How modularity theory explains the main components of digital business ecosystems: The case of Bizum, an instant mobile payment solution in Spain
ABSTRACT
Technological disruption and social transformation have gone hand-in-hand in recent decades and caused radical changes in the viability of business strategies. This continuous change, happening with unprecedented speed, forces organizations to consider being part of new collaborative value creation networks, such as digital business ecosystems (DBEs). Although scholars have analyzed DBEs from different perspectives since its emergence over a decade ago, DBE research lacks its own theories. Through a single case study, the purpose of this study is to identify the main components and its relationships of the DBE of the Spanish instant mobile payment solution Bizum, under the Modularity Theory developed by Baldwin (2020a). The findings show that technology shapes the ecosystem and helps to create superior digital value as an instrument to solve technical or strategic bottlenecks. The main contribution of this study is that this theory can be considered as a first step for a DBE-specific theorisation.

KEYWORDS
Digital Business Ecosystem; Modularity Theory; Fintech; Case Study Methodology

JEL CODES
031; 032; 033; 034
1. INTRODUCTION

New types of business environments, named Digital Business Ecosystems (DBEs), were born in recent years and drew the attention of researchers to the clarification of their origin and emergence (Nachira et al., 2007; Stanley & Briscoe, 2010). Businesses and scholars recognize the strategic value of DBEs. Incumbents are shocked by new digital players who introduce disruption and value because these new actors play as orchestrators (Kawohl, 2021) in the Ecosystem Economy by deploying new strategies (Jacobides, 2019). Normally, end users adopt these new digital solutions with evident preference over the traditional ones coming from markets (Chen et al., 2018; Kumaraswamy et al., 2018; Schmidt & Druehl, 2008).

Initial interest and conceptualization emerged from the European Union (EU) project (Stanley & Briscoe, 2010). However, after the EU DBE project, we found limited studies on post-implementation issues. Globalization of DBE research is limited (Senyo et al., 2019a) and, therefore, any new evidence of DBE research out of that regional context is a must.

Besides that, the term DBE is not only used without having a clear meaning, but also without a clear reference to a particular theory (Senyo et al., 2019a).

Furthermore, most previous DBE studies are conceptual in nature with little empirical validation. In this regard, this research pursues a “micro-perspective” at an organization level analysis. For that, we conducted a qualitative case study approach (Eisenhardt & Graebner, 2007; Yin, 2017), in which we examined the DBE experience of Bizum, the Spanish instant mobile payment solution. Based on the latest evidence, after a deep literature review, we propose Modularity Theory (Baldwin, 2020a) as a reference model.

This study responds to the overarching research questions: “Can Modularity Theory be used as a theoretical framework to explain the main components of the digital business ecosystem of Bizum?”

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**Objective**

The purpose of this study is to identify the main components and its relationships of the DBE of the Spanish instant mobile payment solution Bizum.

**Methodology**

Through a single case study under the Modularity Theory developed by Baldwin, C. Y. in *The Value Structure of Technologies*.

**Results**

The main contribution of this study is that this theory can be considered as a first step for a DBE-specific theorisation.

**Practical Implications**

The findings show that technology shapes the ecosystem and helps to create superior digital value as an instrument to solve technical or strategic bottlenecks.
The rest of this paper is organized as follows. The second section presents the background literature concerning DBEs. The third section refers to the methodology used for this research. Bizum’s case analysis and the results are discussed in the fourth section. The paper concludes by suggesting avenues for future research, pointing out the limitations of this research and outlining contributions.

2. THEORETICAL BACKGROUND

Over the last decade, the literature on DBEs has focused on four main themes, namely business issues, technical issues, DBE conceptualization and DBE artefacts (Senyo et al., 2019a). From the concept of business ecosystems, in DBE two natures converge: digital and business (Stanley & Briscoe, 2010). Moore (1993, p. 76) suggested that “a company should be viewed not as a member of a single industry but as part of a variety of industries. In a business ecosystem, companies co-evolve capabilities around a new innovation: they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations”.

Although DBEs have developed considerably during the last decade, as a concept, it remains under development. Nachira et al. (2007, p. 9) refer to “the technical infrastructure, based on a peer-to-peer distributed software technology that transports, finds, and connects services and information over Internet links enabling networked transactions, and the distribution of all the digital “objects” present within the infrastructure”.

For the purpose of this research, we chose the definition of DBE proposed by Senyo et al. (2019a, p. 53), “a socio-technical environment of individuals, organizations and digital technologies with collaborative and competitive relationships to co-create value through shared digital platforms”.

In the last thirty years, the conceptualization of DBE has been shaped by different key factors. For some researchers, the value chain integration, including assets from different companies, was the explanation of DBE’s own differentiation regarding the market’s standards (Kandiah & Gossain, 1998). Following the idea of integration, other authors found that the relevant aspect of genuine identity was the capacity to co-create value that matches better the end user expectations (Accenture, 2015; Digital McKinsey, 2018). The following step of common value generation, among actors of different nature, was the idea of using interchangeably the processes of cooperation and competition (Dini et al., 2005; Melville et al., 2004). From a macroeconomic perspective, when some diverse companies cooperate (cooperation and competition at the same time), there could be a regional concentration in a specific location that produces a virtual circle of growth and synergies of positive spill-over externalities (Mun Heng, 2015; Enterprise Singapore, 2019). Concerning the limits of the DBEs’ performance, the formulation of the term “value co-destruction” is very interesting due to a lack of alignment in the value co-creation process (Abedin & Bidar, 2019). The complexity of working together, even competitors, in the generation of a superior value is not easy at all. So, a deep examination of capabilities is a must, specially concerning the new required digital skills (Innovate UK, 2015; TechCity, 2017).

If we consider DBE as an artifact itself, then how its components are organized is the main topic of interest. DBE has its own architecture but the enterprise architecture framework is a clear fundamental pillar of inspiration (Zachman, 1999) and there is also a need for a model (Adner, 2017). From an architectural consideration, DBE can follow two different approaches: how to implement a common value proposition (structural approach) or how to organize interactions and relationships looking for new business opportunities (membership-based). Concerning DBE
models, we found different interesting conclusions. The model based on the role of architect or orchestrator (Pashkov & Pelykh, 2020; Kawohl, 2021) and the most sophisticated DBEs evolving towards platforms with a clear nature of networked markets (Parker et al., 2016). These artifacts are inclusive (Sun et al., 2016) so they have an open nature of participation, the reason why they are called Open Digital Business Ecosystems (ODBE). Being open, they have a multi-agent constitution (Senyo, et al., 2019b).

There is no doubt that DBE is a deep transformative economic phenomenon. For some scholars, the main change in our understanding of the economy was the emergence of new ways of communities under network schemes. In those new environments, companies could push radical innovation as a consequence of shared knowledge (Adler, 2001). From another point of view, how end users act in those communities has been researched in the area of ecommerce. An increasing feedback process was observed in the levels of use of social media and websites, and additionally it was also evident how smartphone usage reduced the transaction costs (Amornkitvikai & Lee, 2020). What is obvious is the transformative impact of DBE derived from the shaping capacities of Information and Communication Technologies (ICTs). That transformation means the rise of a new framework where the distinction between the physical reality and the virtual one is not evident and as a consequence of that virtual nature there is abundance (Floridi, 2015).

As mentioned in the introduction, we have chosen Modularity Theory as a reference model in order to verify if this theory is able to explain the main components and nature of DBE. Concerning the nature of DBE, the critical variable is the method of coordinating ecosystems, as shown in Figure 1.

Baldwin (2020c, p. 11) defines platforms as “a technical system comprising a core set of essential functional elements…"
(the platform) plus a set of optional complements. The optional complements may be products, processes, transactions or messages. The platform has no value except in conjunction with the options”. Additionally, that platform is open if: “options are exercised by external agents not under the control of the platform sponsor. The sponsor and users of an open platform constitute its ecosystem”. This taxonomy means a relevant contribution derived from the main methods of coordination employed in Ecosystems: (1) the price system; (2) bilateral negotiations and contracts; (3) multilateral agreements and systems integration; and (4) platforms. Under this theory, platforms can adopt different ways: closed vs open, and within open platforms: standard-based platforms, logistical or supply chain platforms, transaction platforms and communication platforms (Baldwin, 2020c).

In order to explain the main components and how they work together, this conceptual framework considers that technology shapes both technical dependencies and organizational ties. Likewise, sophisticated ecosystems evolve towards platforms. Following Baldwin (2019, p. 1) states that “Platform systems and Step Process call for different forms of organizations. Step process rewards technical integration, unified governance, risk aversion, and the use of direct authority, while platform systems rewards modularity, distributed governance, risk taking, and autonomous decision-making. In this theory framework, technology shapes organizations by influencing the search for value in an economy made up of free agents”.

According to Baldwin (2020b), there are four main issues: two technical problems and two concerning their property rights defense. The technical problems are: (1) to provide all essential functional components, and (2) they must solve system-wide technical bottlenecks wherever they emerge. Concerning their property rights, the issues are: (1) controlling and defending one or more strategic bottlenecks, and (2) preventing others from gaining control of any system-wide strategic bottlenecks.

Another interesting contribution of Modularity Theory is that ecosystems are defined by economic complementarity among their members, or in other words, members acting together generate greater value than when they act separately. Complementarity can be strong or weak. If there are substitutes for the components, the complementarity is weak, and if they are unproductive unless used together, then complementarity is strong (Baldwin, 2020c).

Finally, researchers are focused on application of the modern economic theory of complementarity (Jacobides et al., 2018) or mathematical theory approach (Milgrom & Roberts, 1995; Topkis, 1998).

3. RESEARCH METHOD

We chose the qualitative case study method (Table 1) because it is the most adequate empirical study method when the nature of the phenomenon is complex and it converges with an observed reality that is not easy when it is separated from its organizational context (Langley, 1999; Yin, 2017). The complexity of the research, such as trying to analyze the inter-company relationship or governance within Bizum in its actual VUCA (volatile, uncertain, changing, ambiguous) context, proves the applicability of the selected research strategy. Its application in this research is based on exploratory, descriptive and explanation research.

The reason for choosing Bizum is because this Fintech company has successfully developed and implemented an actual and working Digital Business Ecosystem (DBE) in Spain. The adoption and adherence in Spanish society has been fast and deep. Bizum has penetrated more than 70% of the banking population in Spain with a time to market of less than five years and with very limited resources: only seven employees. It provides digital
To identify the main components and relationships of a DBE, under the Modularity Theory.

Single holistic case study (single analysis unit). Descriptive and exploratory study.

Bizum’s DBE, a mobile instant payment solution.

Logical and theoretical sample (capacity of transferability of the phenomenon studied), non-random (sampling and statistical generalization).

Single case: case of Bizum’s DBE

Documentary review (documentation and archives). Multiple semi-structured interviews with open-ended questions. Use of physical, technological and cultural artifacts.

Internal: internal reports and studies. External: publications, Bizum website and other websites.

Relevant employees, project managers and directors dealing with Bizum's DBE.

Essentially qualitative:
• Search for key factors
• Search for critical difficulties
• Identification and description of the steps to implement such an initiative.
• Analysis of critical decisions.

Analytical induction through replication logic (analytical generalization).

Validity (constructive, internal and external), reliability, consistency (contextual and theoretical – interpretative).

June 2020 – January 2021

Source: Authors
ended and tailored to optimize the final result. We reached a series of preliminary questions with Bizum, which were part of negotiations that were approved in June 2020.

Taking into account the high interest of Spanish society in Bizum as a new digital phenomenon, all the materials obtained from the interviews were compared with newspaper articles, news, internal publications and updates to the company’s website. As researchers in this process, we are users of Bizum in order to directly observe and experience this digital solution. In order to find inter-subject reliability, we use some narratives from one subject to confirm, check, verify or refute other subjects in social triangulation (Miles & Huberman, 1994). As explained, data and observations from various sources merge and support the construction of a complete narrative that provides a detailed explanation of the required process results (Langley, 1999).

Due to the flexibility of the case study method, data analysis is handled together with data collection (Myers & Newman, 2007). Based on our review of the digital business ecosystem literature, we identified a set of initial themes to guide data collection and interview scripts (Klein & Myers, 1999). All the data, inputs, and insights obtained from each interview are organized in different subject clusters. If there were differences, we continued to verify with other participants or checked the theoretical framework of this article. The information process required multiple iterations to ensure that our presentation of the case organization was consistent and coherent (Klein & Myers, 1999).

4. BIZUM CASE ANALYSIS

There is very little evidence of empirical research on actual DBE; and it is even more atypical in some countries, such as Spain. Bizum is the brand name of the company Sociedad de Procedimientos de Pago, S.L. According to Ángel Nigorra (Bizum’s General Manager), it provides a mobile instant payment solution launched in Spain in October 2016 as the response of Spanish banks to drastic regulation changes driven by EU from 2007 via the Payment Services Directive (PSD-PSD2) and the initiative of the European Central Bank to deploy immediate transfers in Europe under the “SEPA Instant Credit Transfer” scheme (SCT Inst), a consumer need that was not well covered at that time, and the incumbents’ defensive strategy to block potential competition from big tech international companies. Initially, it led to easy instant payments between people (P2P) and, later, between people and e-commerce or institutions (for example, donations to non-governmental organizations). Based on these reasons, we can say that Bizum is a DBE created by a traditional competitive economic sector: the Spanish banking sector. It is valuable to explain how competitors technically agreed the creation of an alternative solution for mobile instant payment needs following a cooperative process of cocreation. So, traditional competitors were able to find a new coopetition balance aligned to the definition established by Baldwin (2020a) and Senyo et al. (2019a). Following Baldwin’s taxonomy (Figure 1), we conclude Bizum is an open transactional platform where members acting together generate greater value than when they act separately.

Although initially a defensive measure, finally they implemented an innovative instant mobile payment solution that shaped a digital ecosystem with its own personality. Bizum is an open transaction platform, but this special DBE is not a common configuration—something that is worth pointing out. In effect, there is an “external ecosystem” of platform users and an “internal ecosystem” of platform providers, as it is shown in Figure 2. Both ecosystems require coordination. According to Fernando Rodríguez, Bizum’s Business Development Director: “From Bizum, we govern this entire
scheme: the Infrastructure is ours, as well as the brand and the regulations or rulebooks: operational rules that define the same operational, technical, business framework ... with all the adherent entities as well as with their processors. These regulations regulate how banks have to send us the information of their clients, what exchange of keys to use to the minimum user experience that must be implemented in the banking channels”.

Bizum as a digital solution supported by app works by linking users phone numbers and email addresses with their bank accounts, without any other intermediate instrument (Figure 3).

All the above descriptions are supported by the insights obtained from the four informants that participated in the field work (Table 2).

Looking at Figure 3 as a whole, it is possible to see a digital transaction platform with an ecosystem consisting of three sides: banks, ordering entities (payers) and beneficiaries (payees). But the platform itself is provided by four different agents (Directory agents: Redsys, Bizum; Prosecution agents: Cecabank, Redsys; Transference agents: Redsys; Bank Settlements agents: Iberpay), thus the platform providers are themselves an ecosystem engaged in complementary activities that in combination “produce” the platform.

As mentioned above, we analyzed Bizum’s DBE under the Modularity Theory framework to determine its characteristics and key factors. Following that theory, functional components can be combined and recombined in various ways. Technology search is essentially a search for new
combinations of functional components that capture new phenomena, serve new functions or serve old functions in better ways (Baldwin, 2020b). In fact, Bizum combines previous assets, such as banking entities, Redsys, Iberpay and Cecabank, in order to configure a new instant method of payment with a mobile.

This framework defined three dimensions of architecture: bottlenecks, modules and zones of authority.

1. **Bottlenecks** can be technical or strategic issues and are characterized because it is necessary to the functioning of the system, and they are a source of value. In Bizum, the main initial bottleneck was to allow collaboration among banking competitors in order to get a common instant payment solution as an effective and complete operation for end-to-end users, who were customers of different entities.

2. For that, it was necessary to develop **modules** as group of tasks and decisions that are tightly connected to each other. At Bizum, those modules represented in Figure 3 were directory, compensation, banking settlement and transference itself.

3. In Bizum’s architecture, either banking entities or technical suppliers were **zones of authorities**.
Table 2. Correspondence between key elements of Modularity Theory and testimonies by interviews

<table>
<thead>
<tr>
<th>The Modularity Theory elements</th>
<th>Supportive testimonies</th>
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<tbody>
<tr>
<td><strong>Bottlenecks</strong></td>
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<tr>
<td>&quot;Big banks prefer to reduce the base of cooperation represented by Bizum because they have capacities to create more differentiation, and the opposite with smaller banks. That generates stress&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;The more service Bizum provides, the more frictional risks emerge&quot; – Ángel Nigorra, Bizum</td>
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<td>&quot;For some banks Bizum could be perceived as a portability tool among entities&quot; – Inés Monguilot, Kutxa Bank</td>
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<td>&quot;If a foreign bank acquires a Spanish one, that could be a risk&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;The current system is not ready to manage those new currencies (cryptocurrencies)&quot; – Fernando Rodríguez, Bizum</td>
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<tr>
<td>&quot;In Europe not all initiatives have been collaborative&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;Changes from credit and debit cards towards other solutions based on instant transfer&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;In cases as ecommerce payment the interest conflict is evident due the credit and debit cards&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;Bank entities have to offer new services in order to compete effectively&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;ING had to join Bizum due to the demand from their customers&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;Proactive in the sense that it is perceived that users are increasingly going to demand more secure, faster, more immediate, more comfortable payment services&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;Reactive in the sense that within the framework of PSD2 it is intuited that competitors outside the world of payments were going to increase&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td><strong>Modules</strong></td>
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<td>&quot;All the process was defined from the beginning&quot; – Fernando Rodríguez, Bizum</td>
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<tr>
<td>&quot;Bizum is composed by two types of actors: bank entities and collaborators&quot; – Lorena Poza, Bizum</td>
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<tr>
<td><strong>Zones of authority</strong></td>
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<tr>
<td>&quot;In Europe there is a project that is called European Bizum, looking for interoperability in order to proceed with transfer between two countries&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;One of the guidelines I received was to act with independence from the banks&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;Bizum is universal, I mean from the beginning most of Spanish Banks participated&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;From the beginning we counted on more than 95% market share&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;There is a representation of banks and normally there is consensus, if not we make decisions by voting in regular government commissions. That happened only a few times&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;Task forces are integrated by members from Bizum, Banks and collaborators...Those task forces are organized by themes&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;To be a Bizum’s member now it’s mandatory to have a bank licence in Spain&quot; – Fernando Rodríguez, Bizum</td>
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<tr>
<td>&quot;In each bank entity there are specific people assigned to support Bizum...normally with technical-innovation profile&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;Now banks receive value for being part of Bizum. We have supported banks’own digitalization but in the beginning it was a promise&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td><strong>External ecosystem of platform users</strong></td>
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<tr>
<td>&quot;Users of Bizum are named bismers&quot; – Lorena Poza, Bizum</td>
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<tr>
<td>&quot;In Bizum we count on users that belong to different digital generations&quot; – Lorena Poza, Bizum</td>
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<tr>
<td><strong>Internal ecosystem of platform providers</strong></td>
<td></td>
</tr>
<tr>
<td>&quot;Banking infrastructure in Spain is very good. Redsys, Cecabank, Iberpay allow banks to interact&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;Bizum manages resources and technologies provided by external players, looking for integration, and the Directory was developed ad hoc&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;Processors can be replaced by other actors that are unique&quot; – Fernando Rodríguez, Bizum</td>
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<tr>
<td>&quot;Our advantage is at the same time a constraint factor because it requires the involvement of all banks with other services and priorities&quot; – Ángel Nigorra, Bizum</td>
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<tr>
<td>&quot;Processors have to be certified and they support the bank entities...they are two: Redsys and Cecabank&quot; – Fernando Rodríguez, Bizum</td>
<td></td>
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<tr>
<td>&quot;For shops and ecommerce it is needed that a Bizum’s bank account is involved&quot; – Ángel Nigorra, Bizum</td>
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</table>
Figure 3 identifies the different modules as intermediate agents between banking entities, the different zones of authorities coming from banking entities and technology supportive agents, and the bottlenecks that are the technical or strategic issues in the relationships when executing instant mobile payments. The three dimensions of architecture, together with its hierarchy, are shown in Table 3, looking for equivalences with Bizum’s elements (column three). That anatomic correspondence supports the axiom of Technology shapes value and as a consequence the ecosystem where it is generated (column 4). The digital solution used by users as instant money transfer by selecting mobile phone numbers is perceived as superior value thanks to the combination of different technologies that make it possible. That superior value is based on the following benefits for end users: instant, free (no commissions), secure, comfortable, and social. This high acceptance and adherence is a consequence of being a weak complementarity solution where the value produced by Bizum is greater than the sum of their value in separate use:

$$V(\text{Bizum}) > V(\text{Redsys}) + V(\text{Cecabank}) + V(\text{Iberpay}) + V(\sum \text{payees}) + V(\sum \text{payers})$$

### 4.1. Results

We identify that the key factors of the successful deployment of Bizum’s DBE are a consequence of how the ecosystem created and captured value. In Bizum’s ecosystem, the banking entities had to manage their modular structure (the technical architecture) by solving four issues: two technical problems and two concerning their property rights defense. There were several technical problems. The first problem was to provide all essential functional components. The main functional components in Bizum’s ecosystem were bank entities and technical suppliers, the integrator organism – Bizum – as a legal entity, a brand for an easy recognition among end users, a directory of mobile phones and banking accounts and end user community creation taking advantage of network effects. Secondly, they had to solve system-wide technical bottlenecks wherever they emerged. In that sense, Bizum was as an orchestrator organizing technical modules together with other entities, such as Redsys, Cecabank and Iberpay, in order to make operational tasks possible. Regarding their property rights, they solved two strategic problems: firstly, control and defense of one or more strategic bottlenecks – that happened when bank entities perceived a conflict of interest with other profitable business models, such as credit card payments; secondly, preventing others from gaining

### Table 3. Main elements and hierarchy of the Modularity Theory used to analyze Bizum’s DBE

<table>
<thead>
<tr>
<th>Main elements of Modularity Theory</th>
<th>Hierarchy of Modularity Theory</th>
<th>Bizum’s equivalences</th>
<th>Technology shaping value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottleneck</td>
<td>Functional components</td>
<td>• P2P payments</td>
<td>• Big data: phone number-bank accounts</td>
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<td></td>
<td></td>
<td>• E commerce payments</td>
<td>• Mobile</td>
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<td>• NGO payments</td>
<td>• App</td>
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<tr>
<td>Modules</td>
<td>Modules</td>
<td>• Directory - Informational</td>
<td>• Operational Spanish banking system Technology (SNCE SCT Inst)</td>
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<td>• Prosecution - Informational</td>
<td>• Informational Spanish banking system Technology</td>
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<td>• Transference - Transactional</td>
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<td>• Bank settlement - Transactional</td>
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<td>• Ordering - Transactional</td>
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<tr>
<td>Zone of authorities</td>
<td>Technical system</td>
<td>• Bizum ecosystem</td>
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*Source: authors*
control of any system-wide strategic bottlenecks. Inés Monguiloi (Kutxabank Marketing Director) and Ángel Nigorra agreed that... “Bizum’s creation was itself the way to be protected against new digital Fintech actors’ entrance”.

Bizum’s case satisfies Baldwin’s (2020b) conclusions: (1) no one can profit from a technical system unless all essential functional components are assembled into a working system; (2) as the technical system evolves, the underlying technical recipes change; (3) a firm or individual that solves a system-wide technical bottleneck and can exclude others from using it can use its power of holdup to tax other participants in the system. In Bizum, it is evident that the system works thanks to a perfect assemblage of all functional components. After the creation, the technical system evolved from P2P payment towards other modalities, such as e-commerce or NGO payments. Ángel Nigorra, Managing Director, and Lorena Poza, Marketing Director of Bizum, pointed to new development possibilities out of the initial payment method. Finally, there is a clear consensus over the collaborative work from banking entities, who in essence are competitors. According to Ángel Nigorra “There is no evidence of any precedent case of exclusion from one entity over another one”.

As the main critical factors to explain the fast growth and frequent usage, we can list the following: platform system reward modularity, distributed governance, risk taking, autonomous decision-making, and network effect.

Digital technology shows the platform system reward modularity: banking prosecution, transference, settlement and the directory of links between mobile phone numbers and bank account code. All of them were the enablers of the final solution, whose main components were a digital artefact in the form of methodologies, frameworks, models and modelling languages (Senyo et al., 2019a). Distributed governance is evident because Bizum compries mostly banking entities with active support and working under the coopetition paradigm. All incumbents pushed a free solution for users (Anderson, 2009) as evidence of risk taking. Autonomous decision-making is deduced from the common testimony of interviewed collaborators as Angel Nigorra or Inés Mongilol stated: “no Bank stopped Bizum’s proposals from the beginning”. All banks made the best efforts to collaborate from the beginning. The positive network effect (Parker et al., 2016) created a huge user community, including all digital generations (baby boomers, gen X, millenial). That was achieved based on security, ease and an outstanding smartphone user experience, which was a perfect “product market fit” in terms of satisfied need (Blank, 2020) and generated virality among their own users. As Lorena Poza said: “our customers use the popular expression ‘make a bizum’, when they evoke instant payment through a smart phone”.

Bizum is not only the ecosystem’s brand, but a legal entity comprising the main Spanish banking entities with its own governance structure. Most decisions are made by consensus among the partners on the board of directors. Bizum counts on an executive team to manage the ecosystem and task forces (permanent and ad hoc) by themes (marketing, operations, etc.) in order to propose future evolution lines and how to solve technical operational issues.

In the opinion of Ángel Nigorra: “this potential capacity was perceived initially as a question mark among its own sponsors, the bank entities. For them, payment based on credit cards was extensively consolidated and a similar solution with the smartphone usability’s advantages was a critical concern”. Fortunately, consideration of threat from pure digital player was stronger and the initial steps of this ecosystem were continued. Bizum’s digital value generated for all stakeholders is so evident that other risks for its development were also neutralized. Among the main risks, highlighted by Angel Nigorra, are customer
portability among entities, cybersecurity, cryptocurrencies, and exclusion of socio demographic generations. None of them were enough to stop the emergent development of this ecosystem.

5. FUTURE RESEARCH DIRECTIONS

With regards to future research, as there is a recognized lack of clear understanding of the DBE concept (Senyo et al. 2019a), we call for future research towards an integrated DBE definition.

In addition, although the single case study approach has been ideal for analyzing the phenomenon, we are aware it has several limitations related to the sample selection, the amount of time that longitudinal research takes, but especially related to statistical generalization (Campos-Blázquez et al., 2020). The single case study reduces the chances of using Yin’s replication logic, compared with a multiple-case study. In this regard, it is proposed as a line of future research to use Yin’s replication logic, both in other cases with a similar context (literal replication) and in different contexts (theoretical replication), with a view to achieving a greater degree of transferability (Maxwell, 1996).

6. CONCLUSIONS

This research provides five interesting contributions on the DBE topic. The first contribution is to count on a theoretical framework (Modularity Theory) to analyze its nature and to understand components and the working process of a DBE. The second contribution is the empirical evidence of an actual DBE in countries as Spain, with lack of previous cases. In only four years, Bizum has its own ecosystem identity as an instant mobile payment solution and it has millions of Spanish users belonging to different digital generations (boomers, X, Y).

The third contribution is that we highlight the critical factors of Bizum’s DBE which explain how it was built and why it was able to succeed by providing superior digital value in a critical common need: payments. In summary, Bizum solves technical or strategic bottlenecks within the coopetition environment of its technical systems, where it operates as an orchestrator.

The fourth relevant contribution is that we define the DBE Bizum’s nature: open transaction platform, derived from the ways of coordinating ecosystems which explain the superior digital value generated by Bizum as a consequence of the weak complementarity among a core set of essential functional elements (the platform) plus a set of optional complements, the transactions themselves produced by payers and payees who act freely and appreciate the above mentioned superior digital value compared with other traditional standard solutions among banks.

Finally, in Bizum there is a relevant and interesting fact to be highlighted, as it is not a common configuration, that supports how DBE can be developed combining two different environments: internal and external. In Bizum, the external environment is represented by the community of millions of payers and payees, and the internal environment is composed by agents that coordinate different modules that work together in order to offer the final digital solution of instant mobile payments.

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