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# Application of the BMSA Model in an Engineering Office

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**Abstract.** Business Models have received attention, both from academia and from the market, especially since 2000, when the amount of research has grown exponentially. During the Covid-19 pandemic, the importance of this tool intensified, especially for the service sector, which was the most impacted during this period. However, there is no agreement among researchers on the concepts, elements, and methods of modeling business models. Given these two facts, the purpose of this article is to present the structure of the Business Model Service Area (BMSA) of an engineering office specialized in structural calculations to assist in the decision-making process to optimize management. The BMSA made it possible to visualize the company as an organizational architecture and helps in the perception of possible improvements and decision-making.

**Keywords:** Business model, Business model in services, BMSA, Covid-19.

## 1 Introduction

In the current context, several factors are fundamentally relevant to the failure or success of companies, so companies need to use tools that can guide them, especially about decision making, feasibility, and planning. There is still this challenge to be faced, where companies that are not prepared for competitiveness will be doomed to fail. Competitiveness has been the subject of discussion by several authors [1][2].

The World Economic Forum (WEF) [3][4] deals with competitiveness at a global level and expresses competitiveness in 12 pillars (strategic areas and their indicators). Among them, the dynamism of the business and the capacity for innovation. The dynamism involves features such as cost and the time to start a business, the growth of innovative companies, and companies adopting disruptive ideas. Since the operations and advanced strategies of individual companies spread throughout the economy, it leads to sophisticated and modern business processes in the country's business sectors [4]. This confirms the importance of the development of companies and is in line with the proposal of this work.

To do so, competitive advantage can be created through specific tools or techniques, for example, business models. In addition to the use of innovation factors in business models in the creation of competitive advantage [5], and the creation of sustainable advantage using business models as a mechanism for this creation [6].

Thus, this study hypothesizes that the model used in this study, Business Model Service Area, can provide greater decision-making power, so that it can improve the performance of the company in question. After all, Business Models (BM) are im-

portant for organizations, as they can play a central role in explaining the performance of companies [7].

Therefore, it is necessary to state the research problem of this study: Is it possible for a Business Model for a company in the service sector to assist in the decision-making process to optimize management? Based on the above discussion, the purpose of this article is to present the structure of the Business Model Service Area (BMSA) of an engineering office specializing in structural calculations.

The paper is organized as follows: Section 1 presents the introduction and motivation of this study. Section 2 presents the method used in preparing the article. A summary of business model literature, the model BMSA, and the services sector is covered in Section 3. Posteriorly, the structure and way of using the BMSA are in Section 4. The TD BMSA is illustrated in Section 5, and the discussion in Section 6. Finally, Section 7 draws some conclusive lessons, highlighting the limitations, and future research instructions.

## 1.1 Motivation

The Covid-19 pandemic caused a drop in the participation of the service activity, from 73.5% to 72.8%, between 2020 and 2021, in the Brazilian GDP, being the first drop since 2017, in addition to being the most affected by the crisis [8]. However, there is research showing that despite this fall, the sector in Brazil grew 24% in 2021, recovering the loss, which had been 18.6%, according to the IBGE's Monthly Services Survey (PMS) [9].

This reality of recovery is not yet predicted by the WTO [10], according to the organization, global trade in services in the third quarter of 2020 fell 24% when compared to the same period in 2019, representing only a small increase compared to the 30% drop (compared to the second half of 2019). As a result, the prospects for recovery are still low. In addition, the second wave of Covid-19 infections forced new blocking measures, even stricter concerning travel and services, to be instituted, extending into the first quarter of 2021 [10].

Finally, trade in services was the most affected by the pandemic, compared to trade in goods, which dropped only 5% and is being supported by computer services, which is the most dynamic sector in the third quarter, with a 9% increase. A striking factor was the acceleration of the use of 100% digital technologies, meetings, classes, services in general; that were not remote before, are now being developed entirely online. This increase in the information technology sector is due to this increase in global demand for cloud computing, platforms, and virtual workplaces [10].

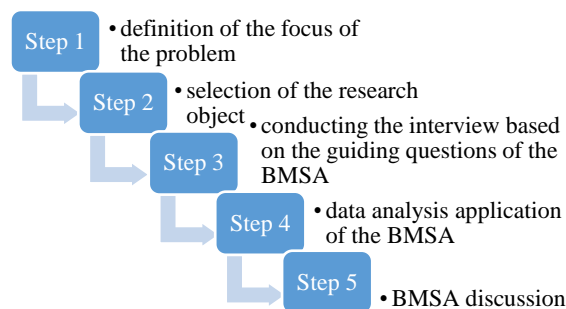
In this scenario, it is important to help with a tool that is capable of strengthening decision-making and management processes. Since 2004, there has been an increase in publications on business models, demonstrating interest in the topic [11]. However, research on the topic of business models is still incredibly early, and there is no complete clarity in the literature since several authors define their concepts on the topic [7]. In addition, they lack a theoretical background in economics or business studies [12].

This work is justified, therefore, not only by the importance of a new business model for a particular company in the service sector, at a new economic and social moment caused by the Covid-19 pandemic, but also by the fact explained by Pateli and Giaglis [13], Osterwalder, Pigneur, and Tucci [14], Zott, Amit, and Massa [7], and Wirtz et al. [11], that the field of research on definition, components, and design still has potential to be studied, mainly due to the lack of consensus among authors who have already published on it.

## 2 Method

In terms of classification, this research fits as applied research (aimed at generating new knowledge, useful for the advancement of science with the expected application), qualitative (carried out through interview semi-structured), case study (once that a specific case was selected to be the object of study, having the tool applied to it) and exploratory (bringing precise descriptions of the hypotheses and seeking to discover the existing relationships between their elements) [15][16][17][18].

The method used to prepare this article was structured based on five steps, as shown in Figure 1. Details of the elaboration of the BMSA model proposition are found in the thesis by Brandão [19].



**Fig. 1.** Article elaboration steps

## 3 Theoretical Reference

### 3.1 Business Model

Business Model is an emerging theme, with several possibilities of study and because it is an area that is still very recent, there is no consensus definition and, therefore, this is still a gap that still needs to be filled [11][7][12]. Although there is a general increase in the literature on business models, there is no definition of a business model that is universal and accepted for all research in this area [7][20].

Future research on business models can be divided into three main areas of e-business interest and the use of information technology in organizations, strategic issues such as value creation, competitive advantage and company performance and

technological innovation and management, and address topics such as components or elements of business models, taxonomy, conceptual models and development of ontologies, classification of models into categories, representation tools, change management or Business Models Innovation (BMI), assessment models measuring performance or performance using Balanced Scorecard (BSC) and adherence factors, methodology of change and business models innovation [7][11][13][14][20][21][22][23].

Business models are not recipes, but they can play one or all the different roles for different companies and different purposes: and they will often play multiple roles at the same time [24]

The formulation strategy and business model, although related, are different concepts, where a business model is the direct result of the strategy, but it is not the strategy [25]. However, it can be understood as a link between strategy and operational implementation, being that strategy an essential element in influencing the development of a business model and can be understood as a kind of guide [11]

There are several definitions for BM (see Table 1). Although definitions differ between studies, most current definitions are close to or consistent with Teece's definition [20][12]. However, in this article the definition used is based on Brandão [19] (see Table 1).

**Table 1.** Service development and delivery process.

Year	Author	Concept
2009	Osterwalder e Pigneur	Describes the logic of how an organization creates, delivers, and captures value, comprising nine components [26].
2010	Teece	The design or architecture of the mechanisms for creating, delivering, and capturing value to employees [12].
2018	Viswanadham	The business model is a description of how a company does business and earns money [27].
2021	Brandão	BM is an organizational architecture of the company, structured in an interdependent, dynamic, flexible, and cyclical way; by simple, relevant elements capable of generating value that surpasses its borders and guarantees competitive advantage [19].

It is noted that a BM is often seen as a guide, which is why it is called an organizational map, being structured in such a way that the elements talk to each other, that is, having interdependence dynamically and flexibly, as each business is unique and has needs and characteristics, in addition to ensuring competitive advantage.

Authors suggest that the target market should be defined from the customer's perspective, that is, the customer is an important factor, considering interactions, information sharing, and their vision [28][29], this factor is related to the dominant logic of the service.

The characteristic of sustainability is seen in more recent business models, as models focused on nature and considering the main elements of how the organization achieves its sustainability and viability goals [30][31].

Models considered easy to use by users were also proposed, after all the users' ability would possibly be limited [19][32]. One way to facilitate this use is the availability of guiding questions, which help when structuring the elements of the model. Some models bring this characteristic, such as the Business Model Service Area [19], the City Model Canvas [33], and the Business Model Canvas [26].

We believe it is important to illustrate the business models for the service sector and its elements [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [28] [29] [27] [44] [45] [46] [47] [48] [30] [31] [49] [32] [50] [33] [51], identified by Brandão [19], as shown in Table 2. Note that only 25 models were identified, from which the BMSA was proposed.

**Table 2.** Business models for service area.

Article	Year	Elements											
		Processes	Actors	Channels	Organizational	Value	Sustainability	Resources	Financial	External Factors	Innovation	Benefits	Risks
Kandampully	2006		✓		✓	✓		✓					
Vafopoulos e Angelis	2010	✓	✓		✓	✓		✓	✓				
Kujala et al	2010		✓		✓	✓			✓				
Solaimani e Bouwman	2012	✓	✓	✓	✓	✓		✓					
Tuan	2012	✓			✓	✓			✓		✓		
Matzler et al.	2013	✓			✓	✓			✓				
Baden-Fuller e Mangematin	2013		✓		✓	✓							
Clauß, Laudien e Daxböck	2014	✓			✓	✓		✓	✓				
Kindström e Kowalkowski	2014	✓	✓		✓	✓		✓	✓				
Peters, Blohm e Leimeister	2015		✓			✓			✓			✓	
Remane et al.	2017	✓		✓	✓	✓		✓	✓				
Adrodegari et al.	2017	✓	✓	✓		✓		✓	✓				
Viswanadham	2018	✓			✓	✓		✓	✓	✓			
Ojasalo e Ojasalo	2018	✓	✓			✓		✓	✓				
Andreassen et al.	2018	✓	✓	✓		✓		✓	✓				✓

Fjeldstad e Snow	2018		✓			✓							
Apte e Davis	2019	✓	✓	✓	✓	✓		✓	✓				
Vatankhah, Zarra-Nezhad e Amirnejad	2019	✓	✓	✓	✓	✓		✓		✓			
Brozovic	2019		✓			✓							
Cosenz, Rodrigues e Rosati	2019	✓	✓			✓		✓	✓				
Salomon, Mello e Salgado	2019	✓	✓		✓	✓		✓					
Turetken et al.	2019					✓			✓				
Yang e Evans	2019					✓							
Timeus, Vinaixa e Pardo-Bosch	2020	✓	✓			✓		✓	✓			✓	✓
Gasparin et al.	2021	✓	✓			✓	✓						

### 3.2 Services

The dominant logic focused on tangible resources, embedded value, and transactions. However, new perspectives have emerged, which have a logic focused on intangible resources, the co-creation of value, and relationships [52]

However, it is difficult to measure exactly what this means economically since expenses with the service sector are poorly understood due to the great diversity of the sector and the lack of uniformity of expense reports, after all, for him the service sector is defined as everything except manufacturing and agriculture [53]. In general, service can be understood as what is produced while being consumed, and some authors approach services according to their characteristics. Services regarding any act or provision that one party may offer to the other, and which is essentially intangible and does not result in ownership of anything, with or without having its production linked to a physical product or which are actions, processes, acts [54] [55].

A striking feature of the service sector is the importance of human resources in the total amount delivered, which can even be a factor that hinders the acquisition of services. This is because regardless of training, human performance is unique and each person carries different values, making precise management and control complex [53].

The service-centered view is defined, as the need to identify or develop essential competencies, knowledge, and fundamental skills of a company and thus represents a potential competitive advantage [52]. A dominant logic centered on the service implies that the value is defined and created with the consumer, instead of being incorporated in the outlet [52], that is, it is part of collaborating and learning with the customer and being adaptable to their needs, being more personalized and dynamic.

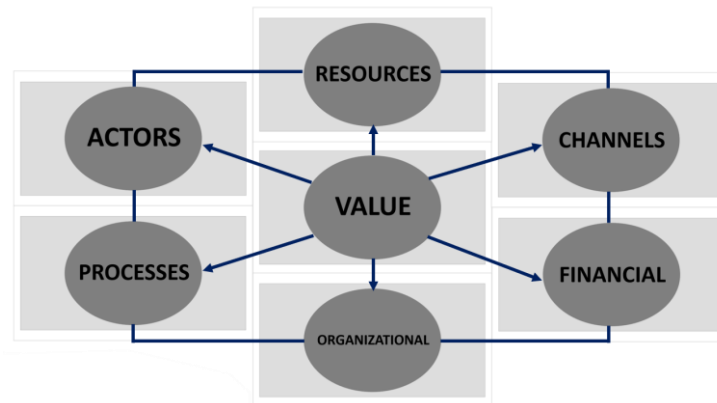
One way of characterization of services is the Knowledge-Intensive Business Services (KIBS), which are not restricted to the transfer of knowledge to customers, but rather a process of co-production of knowledge and innovation that takes place to-



gether with their customers [56], playing the role of problem solvers [57]. And it is in this sense that the present study is characterized.

### 3.3 Business Model in Service

Figure 2 presents the elements of the BMSA [19]. The value constitutes the heart of the BMSA. Following the dominant thinking in services, it represents the value of a solution for the customer.



**Fig. 2.** Business Model Service Area [19]

The central framework contains the value proposition and the co-creation of value that represent the value of the organization. Surrounding the value element are the other elements of the BMSA, actors, resources, channels, processes, organizational and financial, with the appropriate identification tags. Each element is divided into sub-elements, totaling 19 dimensions of the BMSA model [19].

Note in Figure 2 that the BMSA elements are connected by a line, this demonstrates the characteristic that they are all interrelated, that is, if there is a change in one of them, they can all be impacted. Also, note that the value element has arrows towards the other elements, that is, from the value element, the other elements of the model are structured. So that the elements interconnect through the value structure [19].

Value for customers means that after they have been helped by providing interactive resources or processes, they are or feel better than before [58]. Value proposition, value creation, and value capture are common terms that designate these value streams [30]. In the aspect of value creation, the company analyzes the possibilities of facilitating the creation of customer value and how they can help customers achieve their goals [44]. On the one hand, the creation of value means the creation of value in use by the client, however, for some authors the company is not a creator of value, but a co-creator of value [59]

Co-creation focuses on the client's participation in the company's activities and the use of its resources, in the sense of doing things, not only for the client but also together with the client, with a service-centric view [44]. Co-creation makes the value

creation process more adaptable, personalized, and dynamic, focusing on the specific needs of the client [52]. It can be seen as a process of learning and continuous construction for both parties.

Around the value, element are the other elements, with the appropriate identification labels. In such a way that the elements are interconnected to each other through the value framework. The BMSA model includes a set of guiding questions, which were used to conduct the case study interview. For more details and explanations of the elements and guiding questions of the BMSA, see Brandão [19].

## **4 Case Application**

### **4.1 The Company**

The company TD Engineering and Technical Advisory is in Brazil and was founded in 2005 by two civil engineers. TD has developed consistently, performing important structural calculation work, such as bridges, viaducts, buildings, business sheds, and houses in residential condominiums.

TD is well structured, with well-defined targets and indicators (both financial and operational). It has a team of high-level collaborators: five doctors, ten masters, and five project specialists. The main clients are architectural firms, construction companies, and condominium developers.

TD has a website, where it presents the company, its areas of expertise, its main customers and constantly publishes News in the area, including interviews with experts. Its marketing is done through the website and advertisements in specialized magazines in the area. TD has a partnership with an important university and its partners, participate in events in the area, aiming at acquiring knowledge and developing relationships with potential customers. Monthly, the company makes donations of food baskets to two institutions.

According to one of the partners, its employees are TD's most important assets, and their appreciation is part of the company's culture. The company develops refresher courses for employees, and they share in the company's profits. TD's Strategic Plan is revised annually, where it defines the new goals for the next year. TD's principles are ethics, professionalism, valuing the human being, and respect for the beliefs of everyone. The partners believe that customer satisfaction is the best way to recognize that the work was done a lot by TD.

### **4.2 TD BMSA**

TD did not have a structured business model. Thus, the use of BMSA allowed the development of a well-structured understanding and description of the elements that make up the company, allowing the identification of possible improvements and optimization in decision-making.

Thus, after an interview and gathering of information, it was possible to structure the BMSA of the company TD Engineering and Technical Advisory, as shown in

Table 3. Remembering that the BMSA was presented in a table format for easy reading, however it is known that the elements are interconnected, as shown in Figure 2.

**Table 3.** TD Engineering and Technical Advisory BMSA.

<b>Element</b>	<b>Subelement</b>	<b>TD BMSA</b>
Value	Value Proposition	Develop structural calculation, advisory and technical audit solutions
	Co-creation of value	Clients participate in negotiation and delivery/discussion meetings; The client's participation is active with regard to requests and availability of data/information; In advising the client actively participates in the execution of the project.
Actors	Customers	Architecture firm Builders Condominium developers Justice
	Partners	Accounting Office Marketing Agency University
Channels	Information	Sites and digital media News Channels Area events
	Sales	Direct sales
	Delivery	Direct channel (in person and remote) and Site
	After sales	e-mail; Whatsapp; Telephone
Resources	Humans	2 Partners (Civil; Doctors) 5 doctors (Civil and Mechanical) 10 masters (Civil and Materials) 5 specialists (Projects)
	Technological	High-performance computers CAD software Simulation Software High-speed network (Internet) Cloud storage
	Information	Area Events and Customer data
Processes	Service Development	For the structural calculation service (Customer Database; Prospecting Customers in the Market) For the technical advisory service

		For the audit service
	Marketing and sales	Site Advertisements in specialized magazines Customer prospecting
	Delivery	Technical documentation Report with technical opinion
Organizational	Management	The company has a structured management Has indicators: financial and operational
	Strategy	Combined growth and stability strategy Well-established medium and long-term objectives and goals Annual review of Strategic Planning
	Governance	Informal and poor visibility
Financial	Revenue	Structural calculation service, advisory, and audit
	Costs	Payment of employee providers Pro-labore of the partners Fees and taxes Displacement Trainings Equipment Cloud storage Website maintenance

## 5 Discussion of results

In the interviewee's conception, its value "to develop structural calculation solutions, technical advice and auditing". Value arises from the choice of the main delivery; however, this value is co-created from the participation of customers in the negotiation and delivery or discussion meetings of the service, on the requests and availability of data and information necessary for the execution of the service, in addition to the active participation in the execution of the project, in the technical assistance.

This co-creation is extremely specific, for the audit, where the TD company is sought by the courts to analyze and issue a technical opinion on conflicts between two interested parties (as it happened and the defendant, for example, a bridge fell and people died), because the TD has credibility in the market. In this case, there is no perceptible co-creation by the client (Justice). In the other cases (97%), clients (architectural offices, construction companies, incorporated condominiums) participate in the works that will be developed, in at least one stage of the entire process, as explained above. And for TD to continue providing an excellent service, it must always be innovating (technologies, processes, and ways of relating to its customers). Innovation only makes sense if it adds value for the customer and for the customer.

As for the service development process, it is possible to divide it into three distinct groups, as shown in Table 4.

**Table 4.** Service development and delivery process.

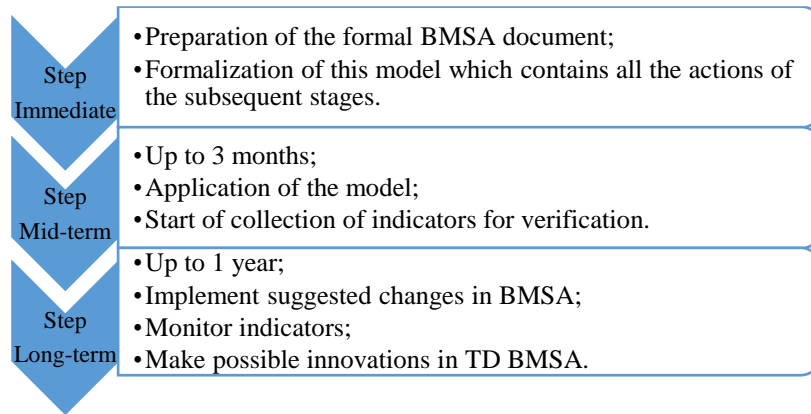
<b>Service Type</b>	<b>Service Development Process</b>	<b>Service Delivery Type</b>
Structural Calculation Service: Clients database	Database clients + information and preparation of the technical / financial proposal + negotiation and contract meeting + project execution + technical documentation + final delivery and discussion meeting + after-sales (technical support meetings).	Technical documentation (drawings, technical specification, modeling, calculations, and simulation results)
Structural Calculation Service: Prospecting customers in the market	Customers from prospecting + initial meeting with discussion and preparation of technical / financial proposal + information and preparation of technical / financial proposal + negotiation and contract meeting + project execution + technical documentation + final delivery and discussion meeting + post-sales (technical support meetings).	Technical documentation (drawings, technical specification, modeling, calculations, and simulation results)
Technical Advisory Service	Clients seek TD + meeting, where the client presents their technical difficulties + preparation of the technical/financial proposal + negotiation and contract meeting + execution of the project jointly with the client + technical documentation + final delivery meeting.	Technical documentation (drawings, technical specification, modeling, calculations, and simulation results)
Audit Service	Justice hires the service + Technical and claims documentation + preparation of the technical/financial proposal + negotiation and contract meeting + execution of the audit project + issuance of a detailed opinion + delivery of the report to the justice.	Report with technical opinion

The company opted for a partnership with a marketing company, which is responsible for the TD website, in addition to working with prospecting customers. However, the possibility of joining digital media platforms and starting to act in digital marketing, for example, using the social media Instagram and LinkedIn, is questioned.

The company does not have corporate governance; however, it is known about the importance of transparency and the impact on the company's visibility to the market

(for example, its financial health and its contributions to society). According to an interview, the company has charitable actions, and such actions could be used as the beginning of the Governance's performance, with visibility of this performance for the market and society in general.

TD is a well-structured company and therefore fully supports the application of the BMSA. The BMSA explicitly shows the relationship between organizational elements and improving the quality of decision making. The TD BMSA application was developed in 3 steps, as shown in Figure 3.



**Fig. 3.** TD BMSA application steps

## 6 Conclusion

This research aims to present the structure of the Business Model Service Area (BMSA) of an engineering office specialized in structural calculations. The study hypothesizes that the BMSA can provide greater decision-making power so that it can improve the performance of the company in question.

We believe that the objective was fulfilled, and the hypothesis answered based on the discussion of the company TD BMSA, carried out previously, allowing the structuring of the company's business model, in addition to proposing application steps, which have already started. BMSA shows a relationship between the elements of the company, optimizing decision-making processes.

The research was not aimed at making innovations in the business model, however suggestions for improvements were presented and included in the BMSA application stages. Topics such as dynamic capacity and BM sustainability will be addressed in future studies to expand the current model.

It is known that the concepts of the presented method are interesting, but they need to be validated through future additional case studies. In this sense, this research gap still needs to be filled. This being a proposal for future studies.

The focus of this study was not on generalizations. But in contributing to the structuring of the BMSA in a simplified way, in a small company, thus contributing to the validation process of this model.

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