a quality advantage can gain market share from an incumbent firm even with a large installed user base.

Finally, Venkatraman and Lee (2014) discovered that network structures and the characteristics of platforms influence the participation of game developers. Overall, this group prefers dominant platforms (with a large installed user base) or emerging ones (with new features) as long as they find low competition. Table 5 summarizes the conditions that influence the network effect of technological standards.

Table 5: Conditions that influence network effects

Conditions	Key references	Theory / Approach
The social distance between users affects the adoption of technology rather than the size of the network per se.	Lee, Lee, & Lee (2006); Lee, Song, & Yang (2016); Shankar & Bayus (2003); Suarez (2005).	Complexity Theory Social Networks Social Ties.
The adoption of technology by a community of firms stimulates the consumers to use it as well.	David (1985); Wade (1995).	Technological Communities.
The conduct of users, such as opportunistic behavior, reputation signaling, and trust, affect the strength of network effects.	Afuah (2013).	Network structure.
In the presence of direct and indirect network effects, platforms can create value for users by limiting the variety of applications.	Casadesus-Masanell & Halaburda (2014).	Empirical studies.
When the intensity of the indirect network effect and the consumer's discount effect are below a certain threshold, a new entrant can take market share from an incumbent with a large installed user base.	Zhu & Iansiti (2012).	Empirical study.
The stimulus of competition between developers and the strategy of exclusivity applications negatively affects the participation of this group in the network.	Cennamo & Santalo (2013).	Empirical study.

Source: The author.

Although some conditions influence the value created for the existing users within the platforms, how value is perceived is an open question. The theories / approaches applied in the studies of network effects don't provide such explanation. This is the central subject around the literature of customer-perceived value.

2.4 CUSTOMER-PERCEIVED VALUE IN B2B MARKETS

Overall, the academic literature associates the concept of value with the competitive advantage of companies through the delivery of benefits to help customers achieve their goals (Flint, Woodruff, & Gardial, 1997). As long as customers perceive a higher net-value of an offer compared to alternatives, the greater the possibility of a company to gain market share and achieve superior growth within the sector it operates (Ravald & Grönroos, 1996; Ulaga & Chacour, 2001; Woodruff, 1997). Also, perceived value leads to customer satisfaction in which influences the purchase intention and the loss of interest in the competitors' offers (Eggert & Ulaga, 2002). Price and value are decisive in the acquisition of products. Still, while the former is essentially an objective idea, the latter is a broader concept addressed in several ways in academic literature (Anderson, Thomson & Wynstra, 2000). Firstly, it involves two relevant areas of management with distinct conceptual roots - marketing and strategy (Ravald & Grönroos, 1996). Secondly, the definition of value is contingent since it depends on the level of analyzes - individual, organizational, or societal (Lepak *et al.*, 2007). What is common between these perspectives is the subjective approach about value perception and its elements (Eggert & Ulaga, 2002; Kothandaraman & Wilson, 2001). In general, customer-perceived value (CPV) in business-to-business markets is defined as a trade-off between multiple benefits and sacrifices of a supplier's offering, as perceived by the available alternatives in a specific-use (Eggert *et al.*, 2018; Grönroos, 1997; Kumar & Reinartz, 2016; Ulaga & Chacour, 2001; Vargo & Lusch, 2004; Woodruff, 1997).

The evolution of customer-perceived value in B2B markets follows the shift from goods-centered to the service-centered business model (Eggert, Ulaga, Frow, & Payne, 2018; Vargo & Lusch, 2004). The three main approaches of CPV are known as *value-in-exchange*, *relationship value*, and *value-in-use*. In the value-in-exchange perspective, originated in manufacturing economies, the utility of the products, technical quality, and acquisition costs

are the primary sources of value (Lindgreen & Wynstra, 2005). Customer-perceived value, therefore, is based on transactions at a time. With the servitization, value emerges from buyer-supplier relationships, and the quality dimension becomes more important than acquisition costs (Grönroos, 1994; Vargo & Lusch, 2004). In this perspective, customer-perceived value is measured within buyer-supplier relationships. Lastly, the service-centered view also premises a continuous process of learning and collaboration between suppliers and buyers through the link of activities and resources (Eggert *et al.*, 2018). Hence, value is perceived during the use of buyers and in the co-creation processes with suppliers.

2.4.1 Value-in-exchange: Value of goods and services

The concept of value-in-exchange in business markets is inspired by previous works about the influence of consumer values in the choice of products, the relevance of the attributes of goods to meet specific buyer's needs, and the relationship between consumer satisfaction and the quality of products (Payne & Holt, 1999). Early studies had mainly an economic and utilitarian approach focused on value embedded in physical goods, reliable performance, and price (Eggert *et al.*, 2018; Payne & Holt, 1999). In this approach, perceived benefits include the combination of physical attributes of products, available technical support, and quality (Eggert *et al.*, 2018; Payne & Holt, 1999). Sacrifices, in turn, involve the costs faced by the buyer during the purchase and the usage of a product, such as installation, transportation, repair, performance, failure risk, among others (Ravald & Grönroos, 1996). Two situations promote the value-in-exchange: (1) when perceived benefits outweigh the costs of acquiring it (positive value); and (2) when the value of a product exceeds market alternatives (Kumar & Reinartz, 2016; Lepak *et al.*, 2007).

The discussions about value-in-exchange expanded from the perspective of a product to different actors in a supply chain in which highlights the influences of bargaining power among buyers, focal companies, and suppliers (Brandenburger & Stuart, 1996). In order to increase profits, buyers pressure the focal company, which forces suppliers to reduce costs (Anderson & Narus, 1998). The value creation of focal companies is the difference between willingness-to-pay (WTP) of buyers and opportunity cost (OC) of suppliers (Figure 2). WTP corresponds to the subjective concept of customer-perceived value, based on their assessment of the product

utility (Bowman & Ambrosini, 2000). Opportunity Cost (OC), in turn, is “The amount of money that leads the supplier to gauge the new situation (money minus resources) as equivalent to the original status quo [...]” (Brandenburger & Stuart, 1996, p. 9).

Figure 2: Value-in-exchange scheme in a supply chain
Source: Adapted from Brandenburger and Stuart (1996).

Since the purchasing process involves different members of an organization who make distinct product evaluations, Ulaga and Chacour (2001) suggest a more comprehensive view of value-in-exchange. According to the authors, in addition to the product-related attributes, it is essential to emphasize the services associated with them (service-related components), and the ways by which products are promoted (promotion-related components).

The lack of analysis around buyer-supplier interactions is the most relevant critic to value-in-exchange perspective (Anderson & Narus, 1995; Prahalad & Ramaswamy, 2004). The next phase about the literature of CPV advocates that long-term relationships are the source of value, a multidimensional concept that goes beyond the trade-off between quality and cost (Eggert *et al.*, 2018; Ulaga & Eggert, 2006).

2.4.2 Relationship value: Value of buyer-supplier relationships

Buyer-supplier relationships have influenced the literature of customer-perceived value in two ways. First, by the interaction of different actors who seek a stable, long-term and predictable relationship, reducing the transaction costs and quality uncertainties (*value through relationships*) (Grönroos, 1994; Lindgreen & Wynstra, 2005; Raval & Grönroos, 1996). Second, through the learning process in interactions, access to new markets, and reputation gain (*value of relationships*) (Lindgreen & Wynstra, 2005; Sharma & Sheth, 1997). Both approaches advocate that long-term relationships provide benefits and sacrifices to those involved (Uлага & Eggert, 2005).

Benefits and sacrifices as two mutually dependent elements also exist in relationship value (RV), but from a multidimensional point of view. While physical attributes of products and transaction episodes are the primary sources of benefits in value-in-exchange, the perspective of RV ratifies the importance of supporting and encouraging loyalty within the relationship (Raval & Grönroos, 1996). Since benefits are higher-order constructs, the literature suggests several dimensions to them. For example, Raval and Grönroos (1996) showed four types of benefits: safety, credibility, security, and continuity. Uлага and Eggert (2005) identified five other dimensions: product-related benefits (performance and reliability), service-related benefits (value-added services), suppliers' know-how, suppliers' capacity to improve time-to-market for its customer, and social benefits. Blois (2004) divided the perceived benefits to customers (improved performance, reduced operating costs, and reduced working capital) and suppliers (purchase price, reputational effects of association with the customer, and access to market). Uлага (2003) discovered six distinct dimensions of benefits: product quality, service support, delivery, supplier-know-how, time-to-market, and personal interaction. In terms of sacrifices, there are two standard dimensions in buyer-supplier relationships: products/services purchase cost and the process cost – managerial time and effort, inventory management, order-handling, and incoming inspections (Raval & Grönroos, 1996; Uлага, 2003; Uлага & Eggert, 2005). Grönroos (1997) classified the sacrifices as direct costs (acquisition) indirect costs (quality issues, not consistent with what was offered), and psychological costs (problems or fears that customers previously knew and may occur during interactions making an ordinary relationship challenging to deal with).

Wilson and Jantrania (1994) expanded the dimensions of benefits within relationships by proposing three types of alignment among participants. The economic dimension goes beyond the reduction of product/service costs to sophisticated concurrent engineering that creates value through cost savings of design, assembly, and time-to-market. The strategic dimension relies on relationships as a source of competitive advantage by enabling the addition of core competencies and strategic fit. Finally, the behavioral dimension supports the long-term relationship through the establishment of social bonds between individuals, trust, and the creation of a culture of collaboration that would not exist in any of the participants in isolation.

The long-term nature of relationship value presupposes continuous modification over time. Anderson and Narus (1995) found that many suppliers offer one-size-fits-all services to their customers, regardless of demands changing. Therefore, strengthening the buyer-supplier relationship involves tailoring offers to meet specificities of current needs, changing in perceive value over time, and future interaction outcomes (Flint *et al.*, 1997; Sharma, Krishnan, & Grewal, 2001). In terms of interactions, not every customer demands a close relationship with the supplier. However, the former must know that the latter will be available when needed, as a latent relationship (Grönroos, 1997).

The quality of buyer-supplier relationships, as well as the level of integration, may generate benefits beyond the financial dimension, and impacting other partnerships. For instance, Walter, Ritter, and Gemünden (2001) suggested four types of business relationships and how they create value for participants. *Low performing relationships* refer to potentialities and risk of new relationships to become long-term partnerships. *Selling relationships* are based on economic criteria of price and quantity sold, high profits, and economies of scale. *Networking relationships* support the integration of companies' resources, such as know-how, market information, and new product development. *High-performing relationships* involve direct benefits (profit, volume, and cost-efficiency) and indirect benefits that can impact other relationships (innovation development, access to new markets, and access to market information).

According to the perspective of RV, the relationships anchored primarily on relational exchange orientation, as opposed to short-term transactions, are more stable and reliable. Based on that, Lefaix-Durand (2009) classified business relationships in a two-axis matrix regarding the exchange orientation and the level of value creation. *Strategic relationships* (high-value

relationships and relational exchange orientation) have long-term and collaborative drivers, also are challenging to replace, as they involve high volumes of purchases, revenues, and a fair price. *Supportive relationships* (relational exchange orientation and low-value creation) refer to long-term and stable sales volumes. *Promising relationships* (high-value relationships and transactional exchange orientation) are short-term relationships involving high volume / profitable deals. At last, *questionable relationships* (low-value relationships and transactional exchange orientation) represent low-value relationships that, in addition to generating little profit, have useless and time-consuming interactions.

Following the complementary approaches of value-in-exchange and relationship value, the literature of customer-perceived value in B2B markets advances to the value-in-use perspective. Based on this view, value creation takes place in a collaborative co-creation process between buyers and suppliers, as explained in the next topic.

2.4.3 Value-in-use: The co-creation process

Value-in-use keep the locus of value creation in buyer-supplier interactions aiming outcomes, purposes, and objectives co-created in the dyad. While suppliers create superior value propositions in order to facilitate co-creation experiences, customers determine the value when the product/service is consumed and measured by its revenue and profits (Payne, Storbacka, & Frow, 2008). The classic notion of quality as an *ex-ante* concept is revisited to the ability to change and continually optimize the customers' process based on *ex-post* solutions (Macdonald, Wilson, Martinez, & Tossi, 2011). "Suppliers, then, do not deliver solutions; rather, suppliers and customers co-create them." (Macdonald, Kleinaltenkamp, & Wilson, 2016, p. 12). Four main assumptions support this view: (i) transactions are predictable and reassuring in order to enable partners to organize their business operations; (ii) relationship creates new solutions resulted from learning and adaptation processes; (iii) customers capture value in specific situations; and (iv) buyers and suppliers search for resources integration (Eggert *et al.*, 2018; Lindgreen, Hingley, Grant, & Morgan, 2012; Macdonald *et al.*, 2011).

Buyer-supplier relationships are contextual, based on practical experiences and cooperation in order to add value to current and future offerings while presenting fewer performance risks (Kothandaraman & Wilson, 2001). Therefore, high-quality partnerships must

be transparently and supported by accessible dialogs that enable deep engagement, shared solutions (Kothandaraman & Wilson, 2001), improvements of technology delivery process (Sharma, Krishnan, & Grewal, 2001), and development of new capabilities (Beverland & Lockshin, 2003). Knowledge is shared through linking practices; then, the ideas are materialized into objects and artifacts, and, finally, continuous coordination institutionalizes the routines (Marcos-Cuevas, Nätti, Paulo, & Baumann, 2016).

Discussions about co-creation value expand their scope beyond the customer-supplier relationship by engaging multi-stakeholder. Reputation enhancement and experimentation of new practices are the main motivations to participate in such a business ecosystem (Pera, Occhiocupo, & Clarke, 2016). The goal is to facilitate interaction and collaboration among participants by means of sustained purposeful engagement - benefits, practices, and capabilities reinforced by a common purpose and continuous involvement of the participants over time (Marcos-Cuevas *et al.*, 2016).

The academic literature presents the concept of customer-perceived value from several dimensions of benefits and sacrifices. Mainly because of the different perspectives about the topic (value-in-exchange, relationship value, and value-in-use), as well as the relationship between desired perceived value and changes in internal or external conditions over time (Beverland & Lockshin, 2003; Flint *et al.*, 2002; Lapierre, 2000). What is in common between these approaches is the economic, strategic, and behavioral orientations (Lapierre, 2000; Walter *et al.*, 2001; Wilson & Jantrania, 1994). The economic orientation implies transactions of products/services that meet quality, performance, and delivery requirements at the lowest cost in terms of design, assembly, and time-to-market. The strategic orientation aims mutual goals, organizational skills enhancement, knowledge sharing, access to resources, and innovation. Finally, behavioral orientation refers to types of conduct that limit opportunistic behavior or encourage cooperation in buyer-supplier relationships. While the benefits of economic orientation are limited to a buyer-supplier dyad, the other two orientations can transfer their gains to other relationships (Table 6).

Table 6: Three orientations of customer-perceived value

Orientations	Benefits dimensions	Sacrifices dimensions
Economic ⁽¹⁾	Asset maximization Cost reduction: materials savings, inventory costs, and inventory slack Delivery performance: on-time delivery, flexibility, accuracy Price reductions Product/service quality: performance, reliability, and consistency Product related components: range of products (breadth), consistency of products, ease of use Reduced operating costs Responsiveness Service related components: technical support, quick response and reliability Technical competence Time-to-market: design tasks, prototype development, product testing and validation.	Acquisition costs Operations costs Management, engineering and administrative time Process costs: inventory management, order-handling, incoming inspections, and manufacturing.
Strategic ⁽²⁾	Access to information, markets, and technology Development of new products Exchange of complementary resources Existing products improvement Fixed capital reduction Improvement or development of organizational competencies Partner know-how Process improvement Reduced financial risk Reputation gain.	Effort Energy Time.
Behavioral ⁽³⁾	Cooperation Dialogue Loyalty Problem solving culture Safety Shared values Security Transparency Trust.	Conflict Opportunistic behavior Psychological costs: fear that problems will occur.

Sources: **(1)** Anderson and Narus (1995; 1998) | Anderson *et al.*, (2000) | Blois (2004) | Eggert and Ulaga (2002) | Eggert, Ulaga, and Schultz (2006) | Flint *et al.*, (1997) | Flint, Woodruff, and Gardial (2002) | Grönroos (1997) | Hogan (2001) | Kumar and Reinartz (2016) | Lapierre (2000) | Lefaix-Durand (2010) | Macdonald *et al.* (2011) | Sharma *et al.* (2001) | Ulaga (2003) | Ulaga and Chacour (2001) | Walter *et al.* (2001) | Wilson and Jantrania (1994). **(2)** Anderson, Hakansson, and Johanson (1994) | Flint *et al.*, 2002 | Grönroos (1997) | Hogan (2001) | Hunt and Morgan (1994) | Kumar and Reinartz (2016) | Lapierre (2000) | Macdonald *et al.*, (2011) | Macdonald *et al.*, (2016) | Marcos-Cuevas *et al.*, (2016) | Pera *et al.*, (2016) | Sharma and Sheth (1997) | Ulaga (2003) | Ulaga and Chacour (2001) | Ulaga and Eggert (2005) | Walter *et al.*, (2001) | Wilson and Jantrania (1994). **(3)** Flint *et al.* (1997) | Grönroos (1997) | Hunt and Morgan (1994) | Lapierre (2000) | Prahalad and Ramaswamy (2004) | Ravald and Grönroos (1996) | Wilson and Jantrania (1994).

In order to answer the research question, the study was developed in two phases. Initially, was performed a secondary data to point out the critical features of eco-platforms and suggest a definition regarding this kind of BPs. In phase two, the previous results were used to identify and develop three case studies of Brazilian platforms: Two eco-platforms and a third that aims exclusively for financial gains. The comparison between two different types of platforms (BP and eco-BPs) contributes to improving the internal validation of the research as a form of predict similar or contrasting results (Maxwell, 2013; Yin, 2018).

3 METHODOLOGY

The relevance of the perspective of platform owners and business users to understand the conditions for business platforms to contribute to environmental sustainability ratifies the adoption of the interpretative paradigm. The assumption underlying this philosophical positioning is the personal understanding of the world through the creation of meanings based on day-to-day experiences (Gephart, 1999). The social world is part of an emerging process, developed by individuals as a consequence of their apprehension of reality (Burrell & Morgan, 1979). The interpretive paradigm has three characteristics (Cunliff, 2010; Guba & Lincoln, 1994; Lincoln, Lynham, & Guba, 2011). Firstly, it is relativistic; once the interpretation of the world is socially constructed. Secondly, it is subjective since the research is built on the interaction between the researcher and the object of investigation. Thirdly, it is hermeneutic and dialectical, because the individuals' point of view can be refined through the relationship between researcher and interviewees. The current research is based on qualitative assumptions to understand processes by which events and actions arise, allowing a profound comprehension of individual behavior peculiarities (Denzin & Lincoln, 2011; Maxwell, 2013).

Creswell (2010) suggests five research strategies in qualitative studies: narrative *or* phenomenology for studying individuals; case study *or* grounded theory for exploring contemporary processes, activities, and events; and ethnography for understanding the broad, culture sharing behavior of individuals or groups. The present study adopts the case study in order to bring contextualized results to scientific knowledge and to understand the circumstances around business platform ecosystems (Gibbert, Ruigrok, & Wicki, 2008; Stake, 1994). Additionally, customer-perceived value in B2B markets, used as one of the theoretical backgrounds (see section 2.4), is subjective since it depends on the business context and the relationship stage. In other words, value is not an absolute concept but constructed continuously over time.

3.1 PHASE ONE: DEFINITION OF ENVIRONMENT-ORIENTED BUSINESS PLATFORMS

Two questions guided the first phase of the research: (i) What are the examples of eco-platforms? (ii) What kind of environmental impacts do these eco-platforms address? Rather than utilizing traditional business model archetypes (Bocken *et al.*, 2014), that have significant

differences compared to business platforms (see the topic 2.2.2), it was used a database to identify and categorize BPs according to the environmental impacts addressed by them. The process was carried out in four steps (Table 7).

Table 7: The validation process of eco-platforms

Questions	Steps	Findings
What are the examples of eco-platforms?	Step 1. The choice of database.	CrunchBase database.
	Step 2. The selection of companies.	1,237 companies.
	Step 3. The analysis of companies' description.	Sixteen platforms classified as eco-platforms.
What kind of environmental impacts do these eco-platforms address?	Step 4. The categorization proposals.	Five proposed categories based on how eco-platforms address environmental impacts.

Source: The author.

Step 1: The choice of database.

Since BPs are essentially technology-based business models, it was necessary a database that addresses this condition. *TechCrunch*, the leading technology media with around 12 million unique website visits, and 37 million-page views per month (TechCrunch, 2017), owns the *Crunchbase*, an open database about industry trends, from start-ups to established companies. Crunchbase differs from other databases because of the Crunchbase Rank (Cb Rank), which shows the businesses relevance by “[...] taking into account many different variables, ranging from total funding amount, the number of connections [...] the amount of community engagement, funding events, news articles, acquisitions, and more.” (TechCrunch, 2018).

Step 2: The selection of companies.

One thousand companies were selected from four category groups available in Crunchbase and linked to the research theme: Apps, Mobile, Platforms, and Sustainability. The choice of the 250 Most Relevant Companies per category was created using the Crunchbase Ranking from February 2018. The first three categories (Apps, Mobile, and Platforms) were concatenated with the Sustainability group and, then, three more filters were applied: Apps & Sustainability, Mobile & Sustainability, and Platforms & Sustainability. This quest resulted in a further 237 results. Hence, 1,237 companies were selected for the subsequent step.

Step 3: The analysis of companies' description.

In the third step, it was checked the description of each company in the Crunchbase database in order to identify whether it was an example of a business platform, based on the highlighted features in Table 4. If so, websites and videos were then analyzed to verify whether the platforms had the purpose to reduce environmental impacts and also possessed some of the elements mentioned by the literature of sustainable business model (sustainable value, value network, and specific templates of stakeholder reports), product-service system (services over products), and corporate shared value (alignment of business strategy with societal demands). As a result, a total of sixteen platforms were characterized as eco-platforms.

Step 4: The categorization proposals.

In Step 4, the sixteen eco-platforms were classified in five categories, according to the way they address environmental problems (Table 8): (1) *Asset optimization* - encourages users to share idle assets; (2) *Waste reduction* - reduction of food waste and improvement in electronics recycling; (3) *Clean energy* - make solar energy solution cheaper to users; (4) *Responsible investment* - foster investments in companies that have environmental and/or social concerns as their core values; and (5) *Engagement* - increased people commitment in using environmentally modes of transportation. Details about each platform can be find in the appendix (see topic 8.1).

Table 8: Categories of eco-platforms

Categories	Environmental benefits	Examples of eco-platforms
Asset optimization	<ul style="list-style-type: none"> • Less use of natural resources; • Decreased traffic problem of urban congestion; • Reduction of CO2 emissions. 	JustPark Scoop Viy.
Waste reduction	<ul style="list-style-type: none"> • Reduction of food waste; • Reduction of the environmental impact of waste. 	ExchangeMyPhone Full Harvest Greenwire HYL A Mobile iReTron, Inc. MaxBack Rubicon Global Tiptapp YouRenew.
Clean energy	<ul style="list-style-type: none"> • Cheaper solar energy. 	EnergySage.
Responsible investments	<ul style="list-style-type: none"> • Foster investments in companies that have environmental and/or social concerns as their core values. 	Aspiration OpenInvest.
Engagement	<ul style="list-style-type: none"> • Increased people commitment in using environmentally modes of transportation. 	My Open Road Corp.

Source: The author.

Despite the economic role, the primary goal of eco-platforms is to address environmental impacts within the industry, not as an indirect effect of their operations, but as a *purpose*, since they combine financial returns to users and platform owners while generating environmental benefits. Based on this, it is proposed the following definition of eco-platforms: “*Business platforms designed to address environmental impacts and generate financial gains for users through environmentally sustainable operations.*” This concept was the starting point for the next phase: the identification and development of case studies.

3.2 PHASE TWO: IDENTIFICATION AND DEVELOPMENT OF CASE STUDIES

In order to address the research question, a categorization scheme was proposed in Phase 1 to identify potential case studies. Then, an internet search was performed within the Brazilian context to choose cases of waste reduction – the most relevant category in numbers (Table 8). During the research, was found a website that identifies technological solutions as a way to reduce waste in the food chain (Foodtech Movement - www.foodtechmovement.com.br). Four companies were chosen to carry out exploratory interviews since they had characteristics of eco-BPs. Two early-stage startups were excluded, and two Brazilian for-profit B2B eco-platforms were selected (coded as P.1 and P.2). Inefficiencies in food supply chains (FSC) distribution are responsible for 200 million tons of food loss worldwide (FAO, 2013). Preventing this problem involves food redistribution (donations of extra food to food banks, soup kitchens, and shelters), and the creation of partnerships between government, business, and civil society (FAO, 2019; Lipinski *et al.*, 2013). In such a scenario, digital platforms can connect, inform, protect, mobilize, integrate, and measure all the actions within the food supply chain (Ciulli *et al.*, 2019). From October 2018 until June 2019, P.1 and P.2 traded or donated 225 tons of food.

A third platform that aims financial gains solely (from now on called P.3) was chosen to improve the internal validation of the research. The comparison between two different types of platforms (BP and eco-BPs) contributes to improving the internal validation of the research as a form of predict similar or contrasting results (Maxwell, 2013; Yin, 2018). P.3 was selected due to the number of business users who joined the technology (in June 2019, the platform had 560 registered companies, serving fourteen industrial segments) as well as the innovation of

their business model, presented at an event organized by a renowned Brazilian university on the subject of servitization.

The following quotes point out the differences between the *purpose* of the three case studies. While P.1 and P.2 show explicit environmental goals in reducing food waste, P.3 focuses on economic objectives strictly.

“Food wastage exists at several stages of the supply chain. The main goal of the platform is to reduce this loss.” [Platform owner, P.1].

“The platform is supported by the premise that everything that exists has a purpose and has to be honored. Food has a purpose and has to be used to the highest level.” [Platform owner, P.2].

“The platform-driven supply chain digitization brings more efficiency and automation to the purchasing processes of machine parts.” [Platform owner, P.3].

3.3 THE DESCRIPTIONS OF THE CASE STUDIES

3.3.1 The operation of platforms P.1 and P.2

By facilitating and simplifying the transaction and donation processes of food close to the expiration date, but fit for human consumption, the two eco-platforms prevent the disposal of aliments in landfills or from being incinerated. Both eco-BPs have the same business model, i.e., connect two distinct groups of users: suppliers (food industries and distributors) – who sell these types of products – and buyers (industrial kitchens, restaurants, and retailers). In addition to the environmental benefits, this business model generates financial gains for both groups of users. Suppliers eliminate the incineration costs of the products, minimize the search cost for buyers, and create additional revenue from sales. Buyers reduce the acquisition costs since they pay lower prices compared to conventional products. P.1 and P.2 have three potential forms of monetization: (i) percentage fee per transaction; (ii) announcements on the platform; and (iii) subscription plans to buyers who desire access to first-hand product offerings.

3.3.2 The operation of platform P.3

Platform P.3 connects the producers of industrial parts (known as suppliers) with large buyers and charges a fee for each transaction made. After the supplier’s registration on the platform, P.3 undergoes a homologation and certification process before officially inserting this

user group into the system in order to guarantee a minimum level of service quality. From the perspective of the buyers, joining the platform is more effortless: they only need to use the technology to order specific parts according to technical drawing. The platform team evaluates the quality of the information submitted and identifies which supplier has the highest technical capacity to match the request. Based on this analysis, P.3 contacts the nearest and more specialized supplier for the service, which is responsible for performs the budget and calculates the freight. According to the platform owner, suppliers utilize the platform to expand the revenues from potential new clients, and to reduce the searching costs for them. Buyers, in turn, seek cost reduction with supplier management, since the platform centralizes contact and a more efficient purchase process.

3.4 DATA COLLECTION AND RESEARCH INSTRUMENTS

The use of data from different sources endorses the arguments of the study and subsequent findings than would be provided by a single source. Data were collected from primary sources via twenty-three in-depth interviews with platform owners, active users, inactive users (who used the platform at least once), and potential users (companies interested in using the technology) (see the interview scripts in appendices 8.2 and 8.3). Also, it was invested twenty-one hours in observing meetings between platform owners and users. Altogether the researcher spent forty hours of primary data collection (Table 9) until reaching the theoretical saturation – when the data no longer showed any new relevant information (Strauss & Corbin, 2008). NVivo software was used to record field notes, memos, and in-depth interview transcripts.

Table 9: The three-step process of data collection

Step	Method	Number of interviews or non-participant observation	Total time spent (hours)
Details about each case study.	In-depth interviews with platform owners (P1; P.2; P.3).	10	13
Understanding the perspective of the users about the platforms.	In-depth interviews with active users, inactive users, and potential users.	13	6

Step	Method	Number of interviews or non-participant observation	Total time spent (hours)
Comprehend the elements of relationships within platforms ecosystems.	Non-participant observation during formal meetings or events.	7	21
		30	40

Source: The author.

3.5 DATA ANALYSIS

The analysis strategy was based on the “iterative nature of explanation building” method (Yin, 2018). This procedure is partially deductive (based on pre-coding from literature review) and partially inductive (supported by the field data). Initially, a within-case study analysis enabled the identification of patterns of each platform, which, in turn, supported generalizations across cases (Eisenhardt, 1989; Yin, 2018). The focus was on understanding how each user-perceived value within the platforms, separately. Then, the findings were grouped according to types of users (active, inactive, and potential) and groups of users (buyers and suppliers). Further, it was performed a cross-case analysis to compare the characteristics of BPs (from the literature review and P.3) with the eco-platforms (data from P.1 and P.2), resulting in the proposal of categories, subcategories, and codes. These analysis steps were in line with the following research objectives: (1) examine how users perceive value in specific cases of BPs and eco-platforms; and (2) understand the relationship between user-perceived value and network effects in BPs and eco-platforms.

The coding was grounded in a recursive process between first and second cycle methods (Saldaña, 2016). Due to a large amount of data, was applied an initial code and aggregation process into generic themes, called *structural coding*, to mature the discussions topics. However, as presented in the theoretical background, previous discussions about business platforms, network effects, and customer-perceived value already provided empirical elements, such as the concepts of market friction reduction and the trade-off between benefits and sacrifices in CPV. Hence, some codes and categories were taken from the literature and validated in the field (*provisional coding*). At some point, it was necessary to abstract data from interviews and non-participant observations to propose and improve concepts, such as the

category “reduction of environmental impacts” and the benefits and sacrifices from economic and strategic orientations (*concept coding*). Finally, it was imperative to reorganize and reanalyze the results to improve the coding in search of patterns, as in the case of the relationship between user-perceived value and network effects (*pattern coding*). Table 10 presents the dictionary of codes.

Table 10: Dictionary of codes

Discussion topics	Categories	Subcategories	Codes	Definitions
Business users expect that eco-platforms reduce the market friction of their transactions and the inefficiencies at the industry and supplier levels. (<i>Structural coding</i>)	Reduction of market friction (<i>provisional coding</i>)	Aggregation	AGGR	Approximation of supply and demand.
		Facilitation	FACI	Cost reduction of information transfer.
		Matching	MATC	Decrease in the buyer's and suppliers' search costs.
		Trust	TRUS	Protection against opportunistic behavior.
	Reduction of environmental impacts (<i>concept coding</i>)	Sector inefficiency	SECI	Improvement in product distribution and marketability.
		Suppliers inefficiency	SUPI	Assisting users in dealing with company procedural issues.

Business users of eco-platforms perceive benefits and sacrifices from economic and strategic orientations. <i>(Structural coding)</i>	Benefits from economic orientation <i>(provisional and concept coding)</i>	Transparency	TRAN	Real-time data reduces the asymmetry of transaction information and improves users' decision making.
		Responsiveness	RESP	Problem-solving skills.
		Variety of offers	VARI	The platforms' ability to aggregate multiple suppliers increases the expectations of buyers about the mix of the product offered.
		Product and service quality	QUAL	Quality assurance and on-time delivery.
		Increase in suppliers' revenue	REVE	Suppliers expect to generate additional revenue due to access to a vast network of buyers.
		Reduction of direct product costs	CDIR	Price reduction compared to traditional transaction model.
		Reduction of acquisition costs	CACQ	Less communication and negotiation effort due to routinized and standardized processes.
	Sacrifices from economic orientation <i>(provisional and concept coding)</i>	Cost per transaction	CTRA	Fee applied to each transaction.
		Lack of matches between users	LMAT	The platform's inability to perform the role of matchmaker.
	Benefits from strategic orientation <i>(provisional and concept coding)</i>	Resource integration	RESO	Suppliers adhere to platforms to accelerate their innovation process.
		Creation or enhancement of the business ecosystem	BECO	Partnership for the development of the business ecosystem.
		Process improvement	PROC	Implementation of more efficient solutions.
		Development of new products	PROD	Creation of new products through partnerships between platform owners and suppliers.
	Sacrifices from strategic orientation <i>(provisional and concept coding)</i>	Time effort	TIME	Time spent on developing the partnership that competes with suppliers' core projects.

Positive network effects are the result of users perceiving more benefits than sacrifices. (<i>Structural coding</i>)	Recurring platform usage (<i>pattern coding</i>)	-	RECU	When both buyers and suppliers perceive value constantly in platform usage (positive network effect).
	Suppliers' adherence (<i>pattern coding</i>)	-	SUPA	When suppliers perceive value in using the platform as opposed to buyers (negative network effect).
	Wait-and-see attitude (<i>pattern coding</i>)	-	WAIT	When both buyers and suppliers do not perceive value on the platform, or they consider that sacrifices outweigh the benefits offered (negative network effect).
	Buyers' adherence (<i>pattern coding</i>)	-	BUYA	When buyers perceive value in using the platform as opposed to suppliers (negative network effect)

Source: The author.

The next section presents the research results, beginning with the summary of the findings and, followed by the arguments regarding each research proposition.

4 RESULTS

The results were divided into three topics in order to answer the following research question “How do business users perceive value in the presence of network effects on environment-oriented business platforms?” (Figure 3). First, it was necessary to compare the expectations of eco-platforms and BPs users (topic 4.1), to understand the context of benefits and sacrifices perceived by both buyers and suppliers (topic 4.2), and the consequence for BPs and eco-BPs (topic 4.3).

Figure 3: Synthesis of results

Source: The author.

4.1 THE EXPECTATIONS OF BUSINESS USERS REGARDING BPS AND ECO-BPS

Economic advantages are the primary motivation of businesses users to join both BPs and eco-BPs, as an outcome of the reduction of market friction. However, suppliers also expect that eco-platforms improve system efficiency. The current topic presents the literature of Transaction Cost Economics (TCE) and Electronic Market Intermediation as the main arguments of market friction reduction (item 4.1.1). Also, it shows the unique feature of eco-

platforms: the reduction of inefficiencies at the industry and supplier levels as sources of negative environmental impacts (item 4.1.2).

4.1.1 Reduction of market friction

According to Transaction Cost Economics (TCE), companies exist when they are more efficient at organizing and negotiating production than the open market; that is, whenever *ex-ante* costs (negotiating and writing) and *ex-post* costs (execution and policing) do not outperform the gains (Coase 1937; Ghoshal & Moran 1996). From this perspective, the efficiency in negotiating, called economizing strategy, explains the difference in performance between two organizations, which can choose different governance structures based on the intensity and administrative controls (Williamson, 1991; 1993). Two assumptions support this statement: the inability of organizations to cover every possible scenario of a transaction (bounded rationality), and the possibility of an agent seeking individual advantages from information asymmetry (risk of opportunism) (Williamson, 1979; 1981). Although the adoption of governance structures can deal with both limitations to some extent, the wrong choice can lead to additional safeguard costs, resulting in less competitive firms (Hill, 1990).

The alternative to the TCE dilemma (internalization versus open market) lies in the four functions of intermediaries, which have been found in the role of the Platforms, P.1, P.2, and P.3: (1) *aggregation* (AGGR code): approximation of supply and demand; (2) *trust* (TRUS): protection against opportunistic behavior; (3) *facilitation* (FACI): reduction of the information transfer cost; and (4) *matching* (MATC): decrease the search costs of buyers and suppliers (Bailey & Bakos, 1997). Initially, the literature suggested that the emergence of the internet would eliminate the intermediaries, once buyers and suppliers would transact directly with each other (Chircu & Kauffman, 2000; Nissen, 2000; Sen & King, 2003). On the contrary, the World Wide Web has facilitated the creation of electronic market intermediaries that overcome market fragmentation through lower transaction costs, transparent prices, and timely information (Le, 2002; Le, Rao, & Truong, 2004; Rao, Truong, Senecal, & Le, 2007). Whether traditional or electronic, intermediaries must turn the transactions cheaper and faster for buyers and suppliers (Nissen, 2000).

As a new type of electronic market intermediaries, platforms also seek to reduce market friction via aggregation, trust, facilitation, and matching. When BPs become more efficient than traditional intermediaries, it may trigger the disintermediation process - the replacement of conventional middlemen by new and improved ways for transaction support (Chirchu & Kauffman, 2000). Indeed, this effect emerged from the field, during the discussions about the restructuring of fruit and vegetable supply chain with the participation of Platform P.2. For example, four actors participate in a traditional supply chain arrangement discussed during the fieldwork: small producers, cooperative, intermediary, and a buyer (Figure 4). The small producers were settled in the city of Mogi das Cruzes, far from the most significant consumer market (city of São Paulo). The cooperative was responsible for consolidating the production for sale. CEAGESP, the largest fruit and vegetable supply center in Latin America, represented the intermediary role. The buyer was a non-governmental organization that offers 2,400 meals to its internal audience daily.

Figure 4: Traditional supply chain arrangement
Source: The author.

The traditional disposal presented some inefficiencies related to the lack of transaction transparency and financial conditions that often favor the intermediary. From the perspective of small producers, economic insecurity (the price of the products was set during the delivery of products), lack of access to the consumer market, and high logistics costs make the operation unattractive. For instance, lettuce becomes profitable to small farmers only above R\$ 0.34 a pack, but occasionally the intermediary paid R\$ 0.24. According to the cooperative leader, under these circumstances, it is cheaper to burn the food than sell it. On the buyer's side, besides the high price paid, procedural issues force the centralization of the purchase process in large intermediaries, since small producers usually do not have some legal documents.

The situation stimulated discussions between the cooperative, the buyer, and Platform P.2 to replace CEAGESP as the intermediary. While the traditional pricing arrangement was based on information asymmetry, the transactions mediated through the platform became more transparent and resulted in financial benefits for both parties. Direct contact between suppliers

and the buyer within the platform made it possible to define price ranges in a specific period (maximum and minimum) for each product. If prices increase, the buyer paid the maximum amount previously set. If prices decrease, the food was purchased with the minimum amount. In addition to the element of trust, the participation of platforms as intermediaries in other supply chains can facilitate supply and demand aggregation, reduce the cost of exchange information, and the search for new buyers and suppliers.

The platform supply chain was also more efficient than the traditional one. The buyer received the products seven days after the harvest when the purchase occurred via CEAGESP. The platform, in turn, reduced this period to four hours. Besides the need for a distribution center to consolidate the products, CEAGESP worked on the asymmetry of information about price and quantities. P.2, in turn, enabled transparent and recurring transactions supported by direct buyer-supplier communication (Figure 5).

Figure 5: Platform supply chain
Source: The author.

Since platforms operate in two-sided markets, they must reduce market friction on both user groups at the same time. Otherwise, they will negatively affect the quality of interaction. For example, P.3 is an efficient and cost-effective solution for buyers. However, in the opinion of suppliers, due to the small number of transactions occurring within the platform, it is more expensive to transact through the platform than via traditional means. The time spent in trying to meet technical requirements and pricing renders the process more expensive for suppliers. When the transaction success rate is low, suppliers question the platform's effectiveness as a matchmaker. Such a situation may explain the small number of active users by P.3 and the risk of a future failure.

While the reduction of market friction (via aggregation, facilitation, matching, and trust) is a common feature of BPs and eco-BPs, the next topic presents an exclusive characteristic of

eco-platforms, related to the reduction of inefficiencies in the level of supplier and the industry as causes of the environmental impacts.

4.1.2 Reduction of inefficiencies at the industry and supplier levels

Food losses and waste (FLW) generate environmental, social, and economic impacts. According to the Food and Agriculture Organization of the United Nations (FAO), the food wastage occupies 28% of the world's agricultural land area, which would make it the second-largest country in the world in terms of territorial extension (FAO, 2013). If included in a ranking of CO₂-emitting countries, FLW reach the third place after China and the United States, and first place in the total blue water footprint for the consumption of agricultural products (FAO, 2013). In social terms, FLW affects people's food security and the reduction of nutritional value due to the increase in food prices (FAO, 2014; 2018a).

Food supply chains have inefficiency problems in each of the five phases (SECI code): production, handling and storage, processing and packaging, distribution, and consumption (FAO, 2018b; Lipinski *et al.*, 2013). Such problems are too complex to be solved individually by a single organization, so platforms tend to act in selected phases of the chain. The two cases of eco-platforms (P.1 and P.2) focus in the last two phases, preventing food still fit for human consumption from being landfilled or incinerated. According to Platform Owner, P.2: *"Today, we experience a huge inefficiency in food distribution. It is disrespectful! The platform comes up to promote ways that make this process easier for companies"*.

P.1 and P.2 also operate at the user-supplier level in addition to decreasing distribution and market inefficiencies in food supply chains (SUPI code). Suppliers consider products close to the expiration date as financial loss in advance, as stated by Supplier, P.2: *"It is unacceptable to throw away the product. We do not produce food to donate."* Hence, the choice of eco-BPs is mainly based on economic criteria, either to generate additional revenue from selling products close to the expiration date or by reducing the waste collection costs, as mentioned by another Supplier P.2:

"When I started working for this company, I realized that we made food donations without criteria. We tried to professionalize this issue and soon came some goals. In a board discussion, someone commented on the high cost of garbage collection: 'We can't spend so much money on that. There has to be a way to reduce it.' That's when we started to work with the platform." - [Supplier, P.2].

In general, three sources of inefficiency are responsible for food waste by suppliers: (1) non-compliance with aesthetic standards; (2) absence of internal policies for donations or sale of products close to the expiry date, and; (3) difficulty to sell such products through the traditional market, e.g., sales representatives, direct sales or distributors (Table 11).

Table 11: Sources of inefficiencies by suppliers

Sources of inefficiency	Illustrative quotations
Non-compliance with aesthetic standards	<i>“A large chain of Arabic restaurants came to us searching for a solution for the esfihas. If they do not sell this product within a few hours, they have to discard it just because of the company quality standard, but the food is still suitable for consumption.” [Platform owner, P.1]</i>
Absence of internal loss policies	<i>“If you asked me: Can you control what you donated, how much you donated, how much was wasted? I don’t have this information yet.” [Supplier, P.2]</i> <i>“Instead of reducing the price, companies keep it until the product expires.” [Supplier, P.1]</i> <i>“Food safety is a severe thing here. When a product reaches 60 days of storage, we don’t send it to the supermarket. We send these products to social institutions, or they are discarded. If someone consumes an expired product and gets sick, it creates a big problem for us.” [Supplier, P.2]</i>
Difficulty to sell such products	<i>“We work with the platform to sell remaining products from contracts that no longer exist or don’t use a particular product anymore.” [Supplier, P.1]</i>

Sources: Quotes from the interviews.

While traditional BPs only aim at reducing market friction, eco-platforms also seek to reduce environmental impacts caused by inefficiencies at the industry and supplier levels. Based on that, it is expected some differences in the value perception by the users. While the mitigation of market friction is associated with the economic orientation of user-perceived value, the reduction of inefficiencies (responsible for negative environmental impacts) relates to the perception of benefits and sacrifices of strategic orientation.

4.2 BENEFITS AND SACRIFICES PERCEIVED BY BUSINESS USERS

Companies perform transactional and relational actions based on their offerings and market characteristics (Grönroos, 1997; Lapierre, 2000; Walter, Ritter, & Gemünden, 2001; Wilson & Jantrania, 1994). While the benefits and sacrifices from the economic orientation are

circumscribed to a specific buyer-supplier dyad, more precisely to the reduction of market friction of each transaction within platforms, environmental impacts caused by inefficiencies require new intra and interinstitutional arrangements. In this respect, customer-perceived value (CPV) – in the logic of business platforms, referred to as user-perceived value (UPV) has to caveats: it is enough that platform users perceive value only from economic orientation; however users of eco-platforms, also pursue strategic benefits.

As an emerging business model, potential users need to trust in the role of intermediation of the platforms even before perceived any benefits from the technology utilization. Companies in B2B markets prefer to know with whom they are negotiating, rather than trading with strangers, as stated by Supplier, P.3: *“I’d rather attend a customer I know than a company I don’t know. I will only attend a buyer from the platform if I have no other work to do.”* Additionally, potential users expect some relevance of the platforms’ network regarding the participation of reputable companies, as mentioned by Platform Owner P.1: *“Suppliers want to know if you are already working with large buyers. They want to know what you are going to do with their product.”*

Since potential users decide to join to the platform, they seek for economic orientation benefits, related to the ability of BPs and eco-BPs to effectively and cheaply intermediate transactions between users. According to the results from the field, there are seven dimensions of perceived benefits: (i) transparency (TRAN code); (ii) responsiveness (RESP); (iii) variety of offers (VARI); (iv) product and service quality (QUAL); (v) increase in suppliers’ revenue (REVE); (vi) reduction of direct product costs (CDIR); and (vii) reduction of acquisition costs (CACQ). Transparency reduces information asymmetry between buyers and suppliers, as both groups can access real-time information about transactions. Users also demand quick reactions to problem-solving compared to the traditional market (responsiveness). The potential to match many users increases the expectation of the mix of product/service offerings, transaction quality assurance, delivery time, and additional revenues for suppliers. Finally, the reduction of market friction declines direct product costs, as well as the communication/negotiation effort as a consequence of routinized and standardized processes.

However, there are also two economic sacrifices in UPV, encompassed the direct costs of transactions (CTRA) and platform difficulty in matching two different user groups (LMAT). Monetization per transaction is similar to the direct cost sacrifices of traditional business

models. Platforms use this practice to increase the adhesion of new users. When users perceive a low success rate in matching other users within the platform, they start to question the effectiveness of technology in mediating transactions: *“The platform sends a lot of bid possibilities, but we close just a few deals. We will stop using it because we are wasting time.”* (Supplier of P.3). Table 12 summarizes the benefits and sacrifices dimensions of economic orientation.

Table 12: The dimensions of economic orientation in UPV (BPs and eco-BPs)

Dimensions	Definition	Illustrative quotations
Transparency (TRAN)	Real-time data reduces the asymmetry of transaction information and improves users' decision making.	<i>“I asked the manager about the platform. He felt secure because he knew what was donating and their destination.”</i> [Supplier, P.2]
Responsiveness (RESP)	Problem-solving skills.	<i>“Buying the product was not a bad experience, because I complained, and they solved the problem. So that's what matters to me: identifying the error and correcting it.”</i> [Buyer, P.1]
Variety of offers (VARI)	The platforms' ability to aggregate multiple suppliers increases the expectations of buyers about the mix of the product offered.	<i>“I saw that there's a lot of cookies and drinks, it's a line we hardly work on.”</i> [Buyer, P.1]
Product and service quality (QUAL)	Quality assurance and on-time delivery.	<i>“In the end, we deliver the product. The supplier knows that making a poor-quality work will affect the evaluation of the quality assurance that will rank him.”</i> [Platform owner, P.3]
Increase in suppliers' revenue (REVE)	Suppliers expect to generate additional revenue due to access to a vast network of buyers.	<i>“What the platform needs to do is publicize and work with buyers.”</i> [Supplier, P.1]
Reduction of direct product costs (CDIR)	Price reduction compared to traditional transaction model.	<i>“Usually, products close to the expiration date are cheaper, and this is critical for the business.”</i> [Buyer, P.1]
Reduction of acquisition costs (CACQ)	Less communication and negotiation effort due to routinized and standardized processes.	<i>“There is global pressure for companies to reduce the number of suppliers because it is expensive to manage. We give access to all suppliers through a single channel. So, we reduce the buyers' cost by locating the specialist.”</i> [Platform owner, P.3]

Dimensions	Definition	Illustrative quotations
Cost per transaction (CTRA)	Fee applied to each transaction.	<i>“Let’s assume that we buy for R\$ 1.00, and we sell for R\$ 1.10. This is our form of monetization: a fee per each transaction.”</i> [Platform owner, P.3]
Lack of matches between users (LMAT)	The platform’s inability to perform the role of matchmaker.	<i>“I know that we will make the budget on the platform, but we won’t get the work.”</i> [Supplier, P.3]

Source: Quotes from the interviews.

Long-term partnerships between platform owners and business users are an exclusive feature of eco-platforms because technology alone is not enough to address industry and supplier inefficiencies. These partnerships foster the development of capabilities - that can be applied to other relationships - and encourage synergies among members (Anderson, Håkansson, & Johanson, 1994). Partners proactively promote learning strategies to increase the likelihood of sharing relevant knowledge through open dialogue, trust, and more egalitarian forms of participation (Arya & Salk, 2006; Van Wijk, Jansen, & Markorie, 2008).

“Trigger events” such as the entry of new competitors or product launches, can change CPV (Flint *et al.*, 1997). When suppliers acknowledge the need to develop new practices to reduce food waste, knowledge exchange occurs through user participation and transparent communication, since the company does not have enough internal resources to solve the problem, as mentioned by Supplier P.2: *“We have a lot of information exchange. And these collateral gains came from these conversations”*, and; Supplier, P.1: *“The key is to create synergy between the platform and the company.”*

The four benefits from strategic orientation have some level of transferability since advantages can be applied to other relationships, indicating the interactions required to develop: resource integration (RESO code), creation or enhancement of the business ecosystem (BECO), process improvement (PROC), and development of new products (PROD). Eco-platforms accelerate the innovation processes, as illustrated by an agribusiness company that used P.1 to solve its waste problem (resource integration). P.2 connected NGOs, public authorities, and private companies to address sale and distribution solutions to products close to the expiration date (creation or enhancement of the business ecosystem). The same platform helped a supermarket to improve the efficiency and traceability of its donations (process improvement).

Together, P.1 and one of its suppliers developed a new by-product from fish leftovers, which has a market value (development of new products). In terms of sacrifice, strategic orientation involves time effort (TIME) to deploy solutions that often compete with core projects of suppliers. Table 13 summarizes the benefits and sacrifices dimensions of strategic orientation.

Table 13: The dimensions of the strategic orientation in user-perceived value (eco-BPs)

Dimensions	Definition	Illustrative quotations
Resource integration (RESO)	Suppliers adhere to platforms to accelerate their innovation process.	<i>"We can't do it alone. We need partners." [Supplier, P.1]</i>
Creation or enhancement of the business ecosystem (BECO)	Partnership for the development of the business ecosystem.	<i>"We did a pilot with the platform. They came to study how we work, our values, and the organizations that receive our donations." [Supplier, P.2]</i>
Process improvement (PROC)	Implementation of more efficient solutions.	<i>"Employees had no problem using the platform. On the contrary, it facilitated the donation process because we knew the right time to make it and the beneficiary institutions." [Supplier, P.2]</i>
Development of new products (PROD)	Creation of new products through partnerships between platform owners and suppliers.	<i>"The supplier had a product without visibility. We managed to turn it into an interesting product with marketability. So, it's not just a platform that you put a product on. We try to position ourselves to generate more value for everyone." [Platform owner, P.1]</i>
Time effort (TIME)	Time spent on developing the partnership that competes with suppliers' core projects.	<i>"As a project coordinator, I could not work on the project because I was involved with another one. The platform visited our store several times without my presence and discussed a lot of things with the manager, but some subjects demanded board validations. Unfortunately, it was not possible to implement the platform solution at that time." [Supplier, P.2]</i>

Source: Quotes from the interviews.

While the economic orientation offers one-off benefits/sacrifices during each transaction, the strategic orientation presupposes a long-term relationship between platform owners and their users. In both aspects, benefits must outweigh the sacrifices to improve the quality of interactions within platforms (BPs and eco-BPs), which results in positive network effects, as suggested in the following topic.

4.3 CONSEQUENCES OF USER-PERCEIVED VALUE FOR BPS AND ECO-BPS

Customer-perceived value is improved by increasing benefits or reducing sacrifices (Eggert *et al.*, 2006; Flint *et al.*, 1997). This study advocates that the combination of UPV benefits and sacrifices influences the adherence and the quality of interactions between platform users (network effects). Therefore, it is expected that the number of users increases when benefits outweigh sacrifices and hence generate a positive network effect. In contrast, when sacrifices outweigh benefits for at least one of the user groups, it follows from platform abandonment (or wait-and-see attitude) and negative network effects. As represented in Figure 6, the relationship between UPV and network effects results in four types of user behavior on B2B platforms: (I) recurring platform usage; (II) adherence of suppliers; (III) wait-and-see attitude; and (IV) adherence of buyers.

Figure 6: User behavior on B2B platforms (BPs and eco-BPs)

Source: The author

Recurring platform usage results from a win-win relationship between buyers and suppliers, as the benefits outweigh the sacrifices for both user groups. In this scenario, the platform gains a competitive edge due to the positive network effect, which in turn influences the growth of the installed user-base, and the volume of transactions (Cennamo & Santalo,

2013; Lee *et al.*, 2016; Shapiro & Varian, 1999). This is also the best scenario from an environmental perspective, since the more the transactions occur within the platform, the better for the environment. The replacement of the traditional food chain intermediary (CEAGESP) for P.2 presented early illustrates the recurring platform usage behavior due to favorable situations to both buyer and supplier, as a result of more benefits than sacrifices.

The combination of high UPV for suppliers and low UPV for buyers results in adherence of suppliers and creates an unsustainable scenario for the platform. The indirect (cross-side) negative network effect occurs when the benefit of an increase in suppliers' revenue increases the sacrifice of direct product costs of buyers, which choose to purchase goods from other channels. According to Buyer, P.1: *"I'd registered on the platform and consulted the products. Prices were more expensive than my traditional supplier. It didn't interest me."* The continual benefits gained from high UPV to existing suppliers stimulate the adherence of new suppliers to the platform, resulting in direct (same side) negative network effects and a decrease of the existing suppliers' benefits: *"We are just another company on the platform. Sometimes my price is R\$ 1000, and the competitor's price is R\$ 980. The buyer always wants to pay the lowest price because he doesn't know our work. So, if you have a low price, you win."* (Supplier, P.3).

When neither buyer nor supplier perceived value from the use of the technology, they sign up to the platform to test the impact on their business (wait-and-see attitude) or abandon it because the traditional intermediation model remains more profitable, as stated by a Supplier of P.3: *"The problem is that we offer our service, and don't get jobs because the platform focuses on price."* The increase in the three sacrifice dimensions of the economic and strategic orientations (cost per transaction, lack of matches between users, and time effort), compared to the benefits perceived, contributes to this scenario.

Finally, certain combinations of benefits and sacrifices stimulate adherence of buyers to the platform - buyers get high UPV and suppliers low UPV. This scenario is not favorable for platforms because new suppliers will not be attracted to technology. Besides, there will be an excess of new buyers that will reduce the UPV of existing users (direct negative network effect). Based on the results of our research, three benefits stimulate the adherence of buyers: (i) variety of offers; (ii) product and service quality; and (iii) reduction of direct product costs.

The combination of the benefits and sacrifices dimensions on each user group result in, at least, one kind of user behavior, as shown in Table 14.

Table 14: Relationship between UPV dimensions and user behavior

Orientations	Dimensions	Suppliers	Buyers	User behavior
Economic (BPs and eco-platforms)	Transparency (TRAN)	benefits	benefits	Recurring platform usage
	Responsiveness (RESP)	benefits	benefits	Recurring platform usage
	Variety of offers (VARI)	sacrifices	benefits	Adherence of buyers
	Product and service quality (QUAL)	sacrifices	benefits	Adherence of buyers
	Increase in suppliers' revenue (REVE)	benefits	sacrifices	Adherence of suppliers
	Reduction of direct product costs (CDIR)	sacrifices	benefits	Adherence of buyers
	Reduction of acquisition costs (CACQ)	benefits	benefits	Recurring platform usage
	Cost per transaction (CTRA)	sacrifices	sacrifices	Wait-and-see attitude
	Lack of matches between users (LMAT)	sacrifices	sacrifices	Wait-and-see attitude
Strategic (eco-platforms)	Resource integration (RESO)	benefits	benefits	Recurring platform usage
	Creation or improvement of the business ecosystem (BECO)	benefits	benefits	Recurring platform usage
	Process improvement (PROC)	benefits	benefits	Recurring platform usage
	Development of new products (PROD)	benefits	benefits	Recurring platform usage
	Time effort (TIME)	sacrifices	sacrifices	Wait-and-see attitude

Source: The author.

5 CONCLUSION

Based on the five environmental benefits identified in the first phase of the research - asset optimization, waste reduction, clean energy, responsible investments, and engagement – it was possible to propose the concept of environment-oriented business platforms (eco-platforms or eco-BPs): Business platforms designed to address environmental impacts and generate financial gains for users through environmentally sustainable operations. The results were divided into three complementary topics: (i) the comparative of the users' expectations of eco-platforms and BPs; (ii) the benefits and sacrifices perceived by buyers and suppliers; and (iii) the consequence of user-perceived value for BPs and eco-BPs. Together, they provide elements to answer the research question: “How do business users perceive value in the presence of network effects on environment-oriented business platforms?”.

First, business users expect that eco-platforms reduce the market friction of their transactions and the inefficiencies at the industry and supplier levels. As digital intermediaries, platforms (BPs and eco-BPs) minimize market friction via (i) aggregation: approximation of supply and demand; (ii) trust: protection against opportunistic behavior; (iii) facilitation: reduction of the information transfer cost; and (iv) matching: decrease the search costs of buyers and suppliers. However, because platforms operate in two-sided markets, they must reduce market friction to both groups of users; otherwise, it will negatively affect the quality of interaction between them. In order to reduce environmental impacts in B2B markets, eco-platforms must also address inefficiencies in the industry (distribution process and product's marketability) and supplier level (non-compliance with aesthetic standards, absence of internal loss policies, and difficulty in selling products close to expiration date through the traditional channels).

Second, business users of eco-platforms perceive benefits and sacrifices from economic and strategic orientations. User-perceived value (UPV) within platforms (BPs and eco-BPs) is a combination of economic and strategic benefits and sacrifices. The benefits from the economic orientation relate to the platform's ability to enable intermediation effectively and cheaply for its users compared to the traditional middleman. The impact of the nine dimensions of economic orientation on users is limited to transactions goals: transparency, responsiveness, variety of offers, product and service quality, increase in suppliers' revenue, reduction of direct product costs, reduction of acquisition costs, cost per transaction, and lack of matches between

users. When comparing these results with previous CPV studies, platforms must be more efficient than traditional business models in reducing information asymmetry, decrease costs, and provide real-time information. As an emerging business model, potential users need to trust platform solutions even before they perceive any economic benefit resulting from technology utilization. Rather than transact with different users only once, companies in B2B markets seek to establish long-term partnerships, as proposed by the platforms we studied. Additionally, potential users expect the platform's network to be relevant, with renowned companies as active users. Nonetheless, strategic orientation is a unique feature of eco-platforms. Platform owners and suppliers share knowledge and resources aiming for the resolution of inefficiency problems and negative environmental impacts of the operation. Suppliers must perceive five strategic orientations of benefits and sacrifices: resource integration, creation or enhancement of the business ecosystem, process improvement, development of new products, and time effort. Buyers, in turn, do not differentiate perceived value in BPs and eco-platforms, as they mainly seek financial gains from the reduction of market friction.

Third, *positive network effects are the result of users perceiving more benefits than sacrifices*. The relationship of user-perceived value and network effects result in four different user behaviors: wait-and-see attitude, adherence of buyers, adherence of suppliers, and recurring platform usage. In a two-sided market, user-perceived value and network effects are self-reinforcing: the combination of benefits and sacrifices perceived by users impacts the quality of interactions within the platform (network effects) and, consequently, the user behavior. When buyers and suppliers perceived more sacrifices than benefits, they assume a wait-and-see attitude, resulting in a platform use postponement or abandonment. When the benefits of one user group lead to more sacrifice to another group, it can promote suppliers' adherence or buyers' adherence. In both cases, there is a cross-group negative network effect due to an increase in sacrifices, as well as a direct negative network effect from an excess of benefits perceived by the same-side user group. Finally, when UPV results in increased benefits from buyers and suppliers, both users assume the recurring platform usage behavior as a result of interaction quality improvement (positive network effect). In theory, this is the best scenario for reducing environmental impact, given the potential expansion of eco-platforms operations.

If eco-platforms generate financial returns and reduce environmental impacts, then why have they not yet fully spread in business markets? One explanation refers to strategic niche management – when organizations seek competitive advantage from the potential to innovate

an existing industry (Kemp, 1994; Kemp, Shot, & Hoogma, 1998). Companies protect innovations before releasing them to the market in search of broader and radical changes. For this reason, suppliers may use eco-platforms in a controlled environment to enable technological and procedural adjustments, testing, and learning to mitigate internal inefficiencies, as well as grasp opportunities to outpace competitors in addressing environmental impacts within the industry.

Another explanation for a relatively slim number of eco-BPs in the markets relates to the “innovator’s dilemma”: management practices that have made the company a leader in the industry are also responsible for hindering any disruptive technological innovation (McGrath, 2010; Christensen, 2013). Finally, government legislation limits the expansion of eco-platforms in B2B markets. In Brazil, although there are laws for end-of-life product disposal, there is no national food waste policy to oversee supply chain actors. This scenario encourages companies to incinerate and discard foods in landfills as less expensive options than investing in partnerships with eco-platforms for long-term environmental solutions.

Regarding relevance, by researching an emerging technology-based business model, the study contributes to the evolution of CPV literature. Findings show that UPV benefits and sacrifices have economic and strategic orientations, as in traditional business models, but they reveal additional features compared to CPV. The characteristics were detailed along with the research, as well as summarize some in the proposed framework, which can be used for the design of future studies. The research also provides insights for practitioners. The findings may inform platform owners on how to attract and retain buyers and suppliers by stimulating specific benefits and reducing sacrifices. Government policymakers may also benefit from the findings as insights on how to support the development and growth of eco-platforms in accordance with societal demands.

The study presents some limitations. The first one concerns the object of study: technology-based business models. Due to the emergent and dynamic attribute of such companies, new elements of user-perceived value may emerge in future research. The assumption that an eco-platform will always reduce environmental problems does not take into account the rebound effect phenomenon: “The difference between the expected and the actual environmental savings from efficiency improvements once a number of economic mechanisms have been considered, that is, the savings that are taken back.” (Vivanco, McDowall, Freire-

González, Kemp, & van der Voet, 2016, p. 60). New research must also include discussions about the impact of the rebound effects of these businesses. Like any qualitative study, the results presented here are neither generalizable. For this reason, we suggested the three propositions to be studied in other contexts, considering the application of quantitative methods for environmental impacts.

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7 APPENDIX

7.1 THE ECO-PLATFORMS FOUND DURING PHASE 1 OF THE METHODOLOGY

Asset optimization

Platforms classified in this category encourage users to share idle assets. *JustPark* connects two groups of users: car park owners and car owners. While the former receives additional revenue for renting the space, the latter pay a lower parking price compared to traditional parking spaces. According to the platform, “23% of car journeys involve some kind of parking pain – that’s roughly 190 million trips a month” – with drivers suffering from both uncertainty (availability, prices, restrictions) and inconvenience (full car parks, slow payments, unfair fines) on a daily basis.” (JustPark, 2019). More time searching for parking spaces increases urban congestion and CO2 emissions.

The other platform, called *Scoop*, is also committed to solving the traffic problem by offering a carpooling solution. The platform mediates the car owners with co-workers and neighbors to similar destinations. Both users split the cost of the trip.

Finally, the *Viy* platform connects groups of users who have idle assets such as vacuum cleaner, tools, musical instruments, and others, with people who wish to use them. Instead of paying a high price to buy such products - which consumes natural resources in its production process - the user pays a rental fee for the utilization period.

Waste reduction

Rubicon Global and *Full Harvest* represent the first group of platforms in this category that aim the reduction of the environmental impact of the waste while making money from it. *Rubicon Global* connects a network of independent waste haulers and recyclers. In addition to charging customers less for removing garbage, the platform enables waste materials to find a new life in other destinations, such as selling pizza leftovers to ethanol generators (Sahlman & Ashmore, 2015). The solution proposed by the platform has a dual benefit, in that it generates financial returns for companies and, at the same time, reduces the amount of waste in landfill sites. *Full Harvest*, in turn, helps small producers to access local and regional markets, in order to transact surplus and imperfect food that would not be sold. On the one hand, the platform generates additional income for small producers, which would be unable to sell their entire

production output. On the other hand, it offers cheaper products to consumers and transparent negotiations between all parties.

The second group of platforms included in this category works with the recycling of stuff (*TipTapp*) and electronic devices (*ExchangeMyPhone*, *Greenwire*, *HYLA Mobile*, *iReTron Inc.*, *MaxBack*, and *YouRenew*). *TipTapp* connects users who want to move things in and out of the house with helpers - regular people with a car, and available time. The other examples of platforms work in similar ways: The owners of electronic devices use the platforms to submit the characteristics of what will be discarded and its physical condition. The platform owner then makes a financial proposal to complete the deal. If the electronic device is capable of being used, it will be resold to the secondary market. Otherwise, its components will be correctly recycled via the platform's partners instead of being sent to the landfill site.

Clean energy

EnergySage (an online energy solutions company) has encouraged and adopted a solution for solar energy applications, making the business financially attractive to solar energy buyers and installers; in effect, the platform connects both these user groups. Consumers register the characteristics of the property's profile, and then installers submit online quotes. They can compare the solar quotes by way of the information that is available on a pre-screened installed network, which carries information about the experience, certification, reputation, quality, and financial proposals of the installers.

Responsible investments

Both *Aspiration* and *OpenInvest* advocate investment in companies that have environmental and social concerns as their core values. These platforms align the financial aspirations of investors with companies that have social or environmental results, such as reduced carbon emissions and philanthropic projects. One primary concern of both platforms is in providing real-time information about the financial performance of the companies and the impact of their business on society. This is done to such a degree that investors can monitor the different investments they have made in the social or environmental sphere in real-time.

Engagement

This category probes the engagement of people with a cause. *My Open Road Corp* promotes the engagement of people for using and supporting greener modes of transportation for a more sustainable world. The Social Responsibility Score (SRS), a KPI provided by the platform, is based on the energy efficiency of each model of travel.

7.2 INTERVIEW SCRIPT FOR PLATFORM OWNERS

Part 1 – About the platform

- 1) What role do you play on the platform, and how long have you been working on it?
- 2) When was the platform founded? How did the idea come about? What were the main difficulties in the initial stage?
- 3) How does the platform work today?
- 4) What are the main objectives of the platform?
- 5) How was the industry organized before the platform? In other words, how did companies deal with the problem?
- 6) How would you describe the evolution of the platform over the years? What was initially planned actually happened (or changed)? Can you give me some examples?
- 7) What are the main challenges faced so far? Nowadays, are problems different compared to the beginning of the platform? What has changed?
- 8) What are the environmental/social benefits generated by the platform, and how are they measured and reported?
- 9) In your opinion, how would you define the platform's success?
- 10) What are the plans for the business? Where do you want to go?

Part 2 – About the users

- 11) How many active users utilize the platform?
- 12) What are the main characteristics of the platform users?
- 13) How do you define what a good user is?
- 14) What are the main reasons for users to join the platform?

- 15) How has the number of platform users behaved over the years? What are the reasons for the decrease or increase in the user base?
- 16) What actions does the platform take to attract potential users? Could you give some examples?
- 17) What keeps users using the platform?
- 18) Comment on an example of a user who started using the platform.
- 19) Comment on an example of a user who stopped using the platform.
- 20) Through which channels the platform obtain and evaluate the feedback of users? Did new ideas emerge from these channels? If so, could you give an example, and how the implementation process worked?

Part 3 – About competitors and partners

- 21) Who are your main competitors? Give some examples.
- 22) Did these competitors already exist, or was it a little-explored market?
- 23) How do you differentiate yourself from them?
- 24) Do you participate in any group/movement with other platforms in the same industry? If so, how has this participation helped your business? When did this happen?
- 25) Who are your most relevant partners? How have you been capturing potential partners? And what are their roles on the platform?
- 26) Do you have any additional comments?

7.3 INTERVIEW SCRIPT FOR BUSINESS USERS (BUYERS AND SUPPLIERS)

- 1) What is your name, your role in the company, and how long have you been working in it?
- 2) Could you comment, in general terms, on your company's business?
- 3) How did you discover the platform?
- 4) Why does your company use (or no longer use) the platform?
- 5) To what extent has the platform been helping to solve the company's problems?
- 6) How long and how often has your company uses the platform?
- 7) Could you explain how (and when) you use the platform?
- 8) What are your main difficulties in using the platform?

- 9) How do you describe the relationship with the platform? What has changed since the beginning?
- 10) What solution did the company use before the platform? Why didn't you continue on this path?
- 11) Do you use (or have you used) similar platforms? If so, which ones?
- 12) What do you suggest about changes in the platform?
- 13) Tell me about a good experience you had with the platform.
- 14) Tell me about a bad experience you had with the platform.
- 15) Do you have any additional comments?