

DINNP-U: A Design Process for Digital Innovation Platforms In Energy Sector Companies

Rodolfo Canelón^{1}, Camilo Peña¹, Andrés Salazar¹*

Abstract: This article proposes a process for digital innovation platforms in the energy sector called DINNP-U. The research method involves the documentary review of research in the field of innovation, transformation, and digital platforms capable of generating value and innovation to its ecosystem. As a result, we generated a conceptual and theoretical basis that allowed the formalization of the disciplines for the design of digital innovation platforms. The process we propose can be used in the development of innovation platforms and can be instantiated for a specific domain. Moreover, the assets produced can be reused to generate a product from a family of domains. The main disciplines of this process are analysis, design, and implementation of digital platforms. For the case study, an interview was conducted with a group of specialists in the ICT area of an energy company (Utilities) in order to understand the digitization process or current maturity of this company. Then it was validated whether the proposed model or design is applicable or should wait until the company achieves the necessary digital maturity. The contribution of this study is to propose a process for domain engineering, which allows contributing with knowledge and experience, for digital innovation platforms in various industrial sectors. There is an interest in this phenomenon due to global trends such as digital transformation and industry 4.0.

Keywords: Domain engineering; Innovation; Digital Platform; Digital Innovation Platforms

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1. Introduction

Today, traditional companies are strongly threatened by companies based on digital technology, since the latter have the ability to generate value for their customers, diversifying their products and/or services more quickly and according to market demands. Moreover, some of these technology companies go further and are able to generate new markets. They are as good and effective at building customer loyalty as they are at capturing new markets and becoming sustainable.

The information technology revolution (ITR) is about digital technology and the representation of information in bits (Shannon, 1948). The use of this information technology reduces costs in the search, processing and storage of data, making geographic boundaries disappear, allowing people and organizations to have access to information from anywhere in the world in a timely manner and at a lower cost.

Given the constant increase of digitization in the processes of organizations, the concept called digital platforms arises, which are transforming industries today and is slowly making its way into the academic literature. Digital platforms are a challenging object of research due to their distributed and intertwined nature of technology, organizations and market (Reuver, Sørensen, Basole, 2018).

The structure of this article, initially, presents in its theoretical framework, the conceptual and theoretical bases that will support the model proposed, and that will support the methodology for the proposal of digital innovation platforms for several industries.

Sector (DINNP-U). Likewise, SPEM 2.0 (Spem, 2008) will be used to present the dynamic flows and to build the disciplines of the analysis, design and implementation of the domain. It will also show the different activities and artifacts that compose them. Finally, the results and their analysis are presented based on the objectives set out in this research.

2. General Background and Motivation

Large companies know that they cannot ignore the digital revolution, since it makes them less competitive and, therefore, with a high probability of becoming obsolete, losing market share and disappearing. Today they must generate new business models that allow them to be sustainable and generate value to their internal and external customers and the ecosystem in which they operate.

When companies go through this digital transformation process, that is when we start talking about platforms and when all interactions and all their services are digitized, and the way to interact with their stakeholders, customers, suppliers and other entities, is through the Internet, since the volume of data increases and it becomes necessary to have data governance and the ability to exploit them throughout the value chain, either through analytics, artificial intelligence and many other tools for this purpose.

The energy company in which we intend to validate the design of a digital innovation platform (DINNP-U) is in the midst of a digital transformation, restructuring its strategy, business models, processes and cul-

(1) Faculty of Engineering, University Central of Chile, Chile
*Corresponding author: rodolfo.canelon@ucentral.cl

ture. The company recognizes that by innovating it can generate value for the customer, its distributors, its suppliers and society. Currently, the company under study is seeking to generate an ecosystem based on the culture of learning, collaboration and data-driven decisions, where experimentation and disruptive technologies are in the value chain of the organization's services and the quality of the customer's life cycle.

Therefore, this applied work was an important contribution in terms of the objectives that the company is currently pursuing. In addition, this work is expected to contribute with knowledge and experience in a rather incipient area in Chile, since there is not yet this type of research on digital innovation platforms in the energy industry (Utilities in English).

The main characteristics of the Chilean territory are its great longitudinal extension with access to the sea and the presence of the Atacama Desert (Pasten, 2012). The sea represents an energy source that can be exploited through tides, waves, currents and thermal gradients. The easy access to the sea from anywhere in the territory makes the exploitation of this resource attractive and the quantification of its potential necessary. Similarly, a great source of solar energy is the Atacama Desert (CNE, 2019).

Gas is a relevant input for the Chilean economy. Households spend on average approximately US\$40 per month on gas cylinders and US\$30 per month on piped natural gas, which represents 19% and 13% of total household spending on basic services, respectively.

In 2020, the sale of GLP reached 1,312,648 tons nationwide, 68% of the sale corresponded to GLP sold in cylinders. GLP was consumed largely by the industrial sector (43.4%), and the residential sector (40.7%), which represents 53% of the value of sales. Of the total residential sales, 84% corresponds to bottled GLP, available in different formats. The largest sale – in tons – is made in the 15 kg format, with 67% of the total (Bernal, n.d.).

The main characteristic of the Natural Gas market in Chile is that it was born practically unregulated, and the evolution of its structure responds only to market forces, is very competitive and can be explained by the almost exclusive participation of the private sector (Fosco. Muñoz & Saavedra, n.d.).

Esto ha llevado a un aumento en los reclamos sobre la libre competencia del sector (Saavedra, 2021).

Today, traditional companies are strongly threatened by companies that use digital technology, since the latter have the capacity to generate value for their customers, diversifying their products and/or services more quickly and consistently, according to market demands.

This work aims to contribute to a company in the energy industry, in its digital transformation strategy, giving the possibility to validate a design of a digital innovation platform adapted to its conditions.

The main motivation for selecting the energy sector as a case study, lies in the incorporation of students belonging to energy production companies in our study programs at the postgraduate level.

This work, both in design and conceptually, can be useful to the Innovation Management of this company or any other company in the Utilities sector, to be able to make decisions on the development of a digital innovation platform.

3. Theoretical Framework

In this chapter, we will review the digital innovation platforms, the types of platforms or models proposed and their stage of development. Then, we will review how they are designed, which are their stages and how these digital innovation platforms are planned. Thus, to be able to choose one or a mix of several models in order to devise and design a digital innovation platform.

3.1 Digital Platforms

Due to the connectivity enabled by digital networks between people, organizations, resources and entire industries, value and economic growth can be generated within the interactive ecosystem of digital platforms. The special feature of this business model is that competitive advantages, contrary to dominant paradigms, do not depend primarily on physical infrastructure or control of scarce and valuable resources. Despite the great practical relevance, there is little systematic knowledge on why business models based on digital platforms often outperform traditional channel businesses in many respects (Rohn, et al., 2021).

A platform facilitates the access, purchase, sale, and use of a wide variety of products and services by using digital technology to connect people, organizations, and resources within an interactive ecosystem in which value can be created (Parker, Alstynne, et al., 2016). In recent decades there has been a sharp increase in startups creating software-based platforms for industries that previously seemed unaffected by digitization (Nieborg, et al. 2018).

The traditional hotel industry that offers rooms, for example, in order to create value for its customers' needs to invest in new real estate or existing properties. An important feature of these digital platforms is that their reach goes far beyond the fields of communication and information, and they do so by enhancing the hotel industries (Abdelkafi et al., 2013, Ardolino et al., 2018). A platform-based company such as AirBnB disrupts the entire hotel business by generating new sources of value creation, "without a single room to its credit"; simply by facilitating a network relationship between owners and seekers of living space (Rohn, et al., 2021). This peer-to-peer platform model allows owners of living space to provide rooms directly to other consumers and generate value by connecting them to facilitate direct transactions, without the need to cover large, fixed costs or purchase assets as most incumbents have to do. (Cennamo and Santalo, 2015; Hossain et al., 2011).

Continuing with examples where established, traditional companies are forced to compete with disruptive business models based on digital platforms, we have:

- Traditional watch manufacturers versus Apple and its AppleWatch series.
- Cab companies versus Uber and its private transportation system.

- And the traditional retail industry versus Amazon and its B2C and B2B marketplace. (Tauscher and Laudien, 2018).

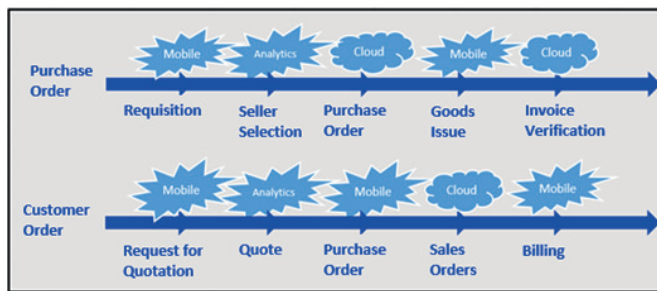
It is remarkable how the use of technology and the creation of digital platforms changed the way of doing business, innovating commercial ideas and business models that can help traditional companies achieve greater efficiency and sustainability (Mishra & Tripathi 2020).

3.2 Innovation and Value Creation

The common characteristics of digital platforms represent ecosystems of newer technologies that can be interconnected to generate creative solutions to organizational tasks and problems, making the use of digital platforms suitable for fostering innovation. The researchers also point out that digital platforms have the potential to drive innovation in companies or organizations, facilitated by their testability, ease of use, interactivity, and cost-effectiveness.

Digital platforms aim to provide organizations with unprecedented innovation potential through their accessibility, ease of adoption, ease of connection with customers and suppliers (Sedera, et al., 2016).

Figure 1. Increased value of business processes through digital platforms. (Adapted from Sedera, et al., 2016.)



According to the illustration above, digital platforms have the option to act on their own and do not necessarily have to depend on another platform, but, although digital platforms have the characteristic of being implemented and managed in isolation, the potential to deliver greater value occurs when integrated and synchronized as platforms of an ecosystem of platforms (Sedera, et al., 2016).

In the special case of this energy industry under study (Utilities), a business information system exists or is used that automates and digitizes all commercial, distribution and sales, logistics, materials and human resources flows and processes. According to previous research, these conclude that when a mature business information system exists in a company, the capacity for innovation increases substantially if it is integrated with digital platforms (Sedera, et al., 2016).

Information systems researchers have studied the emergence and impact of digital platforms as a resource that has the potential to influence organizational strategies, structures, business models and processes (Sambamurthy, et al., 2003). In particular, there is a strong acceptance that these digital resources can deliver value and trigger innovation (Kleis, et al., 2012).

These attribute the ability of digital platforms to drive innovation because of their innate characteristics of: ease of maintenance, ease of connectivity with other technologies, testing capabilities, flexibility, increased processing capacity, reusability for different purposes, and low costs (Yoo, et al., 2010; Yoo, et al., 2012).

3.3 Design a Digital Innovation Platform

Today there is much talk about the digital revolution, the platform economy and whether traditional companies, such as the company under study, lack a strategy for an advantageous entry into the future platform economy. Or if on the contrary, they will lose the ability to compete and will be less able to innovate and generate value to their customers.

Currently, almost no area has as much disruptive potential as digital platforms when it comes to the digital transformation of the organization (Drewel, et al., 2021). The use of patterns of digital platforms was reviewed to be able to create and follow a series of steps or stages, and achieve to devise, design and characterize a platform (Drewel, et al., 2021). Different approaches to participate in the platform economy are presented using platform patterns, which represent proven principles of existing platforms (Drewel, et al., 2021).

It shows the versatility of a catalog of 37 platform patterns that has a generic design and can be customized for a specific platform use case. There are three possible applications of the catalog that allows: (a) Ideation of a platform; (b) Development of a platform; (c) Characterization of a platform (Drewel, et al., 2021).

The pattern-based approach has been applied, for example, to many domains other than developing software or digital platforms. One application of the pattern concept that is mentioned quite frequently in the literature refers to the architectural theorist Alexander, who developed 253 patterns for the design of cities and buildings (Alexander, et al., 1977; Alexander, et al., 1979); since then, this idea of developing based on patterns has been adopted more frequently in different domains, for example, in the development of software or digital platforms. Simply software developers use patterns to leverage the knowledge of other more experienced developers to solve their own problems (Kohls, C., 2014).

Platform design fields are used to identify, classify and differentiate between proven principles. Platform design fields are homogeneous in themselves and can be designed separately from other fields.

Existing frameworks and approaches to digital platform development can be used to identify relevant design domains. The reviewed study conducted a synthesis of existing literature on the process of establishing a digital platform and found 6 design domains that could be addressed using proven principles (Choudary, et al., 2015; Edelman, 2015), as shown in Figure 2.

Figure 2. Design fields of a digital platform. (Adapted from Choudary, et al., 2015; Edelman, 2015)







 <p>Adquisition of Participants. Describes the measures a company must implement to convince consumers, producers and/or partners to join the platform.</p>	 <p>Platform Infrastructure. Includes all parts of the infrastructure that the platform company must provide to enable individualized, high quality transactions between platform participants.</p>	 <p>Other Ecosystem Participants Describes which functions are delegated to additional participants within the ecosystems and which functions the platform itself must provide.</p>
 <p>Transaction Anatomy. Information, units of value and payments are transferred between the participants of a platform. The anatomy of these transactions will be designed into the development of a platform.</p>	 <p>Monetization. It is necessary to define how a digital platform must generate revenue to be successful in the long term.</p>	 <p>Value Unit. The cause of each transaction within a digital platform is the exchange of a unit of value. It is necessary to characterize these units of value precisely within the development of a digital platform.</p>

Figure 3. Application sequence for platform patterns. (Adapted from Drewel, et al., 2021)

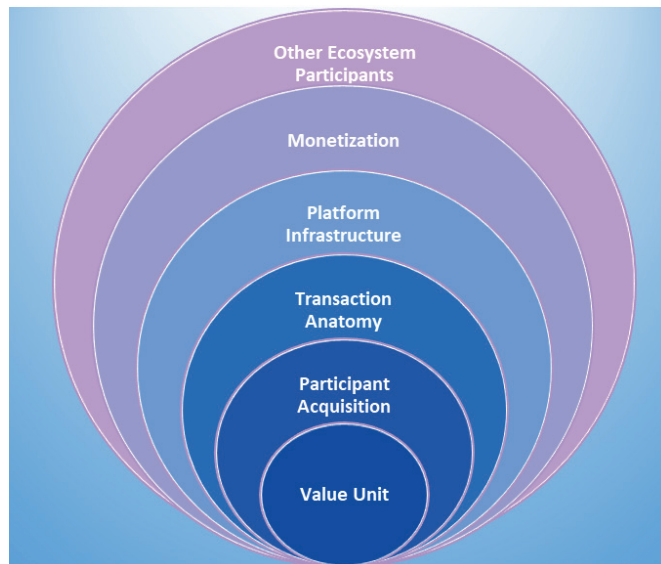


Figure 3 shows the sequence presented and allows companies to decide in which order they should implement the platform patterns, the starting point being the value unit. Each design domain is characterized by guiding questions that help to decide which patterns are applicable. (Drewel, et al., 2021). And Wortmann (et al., 2020) provides the logical steps or stages for the generation of a platform.

As a first step, an appropriate business unit should be selected. Wortmann (et al., 2020) suggests developing a market segment - market value matrix, matching the portfolio of products and services with the market segments. (Wortmann, et al., 2020).

An ecosystem analysis will help to determine the potentials that the platform should have for the company. It is recommended to use a “technique called specification technique for value networks” (Wortmann, et al., 2020), which will help to model the ecosystem, allowing to determine the actors, interactions and transactions, differentiating between products, services, communication and payments.

According to a study of 200 digital platforms, 4 ways were derived to be able to derive the potentials of a platform in the ecosystem

(Wortmann, et al., 2020). Specifically, the study was conducted on B2B platforms. It is important to analyze each transaction and actor with respect to the potentials of the digital platform. These 4 forms are described below:

1. A digital platform has the potential to eliminate the physical intermediary. In effect, if a transaction between two actors is organized by a third actor (the middleman), on a digital platform, the middleman should disappear.
2. A platform generates or creates value that did not exist within the ecosystem, since a platform enables transactions between actors that did not have transactions before. In other words, the digital platform generates a totally new value that did not exist before in the ecosystem.
3. A platform can optimize the transaction(s) between one or more players in the ecosystem. With a digital platform, transactions can be simplified or in other words, a marketplace could bring more transparency to the ecosystem.
4. A platform within a group of ecosystem actors allows them to exchange or share tools and machines. This implies that a digital platform has the potential to create value within a group of actors.

With the four forms or possibilities described above, the ecosystem can be analyzed with respect to the potentials of the platform. It was necessary to obtain or collect the transactions and determine the actors for the platform. It is also stipulated to combine the platform potentials with a catalog of existing generic platform use cases and thus generate ideas of the platform to be designed or generated. The use case should describe the abstract logic of a central interaction of the platform (Wortmann, et al., 2020).

According to Von Engelhardt, unlike classic products or services, one of the main values of a digital platform is the role it adopts as an intermediary. Digital platforms are used to easily access other actors, so that the potentials of the platform can be identified within the various transactions between actors in an ecosystem (Von Engelhardt, S., et al., 2017). According to this approach indicated by Von Engelhardt, we can indicate that it is quite related to the search for value by analyzing the different transactions and actors in the digital platform ecosystem.

4. Scope and Presentation of Methodology

What determined the work methodology was to obtain a proposal of an architecture to design a digital innovation platform for several industries, then this design was validated in the energy industry with a team of specialists in the area of ICTs and innovation, to discuss the feasibility of applying the theoretical models.

The following premises are intended to be included in order to obtain the results based on the objectives set forth in this research:

- Collect theoretical and conceptual background from experts, referring to digital innovation platforms and thus acquire the necessary foundations for a theoretical framework.
- According to the literature review and theoretical framework, design a model of how to devise a digital innovation platform for the energy industry.

The main contribution is closely related to validating the feasibility of applying the methodologies obtained from the theory, through the presentation of a formal methodology proposed for the design of a digital innovation platform.

The Design Process For Digital Innovation Platforms In Energy Sector Companies (DINNP-U) will be presented with the SPEM 2 notation (Software Process Engineering Metamodel), specifying the process models for the flow of activities and artifacts that are defined in the process disciplines.



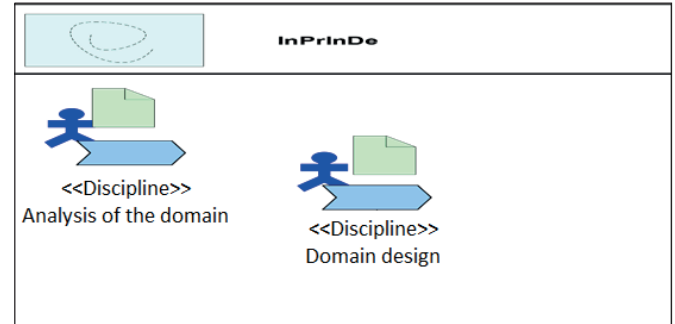
On the other hand, the structure of the process is specified through two (2) disciplines: domain analysis, domain design and domain implementation. The symbol  denoted by identifying the activity affected in each discipline and  the artifact generated. The engineering process disciplines shown in Figure 4 are presented below.

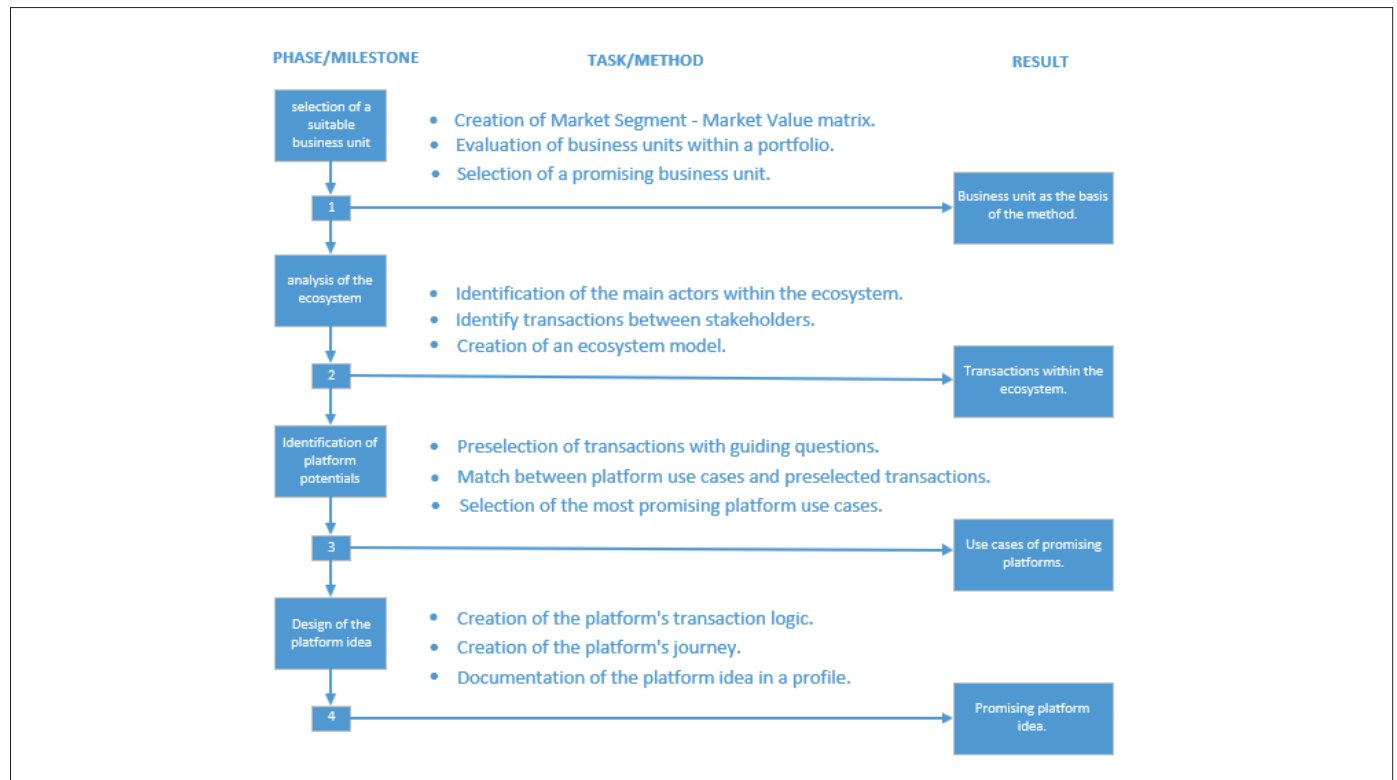
Figure 4. DINNP-U disciplines. (Adapted from Canelón, 2019)



4.2 DINNP-U: Design Process for Digital Innovation Platforms in Energy Companies

The stages and logical steps shown in Figure 5 serve as the basis for the design obtained in this article, in which the activities and input and output artifacts are shown together with the established standards.

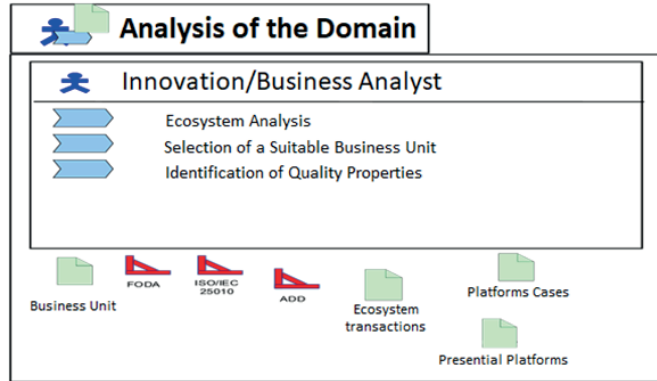
Figure 5. Model procedure for the ideation and design of a platform. (Adapted from Wortmann, et al., 2020)



4.3 Domain Analysis

In the domain analysis, theoretical and conceptual background was gathered from experts regarding digital innovation platforms to acquire the necessary foundations for a theoretical framework, whose activities and artifacts are defined in Figure 6, shown below.

Figure 6. Domain analysis activities. (Adapted from Canelón, 2019)



Ecosystem Analysis

In the next step, we sought to obtain the transactions within the ecosystem. For this, an ecosystem analysis helped to determine the potentials that the platform should have for the company under study. A technique called specification technique for value networks was used, which helped to model the ecosystem, allowing to determine the actors, interactions and transactions of the ecosystem.

Selection of a Suitable Business Unit

As a first step, the appropriate business unit must be selected to obtain the business unit as the basis of the method. For this purpose, a market segment - market value matrix should be developed, matching the portfolio of products and services with the market segments.

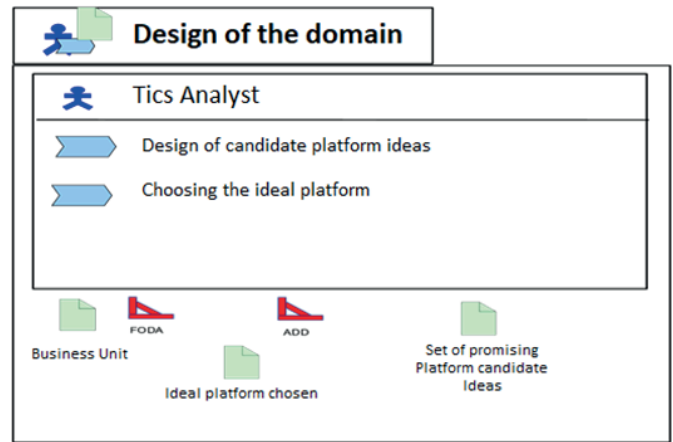
Identification of Platform Potentials

The next step in this methodology stipulates combining the platform potentials with a catalog of existing generic platform use cases and thus generating platform ideas to design or generate. The result is a set of promising platforms use cases. This is the basis for platform ideation.

4.4 Domain Design

According to the literature review and theoretical framework, design a model of how to devise a digital innovation platform for the energy industry, presented in Figure 7.

Figure 7. Domain analysis activities. (Adapted from Canelón, 2020)



Design of the Platform ideas

For the design of the most suitable platforms, it is proposed to use a profile that specifies the different characteristics of the candidate digital platforms. This profile should reflect:

- Description of the platform.
- The logic of the transactions must be shown and detailed.
- The platform's stakeholders.
- Stakeholder-facing incentives that serve to generate motivation to use the platform.
- The platform's journey (technically and graphically). It should show each of the steps to be performed by each actor and the points of intersection or coincidence.
- The revenue logic, which explains how the platform generates business.

Selection of the Ideal Platform

Candidates from the set of digital platforms are evaluated and the ideal platform is chosen, which will be the proposed solution.

5. Results Obtained

The results allowed obtaining a formal methodology/design/stage for the design of digital innovation platforms. This design was presented to engineers from the ICT and innovation area of an energy company for validation.

Following the steps indicated in this methodology should allow the ideation and gradual conformation of a digital innovation platform. Likewise, as a fundamental part of the methodology, specializations on artifacts were generated, namely: Market value-market segment matrix, Selection portfolio for a suitable business unit, Match between use cases and platform potentials, Design profile. From where, their specialization and presentation is described in figures 8,9,10,11.

Figure 8. Market value-market segment matrix. (Adapted from Wortmann, et al., 2020)

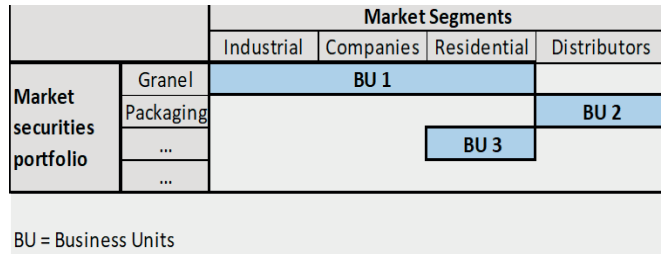
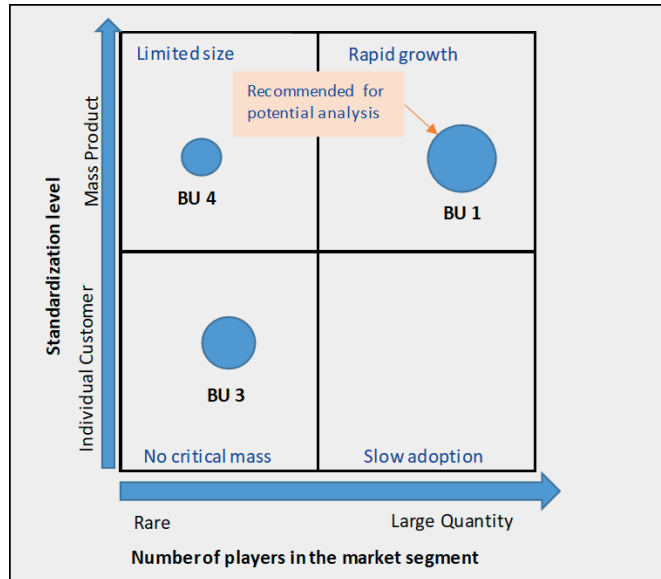


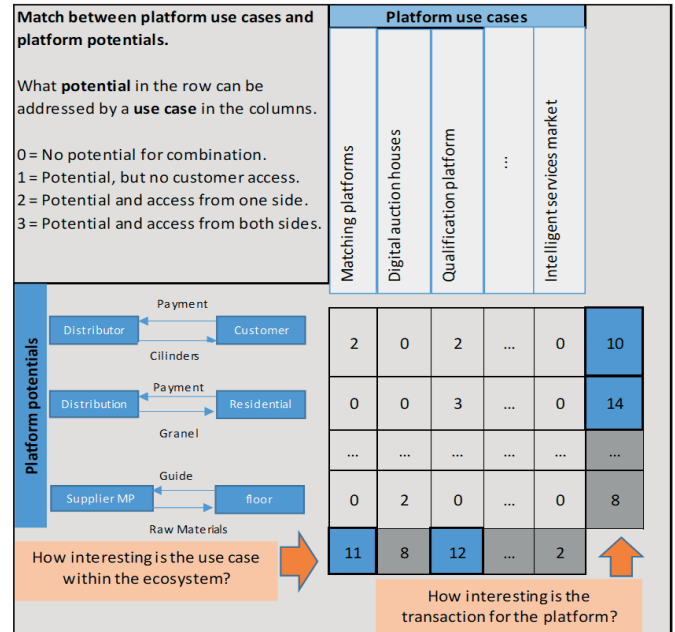
Figure 9. Selection portfolio for a suitable business unit. (Adapted from Wortmann, et al., 2020)



The artifact presented in Figure 10, represented by a matrix, defines the basis for the platform ideation. It shows how the platform potentials and use cases are matched, assigning numerical values according to a scale from 0 to 3, where (Wortmann, et al., 2020): 0: No combination potentials; 1: Potential exists, but no customer access; 2: Potential exists and customer access on one side; 3: Potential exists and customer access from both sides.

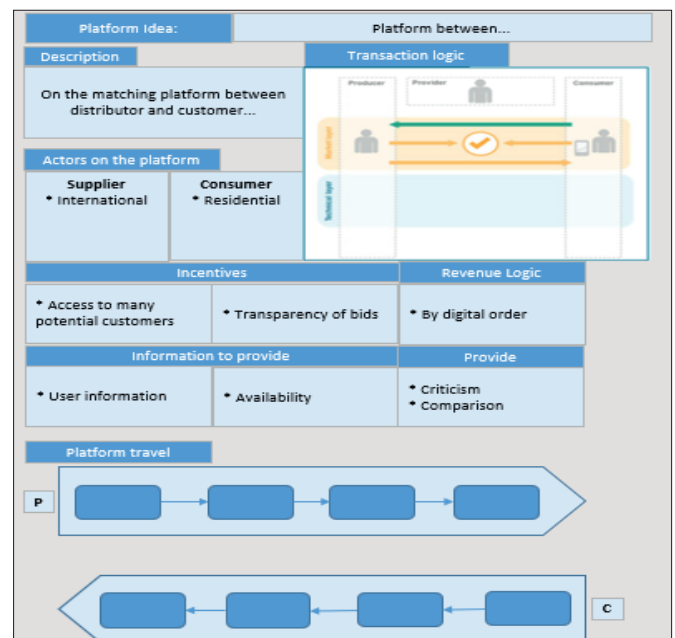
The sums of the highest scores horizontally in the matrix indicate how important the use case is to the platform transaction and the highest sums of the vertical scores show how important the use case is in the ecosystem.

Figure 10. Match between use cases and platform potentials. (Adapted from Wortmann, et al., 2020)



Finally, for the design of the most suitable platform, a profile is used that specifies the different characteristics of the digital platform, as shown in the illustration presented in Figure 11, describing the platform. So, it shows the logic of the transactions, the actors of the platform, the incentives facing the actors that serve to generate the motivation to use the platform. The information they provide is very important to technically realize the platform journey. And the platform journey graphically shows each of the steps to be performed by each stakeholder and the points of intersection or coincidence. An important point is the revenue logic, which explains how the platform generates business. This design profile serves as a basis for further platform development (Wortmann, et al., 2020).

Figure 11. Design profile. (Adapted from Wortmann, et al., 2020)



The model presentation activity was carried out in a meeting. This was separated into 2 main parts: first the presentation of the model to the ICT specialists of the energy company, and then an activity of open questions:

1. What is currently being done, with respect to the proposed methodology and design, in actual work and current ICT and innovation practices in the company?
2. Where might skills or capabilities be lacking?
3. Where might skills or capabilities exist?

Currently in the company, the proposed methodology and design is unknown at a theoretical and empirical level, so it is not formally applied in the actual work of the company. ICT practices are currently based mainly on traditional and classical methodologies. Two years ago, approximately in 2020, the company began a process of digitization, digital transformation and innovation, led by top management, but to date it has not permeated smoothly, reaching all the links of the company. Agile pseudo-cells have been generated, creating new profiles that lead to various changes in the company's IT organization chart; trying to leverage innovation and digital transformation, from the areas of Marketing, Data Engineering, Advanced Analytics Lead, Technology and Digital Operations, Matching Learning Ops and Digital Products. Agile methodologies and tools that enable them are being adopted; but despite all this, the company does not meet the digital maturity, and there is not yet the muscle, nor the competencies to be able to apply the design exposed in this work.

According to the ICT people to whom this design was presented, they indicated that there is a general lack of skills and abilities throughout the company. The company is currently working (advised by external consultants) to generate the ideal profiles to achieve this digital transformation.

Regarding where could exist the skills or capabilities to carry out the implementation of this design, it may appear mostly promising from the areas of ICTs, which by its formation of technological systems may be more linked to digital systems. But it is definitely necessary to form a multidisciplinary team (knowledge of the business, internal and external customer, suppliers, technologies, etc.). That is, train internal people of the company so that they can get the skills and abilities and bring people from the market which are mostly ad-hoc specialists.

5.1 Discussion of Results

With this work a first approach was made, reviewing the research and literature related to digital innovation platforms, and with it a design of a model or formal stages for the creation of digital innovation platforms was achieved.

There are studies in the literature on digital platforms, but not on "digital innovation platforms"; in addition to finding many ambiguities and inconsistencies that the authors themselves explain about this revolutionary and disruptive technology. This technology for the region is very recent in the country where the company under study operates.

This first version of this DINNP-U model work should be strengthened as the empirical experience based on this type of platform increases. In the not too distant future, it is expected to be a contribution to the company in Chile.

In the energy company to which this research and design was exposed, the idea of digital platforms occurs without going through a formal path, defined stages and the use of ad hoc tools; usually the idea appears (is born) spontaneously by a manager with a lot of experience in the business.

This work aims to support the innovation activity of this company, contributing with a design or a formal structure that serves as a guide, and that ensures the ideation of digital platforms that manage to generate value and innovation to the ecosystem.

According to the results of the validation activity of the model presented to the ICT specialists, they found it realistic, credible and implementable, provided that the company had the relevant digital maturity.

On the other hand, more than a design, they see it as a sequence of logical steps, a methodology that uses different tools to achieve the idea of a digital innovation platform.

Given the exposure and study of the case to technology specialists, it is clear that there is little or almost no experience and empirical knowledge of these digital innovation platforms, at least in the case presented and validated in this work.

It can be indicated that currently there are neither the competencies nor the maturity in the company to be able to implement the proposed design. The people surveyed indicate that work must be done on several fronts (training, attracting suitable personnel, improving infrastructure, studying success stories, etc.) in order to generate a base or support for maturing.

6. Conclusions and Future Prospects

Given the recent boom in the development of Digital innovation platforms and the implications that this has on domain engineering and product quality, a process focused on the analysis, design and implementation of the domain for digital platforms has been proposed, in order to obtain a base architecture for digital innovation platforms.

This process has been called DINNP-U, in which a set of specific techniques for the definition of the main activities and artifacts are proposed and adapted. Therefore, there is still a long way to go to formalize the concepts, characteristics and methodologies related to this type of digital platform.

In this work an exposition of the design chosen from the literature or theoretical framework, which provides formal stages for the ideation of digital innovation platforms.

The conclusions that can be deduced from the study is that there is a lack of awareness of digital innovation platforms, and companies are not currently digitally mature to be able to implement these types of platforms.

The model presented is not only based on the needs of internal users, but the analysis view was expanded to involve the analysis of the entire ecosystem, which allows the formalized and presented stages that arise from the theoretical framework, to devise digital platforms with the potential to innovate and generate value.

A formal model (rather than the generation of a platform idea that is born without following a formal path) that allows the creation of digital innovation platforms, which serves as a guide, by simple logic allows to reduce the inherent risk with this innovation. In this way it is possible to create and devise digital innovation platforms in a more tangible way, so to speak, in a planned and methodical way. The digital innovation platform is a revolutionary and disruptive technology, therefore, its associated risk is high.

Particularly, the approach used for the construction of the DINNP-U process was carried out from the energy sector. Therefore, the approach could be generalized and consequently, the process can be applied to the development of other domains or sectors.

It could be suggested to propose a requirements classification model, DINNP-U with quality scopes, ISO/IEC 25010 (ISO/IEC 25010, 2009) that allows generating groups of platforms incrementally and proposing a quality model.

As future work, extend this work to companies in various sectors in public or private domains, with global trends such as digital transformation and industry 4.0.

In future work, the definition of the “DINNS” process can be addressed as families of digital platforms for companies in similar sectors. However, in practice, a family could be broken down into subfamilies and so on. In this sense, a refinement should be made in the architecture, allowing to manage taxonomies of families and subfamilies.

Finally, it is concluded that the process is flexible because it accepts adaptations and is general because it could allow the incorporation of elements/aspects not present in the digital platforms considered today.

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