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## **PhD Thesis Summary**

# **RESEARCH FOR THE DEVELOPMENT OF ONLINE BUSINESS MODELS**

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## INTRODUCTION

The thesis "*Research for the development of online business models*" aims, through definitions, examples and classifications, to analyze disruptive business models and, in particular, those that have an online presence. The current economic and social context has led to major paradigm shifts both among companies and at individual level. The digitization of each operation becomes a major necessity for the company, which can fundamentally change the way in which we communicate. The development of digital technologies offers unique opportunities and helps to remove information barriers. On the other hand, accelerated technological progress may also have negative effects. For example, digitization can lead to the elimination of a considerable number of jobs, the replacement of more and more employees with robots and their dismissal due to processes that are automated.

The technological developments have also induced the need for online stores, customer-oriented software applications for distance-selling and generated efficiency by quickly taking orders. These integrated sales systems have created a new market, with online stores increasing every year both in terms of the value of orders and in terms of the number of people who give up classic shopping in favor of those made electronically.

The main objective of this work is to identify solutions for improving business models by integrating new digitization systems into the existing e-commerce platforms and in the digital systems connected to them. In each chapter, there were also secondary objectives pursued, such as: (i) identification of the current situation, (ii) identification of the unresolved issues at the current stage of development and (iii) identification of the manner in which a business model can be improved.

The novelty element brought by the paper consists in the use of the "Canvas" generic model as the main research tool in order to identify a technical solution which would be accepted by decision makers.

The study will use qualitative and quantitative research methods. These methods aim to identify the problems that online store owners in Romania face in carrying out their activity.

At the beginning of the paper the particularities of the business models supported by electronic media, more precisely, the online business models that started and developed due to the digital progress are presented. Using the research conducted so far, a useful classification has been made to identify business models based on online sales and operating systems.

The second part of the analysis of scientific data assesses the current state of research in the field of business models and performs a qualitative analysis of them. This section includes the definition of the concept of "business model" and an exemplificative presentation of some popular business models. This approach illustrates certain typologies of businesses analyzed by specialists. The results obtained will contribute to the improvement of the online business model, the main objective of the research presented in this paper.

The next part of the paper includes research aimed at understanding the needs of

companies and the manner in which these needs can be addressed through digital systems. Following the initial research it is discovered that there is a high demand for the interconnection of the many applications already used within businesses. The interconnection problems discovered are analyzed taking into account the currently available hardware and software technologies. In case of online sales platforms, a research called "*Comparative analysis of e-commerce platforms*" is also being conducted to confirm that a new system can be accepted by digital platforms with high exposure and visibility in the online environment.

At the center of this research are the opportunities that have emerged with the rise of digitalization in the entrepreneurial environment. Entrepreneurial companies based on advanced technologies achieve better economic results, quickly becoming stable and profitable businesses.

The research continues by analyzing the needs of entrepreneurs engaged in online commerce activities through the "*Pilot study for determining the need to improve online business models*". The results of the research show that the business model can be improved by increasing the interconnection capacity. The data obtained from this qualitative research are used to design and carry out a quantitative research to identify the current state of the online stores and the perception of the persons with management powers operating in different companies in the field of e-commerce.

Based on the "Canvas" business model, a series of "*Researches for identification of potential solutions to improve online business models*" are performed. These quantitative researches are designed to identify relevant statistical links to design a solution for improvement of online business models.

Following the analysis of several online business models, both from the perspective of the "Canvas" business model and the qualitative analysis, a questionnaire structured on the 9 groups that make up the "Canvas" business model was designed.

In the final part of the current study, a new communication system is proposed that facilitates the interconnection of the currently existing systems. The new system includes a structured language, based on a single taxonomy, which facilitates the transfer of data between IT systems using different e-commerce platforms.

The results of the research indicate a multitude of possibilities to improve a business model by interconnection with other information systems. The proposed solution to improve business models is called GAS (Global API Sync). The name "GAS" is an abbreviation of some words that illustrate the usefulness of the system:

- *GLOBAL* - The system allows systems to interconnect without imposing geographical limitations.
- *API* - The generic name of the technology that allows the interconnection of digital systems.
- *SYNC* - The proposed system simplifies the activity by correlating data from different information systems.

The abbreviation obtained also symbolizes a manifesto against fossil fuel consumption, which can be reduced and streamlined through efficient data transfer. Continuous digitalization can bring multiple benefits to society as a whole, including the capacity to lower pollution levels.

GAS's promise is to provide a useful system that is easy to understand and accept by entrepreneurs. The more organizations are that adopt it, the more value the proposed system brings. The use of a common taxonomy offers new opportunities for interconnection and increases the speed of integration between information systems. In order to facilitate the access to the designed system, XML data structures that will be available in open source regime have also been developed. These structures have been designed in such a way that they are easy to understand and incorporate into applications aimed at facilitating interconnection.

This system allows for easy interconnection of various digital systems. The paper follows companies that carry out their key activities with the help of digital technologies and identifies the needs for the development of existing online business models.

In order to validate and improve this system, a qualitative research has been carried out that aims to determine whether this concept can be accepted by entrepreneurs. The "*Pilot study for the validation of the GAS system*" identifies the most important benefits obtained from the perspective of the business managers who make sales on the Internet. The study also includes analysis from the perspective of the "Canvas" business model, which can be considered an effective tool for synthesizing the main characteristics of any business model, both for businesses that provide services and for those that manufacture or sell various goods.

To validate the system in a real environment, GAS has been implemented at three companies and operated in a real testing environment for a period of between 6 to 24 months. In order to demonstrate the ways in which this system can be used, various graphically represented examples have been designed, as well as a business model that can financially support the proposed system.

The information systems that facilitate online sales already allow the execution of complex processes and the issuance of the necessary documents in accordance with the legislation in force and the internal procedures of each organization. The proposed system was analyzed from the perspective of the key components to identify the most desired facilities by entrepreneurs.

The main contribution of the thesis is to propose an online business model based on improving computer communication by using the GAS model. For the development of the online business model, the general framework provided by the "Canvas" model was used.

The paper "*Research for the development of online business models*" consists of 8 key chapters and has a size of 268 pages. For the elaboration of the work were consulted 136 bibliographic sources, most of the references consulted being from the last 5 years. Also, the work contains 112 tables, 75 figures and 8 annexes to illustrate the main results obtained from the research undertaken by the author.

## CHAPTER 1. RESEARCH OBJECTIVES AND GENERAL PRESENTATION OF THE THESIS

The current context generated by the pandemic has led to the acceleration of the digitalization process and has helped to grow the businesses that function in the online environment. The present work aims to identify easy solutions that can better raise the profile of today's businesses, helping to design improved business models.

Data, information and knowledge are the new success factors that lead to market opportunities and new business models. Organizational performance is achieved by intelligently combining these factors and the rendering of services. These new data, information, knowledge and technologies are used in various contexts, from economic platforms to information systems that provide support services, making processes more efficient. Seizing valuable opportunities and generating business ideas gives digital entrepreneurs the opportunity to successfully develop their own businesses. Business model design, software/hardware architecture planning and individual data storage are at the heart of a new approach to digital entrepreneurship (Soltanifar, et al., 2021)."

The scientific benefits can be helpful both to electronic businesses and to those in other fields who want to improve their business model. A good example of this is Philip Kotler et.'s presentation of the Argos case, in which he explains that although Argos still uses physical format catalogs of products in its stores, its centers have been radically transformed into a state-of-the-art solution, becoming digitized stores. The idea behind these changes was that every customer needs to be better informed and deserves the best. Argos' approach is to ensure that it brings value to customers (Kotler, et al., 2020).

The thesis "*Research for the development of online business models*" aims to develop online business models, which are analyzed through the "Canvas" model, utilized as a tool throughout the research.

An invincible company is the organization that is constantly reinventing itself, before it becomes obsolete. The invincible company explores the future while excelling in exploiting the present. This type of company cultivates a culture for innovation and execution that works in harmony. In this way, the company competes with a superior business model that transcends industrial and traditional boundaries (Osterwalder, et al., 2020).

Lynn et al. state that there are many benefits and risks associated with the adoption of cloud technology, which is a topic highly analyzed by computer science researchers. However, the same cannot be said of the problems associated with the ethics of cloud adoption. Only a few experienced scientific researchers have looked at ethical issues. At the same time, there are voices warning that digital technologies could cross certain boundaries concerning what is moral and desirable for individuals, businesses and society (Lynn, et al., 2021).

Technological development and increasingly easy access to digital systems are a constant contribution to improving the business environment and expanding the capabilities of current online business models. Thus, in the current socio-economic and medical context, including from the perspective of the pandemic, an accelerated increase in the need for digital solutions can be observed. Bernhard Nielsen, a professor of business strategy at the University of Sydney and a professor of international business at Copenhagen's Business School believes that as uncertainty in business grows to unprecedented levels, decision-makers, both at company and national level, will have to develop new business models. These models must be able to move new goods, services and even people across geographical boundaries in new ways. Technological innovation will play an important role in this endeavor (João, et al., 2021).

Janis Stirna, a professor at Stockholm University's Department of Computers and Systems Sciences, says that historically, pandemics have forced people to detach themselves from the past and imagine a new world. Companies are looking for new areas of applicability for their products and services or adapting their business profile for the coming times (Zimmermann, et al., 2021).

With the COVID pandemic, we are forced to make investment decisions without a lot of physical interaction. Such a change will eliminate a lot of theatrical acts or positioning in the meeting rooms. Above all, connecting in the digital environment will reduce the meaningless assessments of CEOs, where vice-presidents draw wrong conclusions on how to lead (Ramsinghani, 2021).

Taking into account all these paradigm shifts, as well as the rapid evolution of digital systems, we can consider that this topic is of interest for improving online business models. Both the permanent increase in the number of users and the internet penetration rate at international level contribute to the improvement process.

The present paper aims to study the existing business models based on the scientific materials developed so far and to propose improvements to these business models in order to develop the value proposition, to increase the quality of the solutions offered and, last but not least, to reduce costs.

Before the situation generated by the pandemic, there were already multiple possibilities for developing businesses with presence in the digital environment. Following the emergence of this event, society has turned its attention to these technologies, which are far from reaching their full potential.

Careful analysis and use of the "Canvas" business model can allow the identification of solutions that allow the rapid and easy exchange of data. The use of current technologies and the research of the "Canvas" model for structuring a business can lead to new solutions to improve the commercial activities carried out in the digital environment.

The present work aims at developing a system that can be understood by people with decision-making power in the private environment and which can be easily embedded in the technologies that are already used by the economic agents.



The logical scheme of the thesis, presented in Figure 1.1, highlights the relationship between the objectives, researches and results of the thesis.

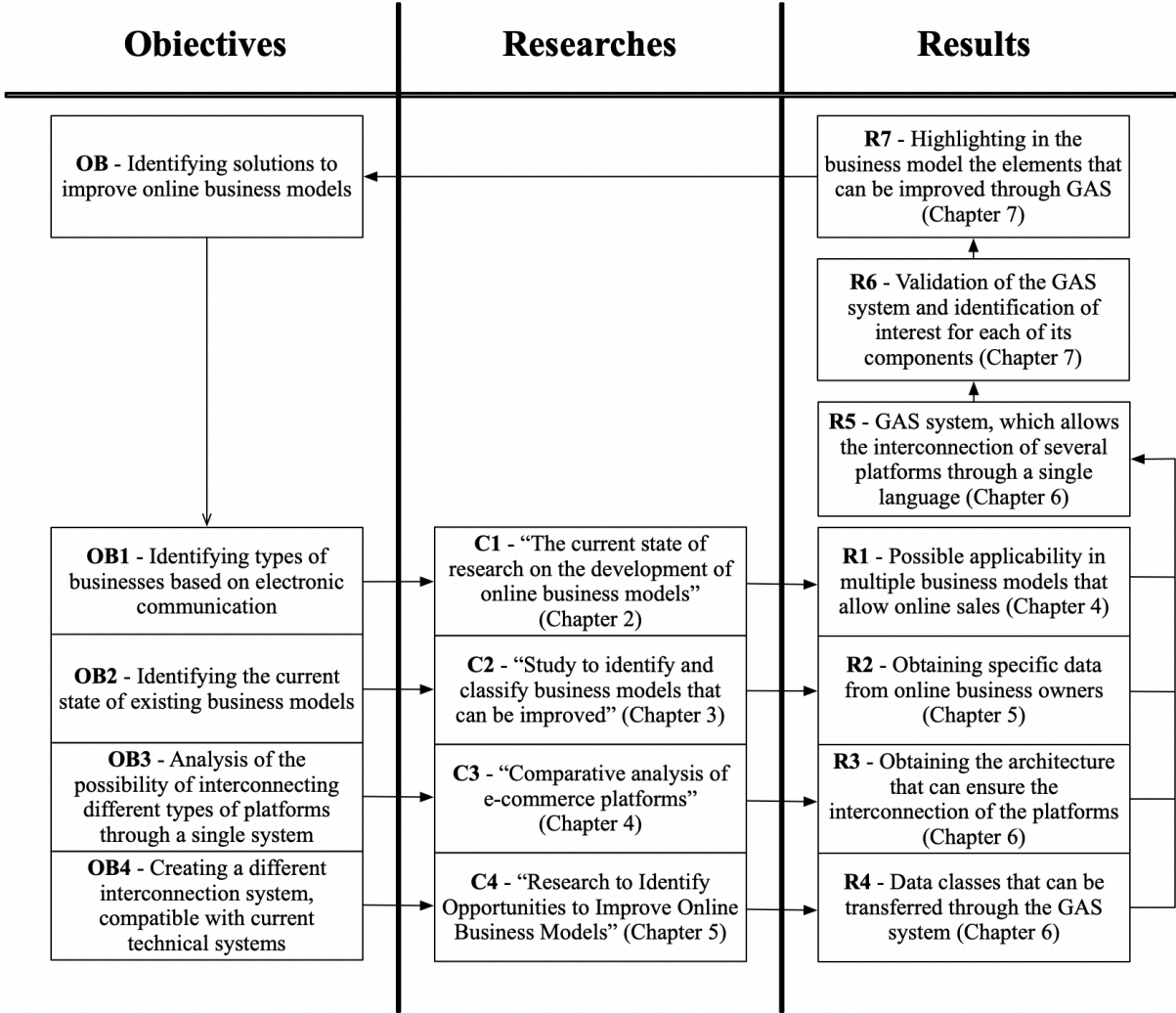


Fig. 1.1 - Logical scheme of the thesis

The research has followed at each stage the "Canvas" business model, the specificity of the businesses included in the study and the analysis of the specialized literature. This research process supported the development of an interconnection system that offers new opportunities to organizations and for the improvement of the business model. In figure 1.2 the steps that have been taken to complete the research and to develop the prototype of the GAS system are presented. The steps that have been taken to achieve the proposed objectives are shown in Figure 1.2.

## **CHAPTER 2. CURRENT STATE OF RESEARCH ON THE DEVELOPMENT OF ONLINE BUSINESS MODELS**

In this section of the paper, the online business models will be analyzed in order to identify the contributions made by specialists from the scientific and economic environment. The purpose of this study is to identify how digital businesses are classified, how value is created, and what is the contribution of entrepreneurs in these businesses. The analysis aims to identify business trends in the digital environment and identify resources that improve the economic efficiency of online businesses.

Following the identification of online business models, it could be concluded that an online business always has physical components as well. However, an online business is the one that includes digital systems absolutely necessary for its operation.

From an economic point of view, the revenue generation, pricing and business operation models are significantly adapted or changed to allow them to operate in the digital environment. According to the papers analyzed, it was possible to identify the manner in which these businesses generate value and a classification method by groups such as brokerage, advertising, mediator, trader, producer, affiliate, community-based business, subscription or utility. Each group analyzed includes several types of functional economic models.

The analysis of the specialized literature allowed the identification of many particularities of digital technologies, and then of a digital system architecture that positions the entrepreneur in the center of key activities.

At the same time, in this section of the paper the types of key indicators used to assess performance were identified. They are divided into 3 classes: sales, marketing and customers. In opposition to businesses specific to traditional environments and after analyzing the types of indicators that define performance, it was possible to identify numerous tools that can analyze performance in the digital environment. These tools are divided into web analytics applications, social media analysis, search engine analysis, and customer interface performance analysis.

For a more accurate highlighting of the business characteristics supported by online resources, examples from the area of cloud technology, online promotion, marketplace, transport, tourism, fintech, augmented reality and artificial intelligence were identified, analyzed and compared.

For each example, the elements of differentiation between the main known players in the respective market segment were presented. With this analysis, it was possible to identify the potential needs of other entrepreneurs. In the context of a digital system interconnected within the value chain that has emerged in the digital environment, there is a need to interconnect systems specialized on a function, process or service.

### **CHAPTER 3. STUDY FOR THE IDENTIFICATION OF BUSINESS MODELS THAT CAN BE IMPROVED**

The study conducted at this stage of the research aims to identify the types of businesses that operate in traditional environments. By analyzing these business models, one can see the key elements that can be digitized. In contrast to traditional business models, the study will also consider examples of disruptive businesses that have a high degree of innovation. In the last part of the study the "Canvas" business model will be analyzed, a model that will be considered the main working tool for improving online business models.

The business model is a generic definition of the company's activity. Based on the analysis of the literature, several definitions are observed, each of them paying increased attention to certain components or functions that the company uses to create value to its customers.

Following the analysis of the proposed definitions, it can be seen that the attention is focused on identifying a definition generic enough that any organization can fit its activity. The specificity of a business model is identified by the way in which its components are integrated and by their ability to generate value and revenue.

As the field of digital business is in full expansion, the analysis of the manner in which these models are classified has been pursued. This initial analysis is essential in order to identify opportunities for innovation. The highlighted classifications position the economic agents in the value chain. Thus, connectivity channels between them that can be digitized can be identified.

By analyzing existing business models at a generic level, opportunities for the development of existing businesses by incorporating state-of-the-art technologies can be identified. Thus, in this section of the research, disruptive technologies that propose new commercial models were also analyzed, such as "MaaS" (model as service), "DaaS" (data as service), "RaaS" (robot as service) or academical "Spin-off".

Examples of well-known companies, for example, Amazon, Google Ads, Tesla, Netflix, Starbucks, Siemens and how they have improved their business models have been analyzed through the examination of the "Canvas" business model to identify activities and components that contribute to disruptive innovation.

This analysis of the definition of the "Canvas" business model and its incorporation formed the basis of qualitative and quantitative research carried out to determine how a business model can be improved by streamlining digital operations.

According to these analyses, it is noted that there is steady progress in the international economic environment. Probably all the businesses mentioned depend on advanced digital systems and are forced to exchange data between multiple internal or external systems.

## **CHAPTER 4. STUDY ON IMPROVING THE BUSINESS MODEL BY INTERCONNECTION OF PLATFORMS**

This chapter explores digital business models and the manner in which these models can be improved by interconnecting e-commerce platforms. The main tool of this analysis is the "Canvas" business model. It was created to represent the generic activity of a business built around an electronic shop application.

Based on the model created, the potential benefits brought by a new interconnection system were analyzed and the categories of data traded at each stage of the ordering process were identified. For the analysis of the feasibility of a system, the most used electronic commerce platforms and the manner in which they can be extended with new features were considered. Thus, several techniques have been identified for extending the existing functionalities of the most well-known IT applications, techniques that are presented in a comparative analysis. Following the first results, several technical solutions have been identified, but they must be compatible with the designed system.

In order to improve an online business model, an analysis based on the "Canvas" business model will be carried out. This is used to outline the key points of a business model and it is useful for structuring the activities that can be streamlined by digitizing commercial operations.

The "Canvas" business model is the central element of the analysis carried out. With its help, solutions to improve the components of a business model are identified. For exemplification purposes, a "Canvas" business model which generically presents the activity of an online store was created.

In order to improve online business models, the types of activities carried out by the online sales platforms were analyzed first. Each online sales platform can include one or more activities, which are the basis for the creation of a generic "Canvas" business model, which can be applied to any store that falls into multiple business typologies.

Through the analysis of the generic business model of an online store, we aim to identify possible changes to the "Canvas" model that can be improved in order to obtain a system through which online business models can be improved.

In each quadrant of the "Canvas" business model, the ways of improving the "Canvas" business model by proposing an interconnection system that can simplify data transfer have been identified, these advantages being analyzed by the appropriate research methods, presented in Figure 4.2.

Key partners	Key activities	Value proposition	Relation with customers	Groups of customers
<ul style="list-style-type: none"> <li>➤ Rapid integration of new partners into the organization's processes</li> <li>➤ Working with a larger number of partners</li> <li>➤ Increasing connectivity and speed of information transfer between partners</li> <li>➤ Reducing human error in data transfer</li> </ul>	<ul style="list-style-type: none"> <li>➤ Removing linear and repetitive tasks</li> <li>➤ Increasing the operating speed</li> <li>➤ Elimination of errors caused by manual data processing</li> <li>➤ Increasing the productivity of the human resource</li> </ul>	<ul style="list-style-type: none"> <li>➤ Easier implementation of the value proposition, by relieving the activities carried out by the human factor</li> <li>➤ Increasing customer satisfaction</li> <li>➤ The emergence of new benefits for customers</li> </ul>	<ul style="list-style-type: none"> <li>➤ Shortening the time for identification of a customer in the database</li> <li>➤ Easy implementation of automated direct marketing systems</li> <li>➤ Grouping customers for contextual communication</li> </ul>	<ul style="list-style-type: none"> <li>➤ Identifying customer groups in detail by aggregating data from multiple sources through a common system</li> <li>➤ Analysis of the overall behavior of each group of customers</li> </ul>
	<p style="text-align: center;"><b>Key resources</b></p> <ul style="list-style-type: none"> <li>➤ Internal human resource</li> <li>➤ External human resource</li> <li>➤ Equipment necessary for operation</li> <li>➤ Storage space (capacity and location)</li> <li>➤ Availability of stocks</li> </ul>		<p style="text-align: center;"><b>Channels</b></p> <ul style="list-style-type: none"> <li>➤ The rapid digitization of distribution channels allows for a more efficient use of them</li> <li>➤ Adoption of digital systems that allow automated decision-making regarding the optimal distribution channel</li> </ul>	
<b>Cost structure</b>		<b>Sources of revenue</b>		
<ul style="list-style-type: none"> <li>➤ Reducing hardware and software costs (having a common API language can achieve better processing performance than software robots)</li> <li>➤ Reducing development times for adding new integration (by reusing the source code)</li> <li>➤ Reducing ad costs by making better targeted or contextual ads</li> <li>➤ Reducing human resource costs</li> </ul>		<ul style="list-style-type: none"> <li>➤ Increasing revenue by improving the value proposition</li> <li>➤ Increasing revenue by creating effective advertising campaigns</li> <li>➤ Improving marketing strategy and customer satisfaction</li> </ul>		

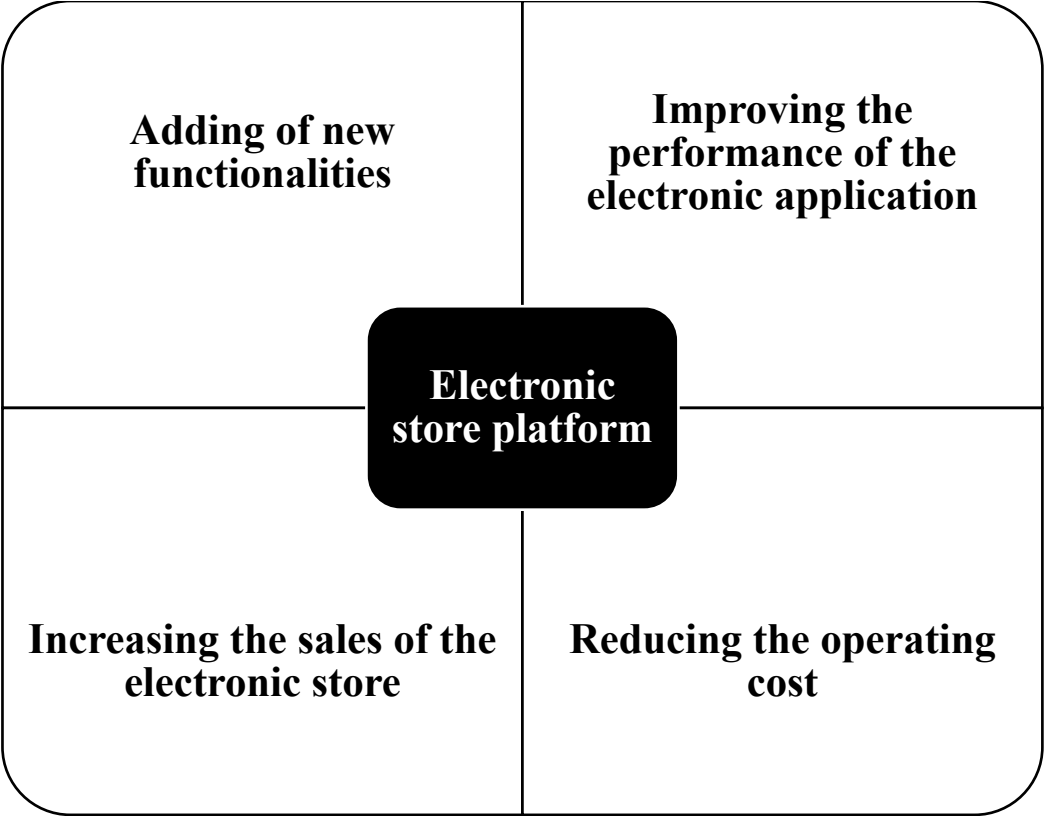
**Fig. 4.1 - Estimated improvements to the business model through the adoption of taxonomies that ensure the interconnection of digital systems**

*Source: Own contribution for the contents of each dial, figure filled in following the "Canvas" Strategyzer AG model, 2018*

The current study aims to identify large-scale e-commerce platforms in the global market. Through this study we will analyze open-source platforms, SaaS platforms and also "plugin" applications, in order to afterwards identify the ways for expanding the functionalities which are already offered by these platforms. The identification of popular electronic commerce platforms was achieved through an analysis of several specialized rankings.

The top 5 platforms used for e-commerce activities are Woocommerce with a share of 36.88%, Magento Open Source with a market share of 14.47%, Shopify with a share of 11.91% and PrestaShop with a share of 7.84%.

In order to improve the business model, we will analyze the methods by which more value can be offered to the customer and the online store manager. Figure 4.14 sets out the ways in which an improved interconnection system could provide more value.



**Fig. 4.2 - Opportunities for the development of e-commerce platforms**

*Source: Own contribution*

Typical processes that can be found in several types of activities specific to Internet commerce have been identified based on the "Canvas" business model and the typology of existing digital businesses.

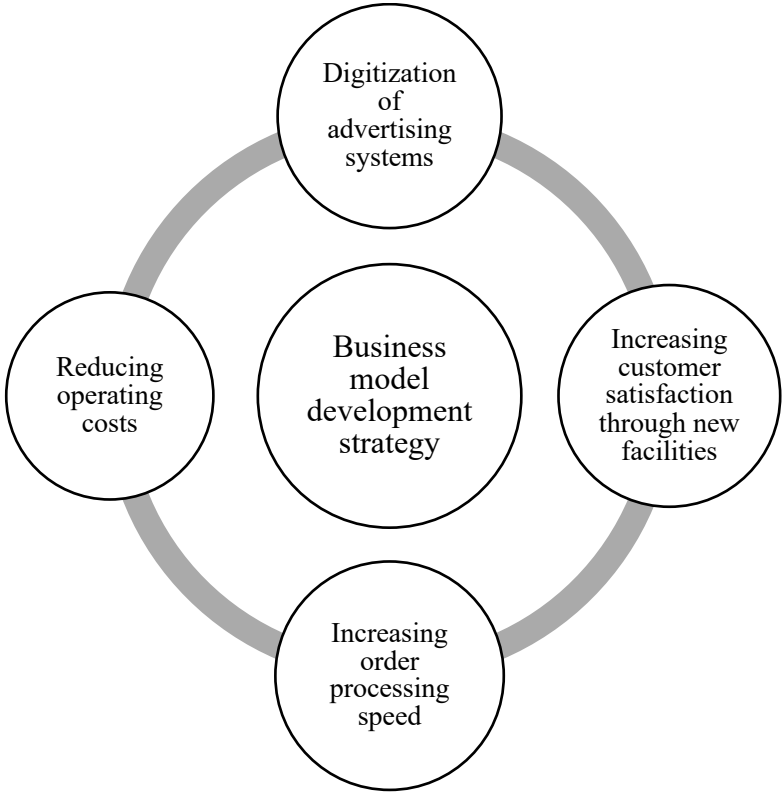
The practical result is the proposal of solutions that facilitate communication between different platforms, regardless of the operating language used. In today's information ecosystem there is a high availability of technical solutions that allow the interconnection of platforms, but the traded conventions and data depend exclusively on the parties involved in this process.

Proposing a common communication taxonomy can facilitate collaboration between electronic commerce system developers, reduce implementation times and increase the speed of adoption of new applications.

# CHAPTER 5. RESEARCHES TO IDENTIFY IMPROVEMENT OPPORTUNITIES FOR ONLINE BUSINESS MODELS

In order to identify solutions to improve online business models, two researches will be carried out in this chapter. They have the common objective of identifying the needs for the digitalization of businesses. The first results presented are those of the "*Pilot Study for determining the need to improve online business models*", a research supported by the method of in-depth interview. These results are then used to design a complex questionnaire used for the quantitative research. The second research carried out is "*Research to identify opportunities to improve online business models*", which offers both quantitative and statistical results. This research is addressed to online store managers, is aimed at identifying solutions to improve business models and is structured in accordance to the "Canvas" business model.

The results of the in-depth interview led to the identification of the main elements that are included in the short and medium term development strategy of the analyzed business. The answers obtained from the interview indicate the 4 directions shown in figure 5.3.



**Fig. 5.1 - The main directions of improvement of the analyzed online business models**

*Source: Own contribution*

The purpose of the research for identifying potential solutions of improving online

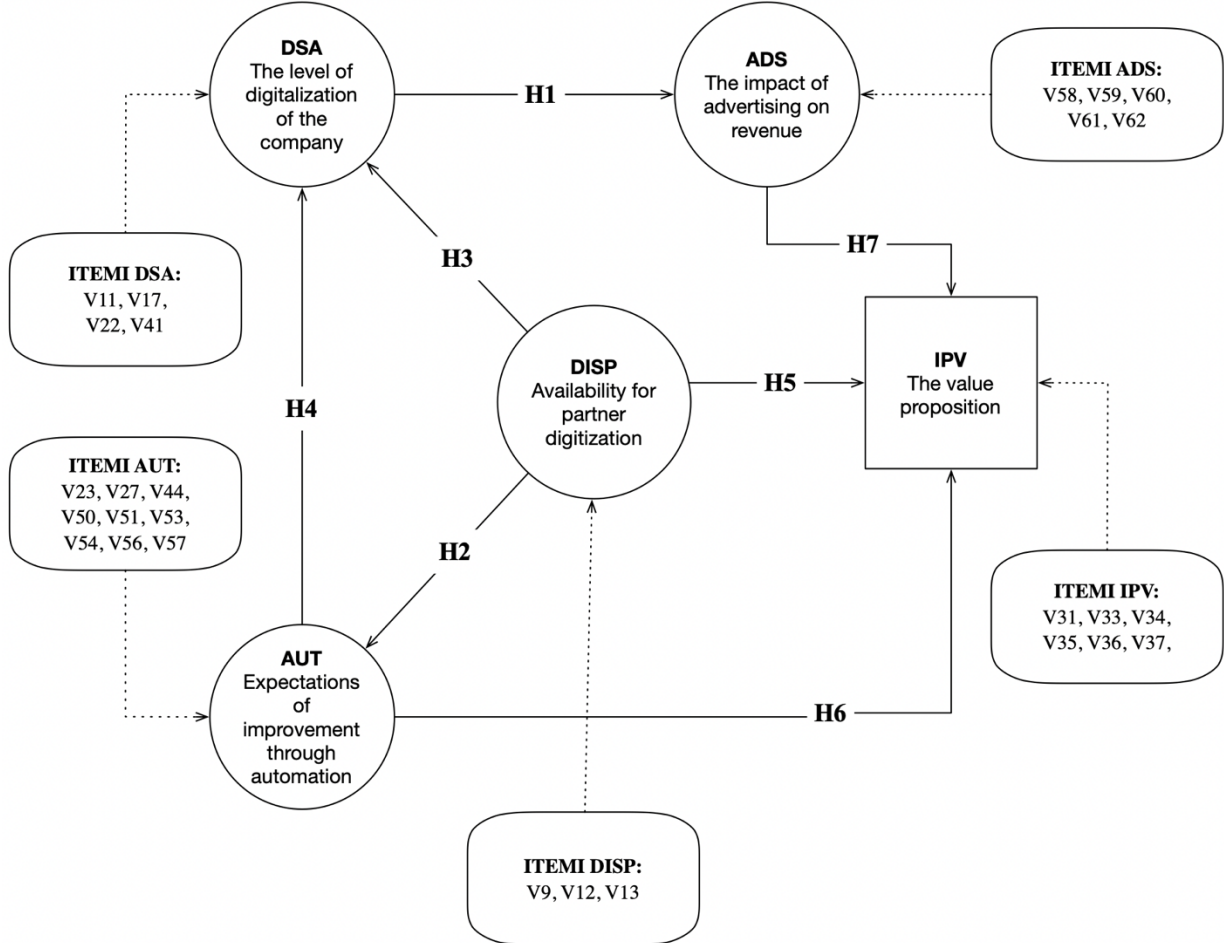


business models is to identify the needs for improvement of online business models operating through an online store platform. The results of the in-depth interview confirm the need to digitize these business models to reduce costs and increase operating speed. The selected topics of interest are structured according to the "Canvas" business model and in the assent of specialists in the scientific field.

The design of the survey follows the matrix of the "Canvas" business model to identify specific activities where there are opportunities to automate certain operations.

The results obtained from the application of the questionnaire will be represented by items that can identify the points where the business model can be improved, the current state of digitalization and the perception of the decision-makers concerning the optimization of the activity. These items will be grouped into variables to evaluate the H1-H6 assumptions.

In accordance to the variable loading model, figure 5.6 shows the manner in which the items were allocated into the defined variables. The diagram of the conceptual model is presented in detail, including the code of each selected item.

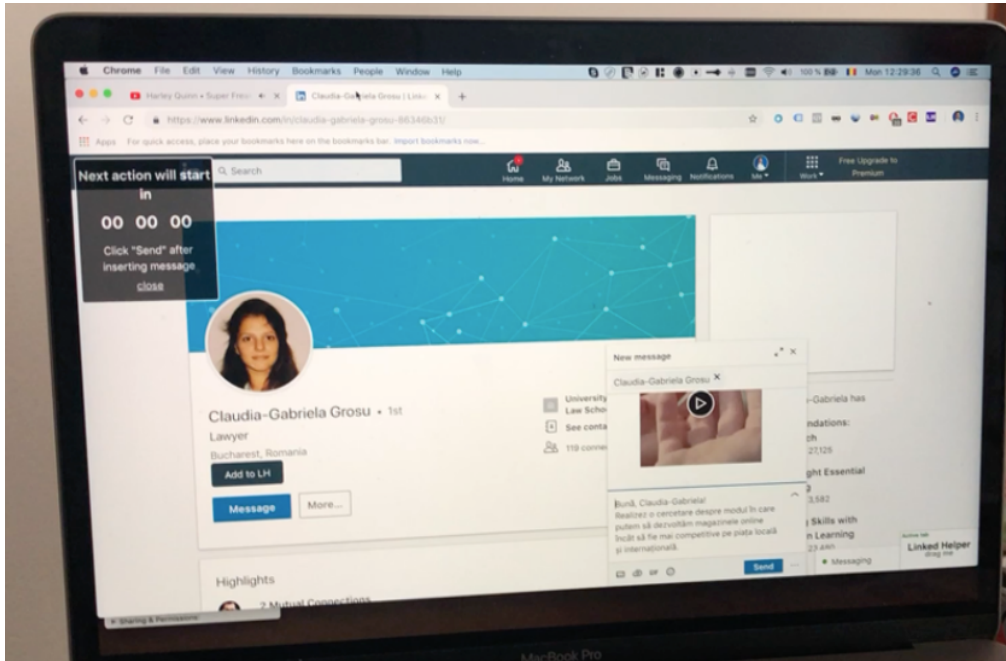


**Fig. 5.2 - Presentation of the items that load the conceptual model variables**

*Source: Own contribution*



The questionnaire was distributed exclusively in the electronic environment, to people who own at least one online store. In the case of the LinkedIn social network, a robot that imitates human behavior was used to send invitations to complete the questionnaire. Figure 5.7 illustrates how the LinkedIn software robot contacts potential respondents.



**Fig. 5.3 - Exemplification of the software robot that sent the invitations to participate**

*Source: Own contribution*

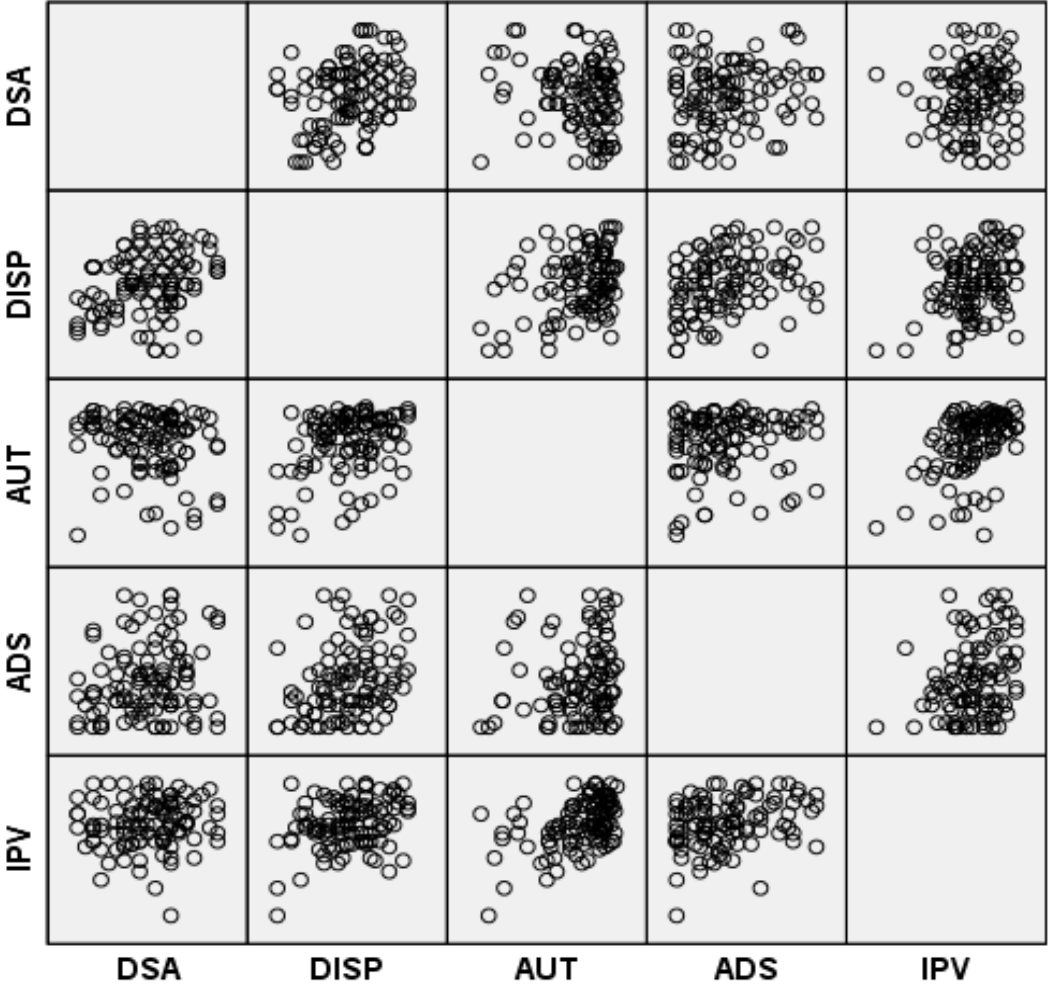
In table 5.21 the cumulative data of the stores that participated in the research is presented. Thus, representative values about the activity of these businesses are synthetically presented.

**Table 5.1 - Aggregated data of online stores that participated in the research**

Cumulative characteristics of the sample	Values
Number of respondents	105 people
Total number of orders processed monthly	28,913
Average number of orders processed monthly	275 orders
Employees involved in the activity of the analyzed stores	796
Average number of employees of the analyzed companies	7.58 employees
Number of products listed in the store offer	253,505
Average number of products listed in the offer	2,414 products
Shops that allow the pick-up of goods from the headquarters	38.95%
Stores that deliver goods on the local market	97.85 %
Stores that deliver goods on the international market	20.90 %

*Source: Own contribution*

Figure 5.8 shows the general Scatter-Dot diagram, which illustrates the manner in which the results are visually placed in accordance to the values shown. In the figure it is shown that the values of the correlations between the variables presented are positioned in a common area in most cases.

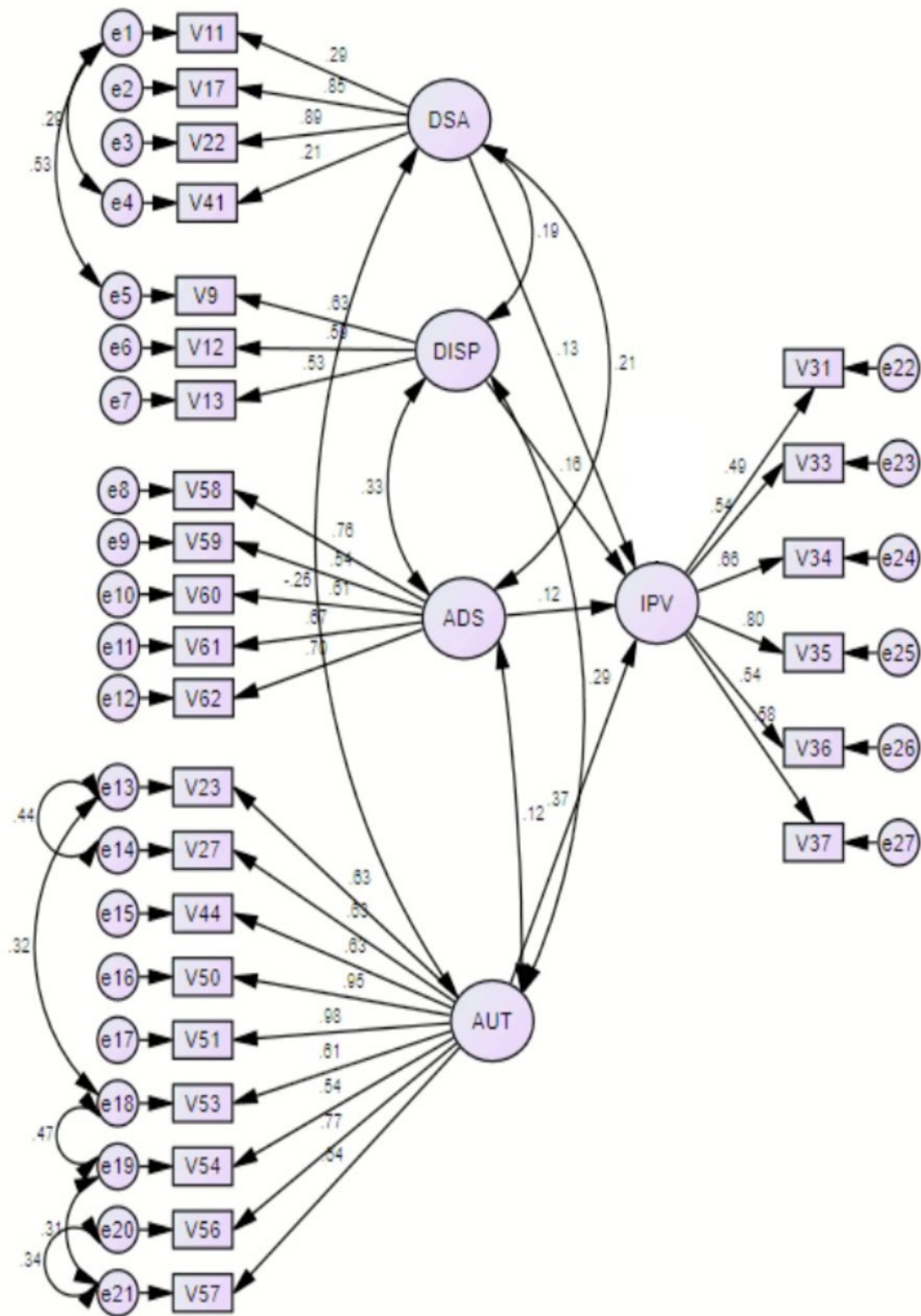


**Fig. 5.4 - Scatter-Dot diagram of variables**

*Source: Own contribution*

In order to identify whether the proposed model is statistically suitable, the chosen solution was to validate the assumptions with the help of the AMOS software. In this regard, the presented model has been reconfigured and the necessary covariances for validation by AMOS have been added.

Figure 5.13 shows the variables obtained from processing through SPSS and the items that were used for the compounds. The original model was reconfigured to model the structural equation. In this regard, covariance links were added between residual errors of variables that did not fit the complete model. To achieve these results, standardized elements, history of minimizations, residual moments and change indices were analyzed. Also, in order to validate the model, data on indirect and direct effects, estimates of covariance and correlations were also extracted.

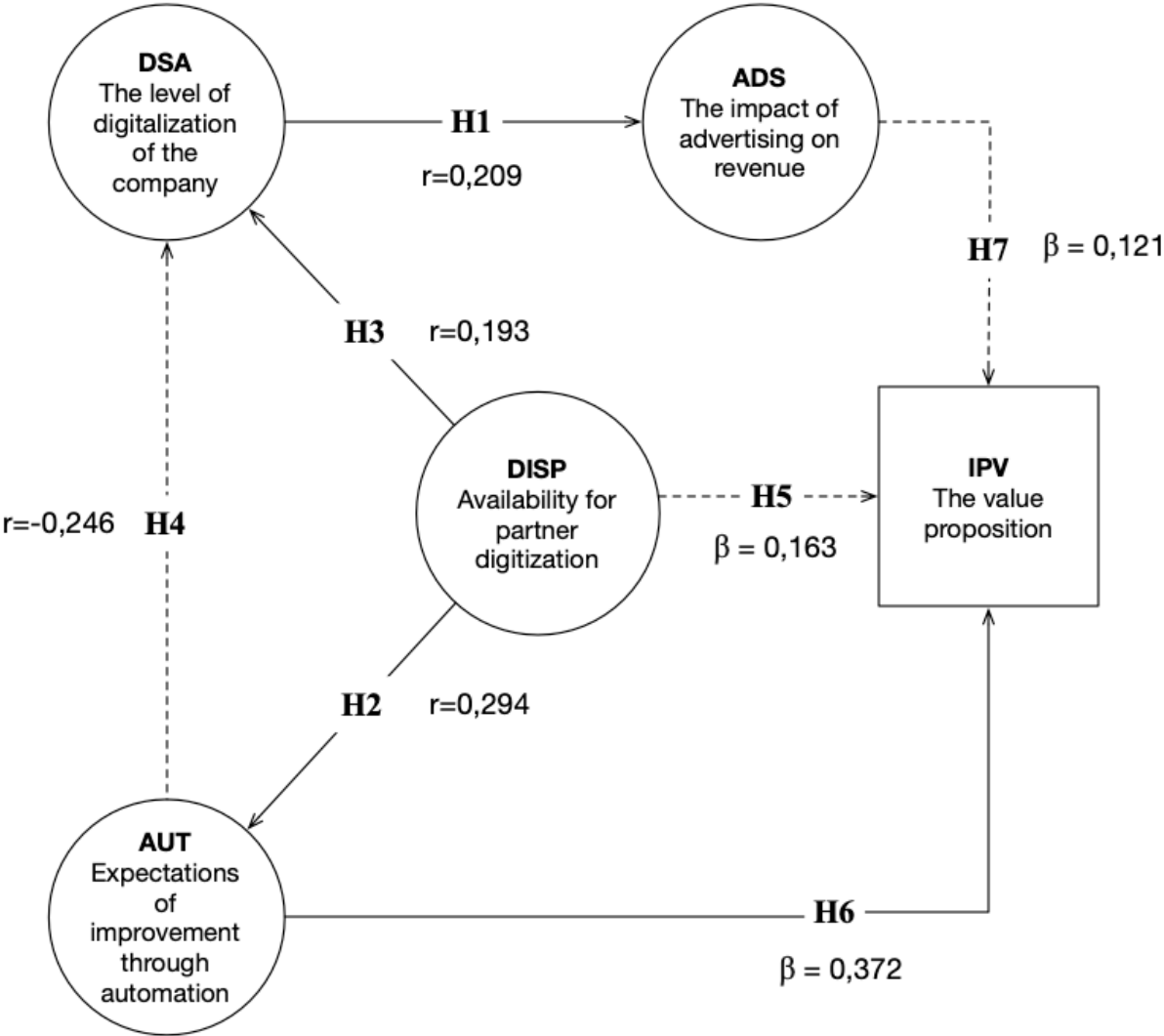


**Fig. 5.5 - Conceptual model diagram (generated using the AMOS program)**

*Source: Own contribution*

As a result of the research carried out, the following results were obtained for the evaluation of the proposed assumptions. In figure 5.14, the statistical results obtained from the evaluation of the proposed model can be observed. Valid hypotheses were marked with a continuous line, while invalidated assumptions were marked with a dotted line.

Of the 7 hypotheses, 4 were confirmed by positive correlations with moderate values. H1, H2, H3 and H6 are confirmed by correlations with an above-average level. H4, H5 and H7 are hypotheses that are not statistically confirmed. A visual representation of the results of the validation of the assumptions is shown in Figure 5.14.



**Fig. 5.6 - Structural model for validating assumptions**

Note: The dotted lines represent assumptions that are not confirmed, the numeric values indicate the value of the correlation.

Source: Own contribution

## **CHAPTER 6. DESIGNING THE GAS SYSTEM FOR IMPROVEMENT OF THE INTERCONNECTION CAPACITY**

As a result of the research carried out, a system that allows the use of a unique taxonomy is proposed. This system can be embedded in e-commerce applications, necessary for an online store, or it can be extended to be used in other areas of interest. The system can be put into operation with the help of any type of format that allows the storage of structured data. IT&C specialists will be able to make interconnections through API systems in XML, JSON, CSV format or even by writing directly to the database in the case of applications that are not equipped with more complex interconnection systems.

By proposing this system of classification of the business environment, the simplification of the connection process of online platforms is intended. The main objective of the system is to digitize current operations so that business models are improved.

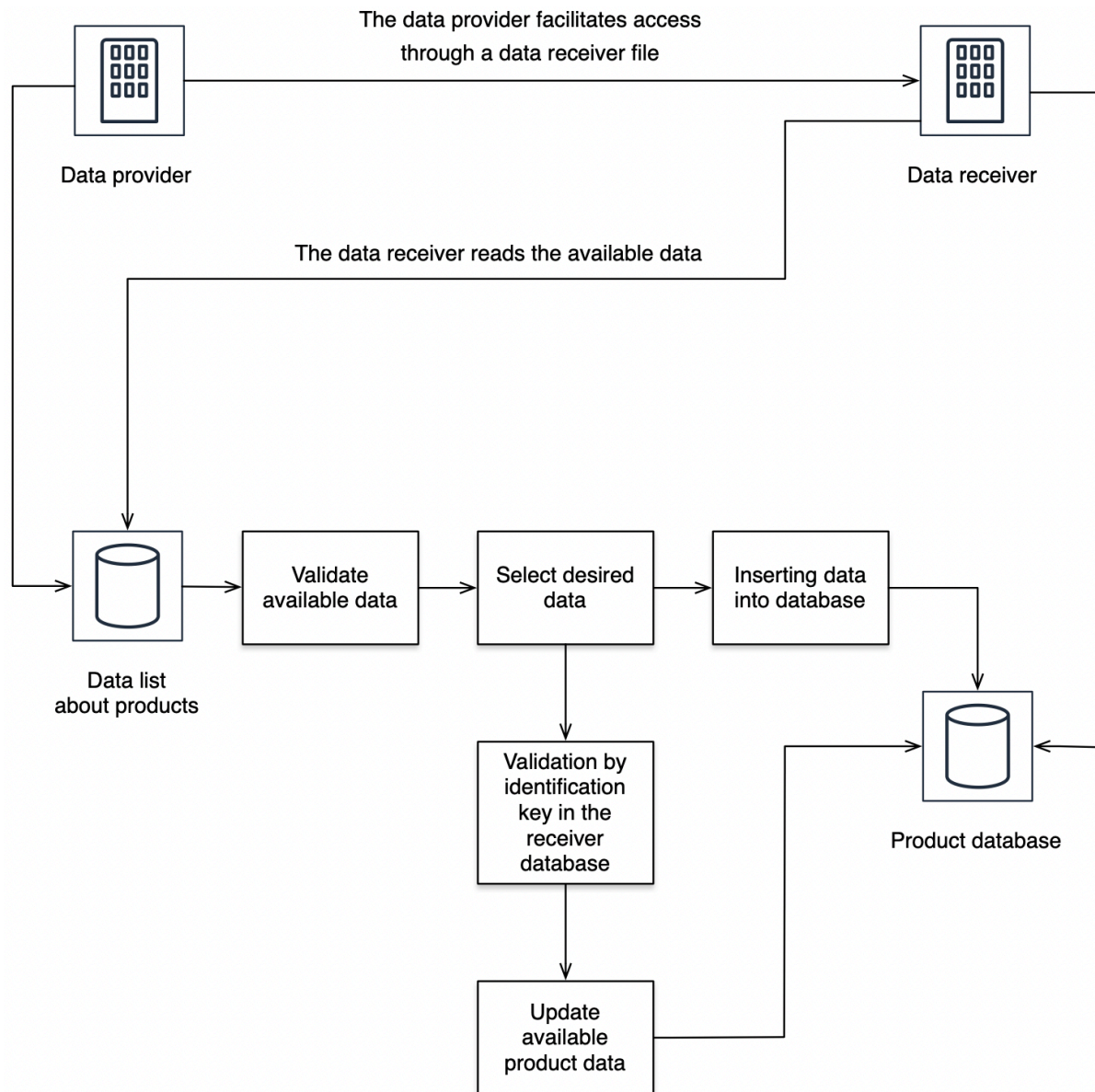
The technology can be used more efficiently than today, as long as the IT systems can be connected more easily to achieve common goals. The proposed communication system is called GAS (Global API Sync). The languages and platforms that are already used by the business environment will be at the basis of this system. Every business will have the opportunity to incorporate the interconnection capacity to improve its digital processes. GAS also has the potential to become a stand-alone business model. The use of a single taxonomy offers new opportunities to do business through the cross-cutting integration of digital platforms of different origins.

To exemplify the processes that can be optimized, a typical product update process between two different computer applications has been created in figure 6.1. The represented process contains the key steps by way of which a product is transferred or updated between the two systems. In the presented diagram you can see the steps that the algorithm executes to reach the final result.

Figure 6.1 explains how the supplier's system provides product data to another system. The receiving system chooses which data to use to update its already listed products or to improve its commercial offer.

Currently, such applications are used in the case of online stores that use the business model involving delivery from the supplier, in the case of marketplace type online stores or in the case of businesses that sell products to the final customer. The number of such integrations is theoretically unlimited. It does, however, depend on the technical capabilities of the electronic store platform and the server where it is hosted. For the implementation of such a process, both the persons with decision-making power and the technical staff of the company are involved. Such a process that runs automatically involves careful testing until the application passes into the production environment.





**Fig. 6.1 - The process of updating product data between two computer systems**

*Source: Own contribution*

### **Utilization of the GAS system for building a potential business model**

The GAS system can contribute to the development of other business models and subsequently become a business model in its own right. Designing a system that ensures easy interconnection can bring value to all parties that trade data. The implementation of this system as open-source offers the opportunity to provide technical solutions that facilitate the easier transfer of data and relieve the companies' staff from repetitive work. This business model is addressed to companies in the digital environment and brings multiple benefits to the final customer by improving the value proposition. A possible business model that incorporates GAS is presented in the form of the "Canvas" business model in figure 6.3.

Key partners	Key activities	Value proposition	Relation with customers	Customer groups
<ul style="list-style-type: none"> <li>➤ Affiliated web developers</li> <li>➤ Couriers</li> <li>➤ Online payment systems</li> <li>➤ API holders</li> <li>➤ Technology companies</li> </ul>	<ul style="list-style-type: none"> <li>➤ Designing an extensible/modular system</li> <li>➤ Improving the data transfer protocol</li> <li>➤ Aggregating data of the same type into a single convertible format</li> <li>➤ Marketing of modules compatible with the GAS system</li> <li>➤ Development and extension of the communication standard</li> </ul>	<ul style="list-style-type: none"> <li>➤ Global communication system between different APIs</li> <li>➤ Fast and real-time data migration to different systems</li> <li>➤ Protection and security of manipulated data.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Self-service through clear documentation and concrete examples</li> <li>➤ Support services through affiliate partners</li> <li>➤ Online groups and forums</li> </ul>	<ul style="list-style-type: none"> <li>➤ Producers</li> <li>➤ Importers</li> <li>➤ Distributors</li> <li>➤ Online shops</li> <li>➤ Marketplace systems</li> <li>➤ Marketing specialists</li> <li>➤ Web developers</li> </ul>
	<b>Key resources</b>		<b>Channels</b>	
	<ul style="list-style-type: none"> <li>➤ IT infrastructure and software</li> <li>➤ Affiliated software developers</li> </ul>		<ul style="list-style-type: none"> <li>➤ Marketplace for web applications</li> <li>➤ Own website</li> <li>➤ Social media</li> <li>➤ Push notifications</li> </ul>	
<b>Cost structure</b>		<b>Revenue sources</b>		
<ul style="list-style-type: none"> <li>➤ Costs for development of applications that are compatible with each system</li> <li>➤ Costs of equipment that processes data at the request of customers</li> <li>➤ Costs of promoting this standard</li> </ul>		<ul style="list-style-type: none"> <li>➤ Selling applications that facilitate the integration of this system with electronic commerce platforms</li> <li>➤ Renting equipment that stores and processes data according to the APIs of each compatible system</li> <li>➤ Consultancy and audit for the accession of API systems to the new proposed system</li> <li>➤ Obtaining financing and sponsorships to promote this system in order to simplify the transfer of data with technology companies that process large volumes of data</li> <li>➤ Application development commission from affiliated developers</li> </ul>		

**Fig. 6.2 - Presentation of the business model that can be implemented by launching the GAS system**

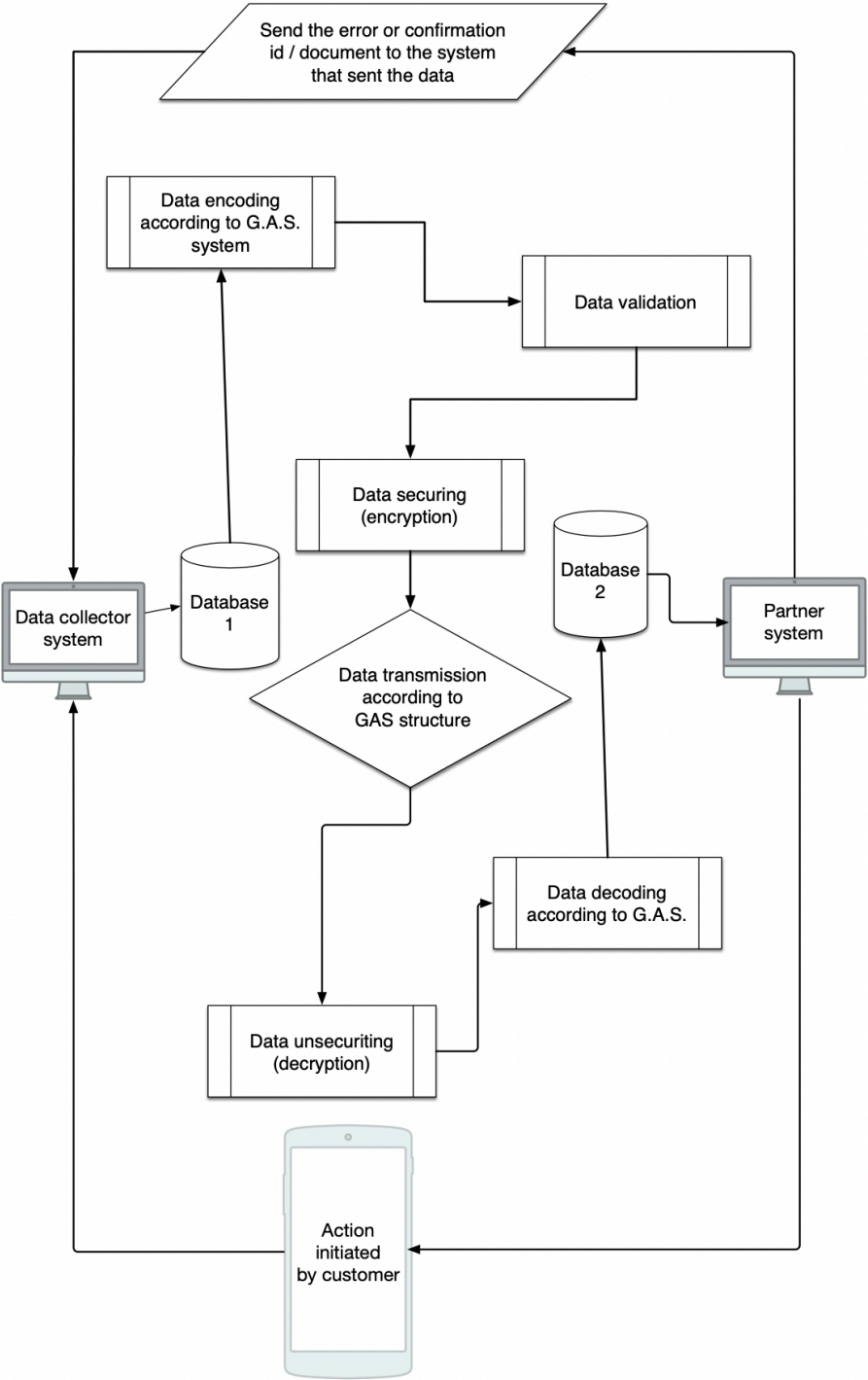
*Source: Own contribution in each dial, figure filled in following the business model "Canvas" AG, 2018. Strategyzer.com.*

In order to improve the interconnection capacity of digital data processing systems, the building of a communication system that can be adopted in open-source mode is proposed. The system can be integrated by technology companies and independent developers who manage platforms that constantly need new interconnections.

All these communication processes through different systems and technologies, are performed through the availability of programming languages that usually use API integrations. Because API systems have the ability to send and receive data, they have generated the availability to create complex mechanisms. Hardware and software systems are constantly adapted, even if they have not been designed to be equipped with APIs.

Figure 6.8 exemplifies the mechanism through which the GAS system works, the trigger

of the mechanism being an action initiated by a customer. The process generated as a result of the customer's action is received, the values being stored in the database of the data collector. The data is encoded in the proposed language and transmitted in the format agreed and stored in the partner's database. In the next step the data will be interpreted by the partner system and it will send the necessary data to the customer.



**Fig. 6.3 - Diagram of operation of the GAS system**

*Source: Own contribution*



The categories of data to be included in this digital communication system are presented in 6.9. The data shall be grouped in such a way that each component is representative of the name of the list in which it will be included.

**Table 6.1 - Data categories of the GAS system**

No.	Gas name	Detailing the types of data that can be processed
1.	„gas_products”	Data that characterizes a physical or virtual product. These data contain standard elements as well as data types adapted to each listed product.
2.	„gas_groups”	Data about the classification of a product, person, organization, action, or notification. Data of this type describes the category in which the product may be included.
3.	„gas_persons”	Personal data that relate strictly to an individual. Personal data may be used for the rendering of services or the delivery of goods.
4.	„gas_membership”	Data that identifies a person's membership in a group or organization. The group includes data about the organization listed for use in different digital process automations.
5.	„gas_actions”	Data that defines the actions necessary to initiate certain processes between different systems that adopt this standard.
6.	„gas_notifications”	Notifications and messages transmitted through various online communication channels.

*Source: Own contribution*

As a result of the research carried out, it was noticed that in case of the business model for online stores, the key partners are the suppliers of products, courier companies, companies that develop the online commerce platform, advertising providers and specialized service providers. The needs of an online store increase the more the online store develops, the store needing numerous specialized services and integrations with partners.

With respect to key activities, the activities of supplying products, displaying products in the store offer, processing the orders received, promoting the offer, communicating with customers and delivering products were identified. Much of these key activities are time-consuming and financial resource-consuming, but can be optimized.

The key resources that an online store requires are represented by the company's staff and external collaborators. Within the key resources required are also included the operating equipment necessary for packaging and processing orders, storage space and the portfolio of products available in stock.

The digital market has generated a strong competitive environment because geographical barriers at national and even international level are not a major impediment. For this reason, the value proposition is very important. A potential customer can choose in a few seconds the store where they want to make the purchase based on the marketing mix built around the value proposition.

In case of distribution channels, a business model characteristic for the activity of an

online store can distribute the products through courier companies both nationally and internationally. The company can deliver the products through distributors, offer the possibility of picking up the products from the headquarters or can use delivery services employing disruptive technologies.

The research carried out among entrepreneurs in Romania has identified different weights of the analyzed groups of clients (individuals, legal entities, traders, clients with atypical requests and needs for personalized offers, clients making the purchase through public auctions), but all of them can benefit from the advantages of digitalization.

The GAS system was created as a result of the researches performed on electronic commerce entrepreneurs. It aims to provide a practical perspective on how data is transferred inside and outside the company, using pre-existing technical solutions.

The use of this system can simplify the way entrepreneurs use the technology available within their business. This is a key element for improving the business model.

The proposed system can be embedded in multiple existing business models and is adaptable to any digital communication system because it uses text formats.

The proposal for this system arose from the analysis of the needs of the online stores, their partners and the online platforms currently in use. From the perspective of the technical resources needed to propose this system, it can be seen that the technology and programming languages are performant, but the systems proposed so far do not fit the activity of online stores.

The analysis of the existing solutions reveals that some data structures are too simple and do not fully cover the needs of an online store, while other structures are morally impaired or have an extremely high complexity.

The novelty of this solution is given by a balanced recipe between the simplicity of using such a concept and its applicability in the electronic commerce businesses.

The xml schemes presented aim to improve components of the "Canvas" business model by developing new functionalities specific to each business. For exemplification purposes, diagrams of how to use it in various processes were included, as well as the architecture of each class of data graphically presented in the previous figures.

The 6 groups of GAS data refer to data about products, groups, people, members, actions and notifications. These classes of data are grouped under a clear, simple, and repeatable structure. They can be improved by each company. By incorporating this technology, the activity of companies can be simplified, sales can be increased or operating costs reduced.

## CHAPTER 7. VALIDATION OF THE GAS SYSTEM FOR THE IMPROVEMENT OF ONLINE OPERATIONS

This penultimate chapter of the paper presents the way in which the GAS system has been validated. Following the research, the entrepreneurs' opinions about the system and the components related to this system were obtained. Due to the qualitative research, it was also possible to obtain recommendations that can help determine the direction of development of the system. Furthermore, the proposed system has been implemented in 3 companies, where it has been used for a period of between 6 to 24 months to help digitize operations.

For the public launch of the GAS system, a *"Pilot study for establishing the acceptance of the system"* was carried out. The proposed system can be integrated and includes the necessary components, but for it to be successful, it must also be accepted by decision-makers. The current research aims to analyze the issue of acceptance of the proposed system, the general objective being to identify the opinion of entrepreneurs concerning the acceptance of the GAS system, the perceived value and the possibilities for improvement.

Qualitative research methods can be used as independent techniques as the investigation's topic of discussion requires an in-depth understanding of a complex culture, of the psychological motivation and of the behavioral motivation. Quantitative research can be superficial or neglect certain responses from consumers, obtaining the comprehended results and not the true reasons for the purchase decision (Hair, et al., 2016).

For the conducting of this pilot study, qualitative research was chosen. Since the analyzed field is quite extensive, the focus group uses both open questions, assisted by the moderator, and the Q-Sort method. 7.1 briefly presents the key elements of the pilot study conducted.

**Table 7.1 - Pilot study for gas system validation**

Key elements	Details
<b>Sample</b>	<ul style="list-style-type: none"> <li>▪ Decision-makers who run at least one online store</li> </ul>
<b>Research methods</b>	<ul style="list-style-type: none"> <li>▪ Q-Sort method</li> <li>▪ Focus group method</li> </ul>
<b>Tracked items</b>	<ul style="list-style-type: none"> <li>▪ The desire to benefit from opportunities through digitalization</li> <li>▪ Identifying the most important advantages of GAS</li> <li>▪ Validation of the proposed structure and its improvement</li> <li>▪ Identify possible problems that may prevent the adoption of this language</li> </ul>
<b>Instruments</b>	<ul style="list-style-type: none"> <li>▪ Focus group interview guide</li> <li>▪ Q-Sort method application grid to identify attractive components that can be improved in the "Canvas" business model</li> <li>▪ Q-Sort method application grid to identify the attractive components that can be used within the GAS system</li> </ul>

*Source: Own contribution*

On 26 June 2019, the focus group for identifying whether the GAS system can be

accepted by online entrepreneurs was organized. The focus group was divided into two sessions. In this way, there was the possibility to understand the proposed system, to take qualitative information about the acceptance of such a system and, finally, to obtain opinions that can help to successfully implement it in small and medium-sized enterprises.

Using the Q-Sort grid, information was requested from store managers who participated in the research. Figure 7.2 shows the organization of the room where the research was carried out and how the Q-Sort method was applied. Each participant had use of tokens extracted from the benefits brought from the improvement of the "Canvas" business model.



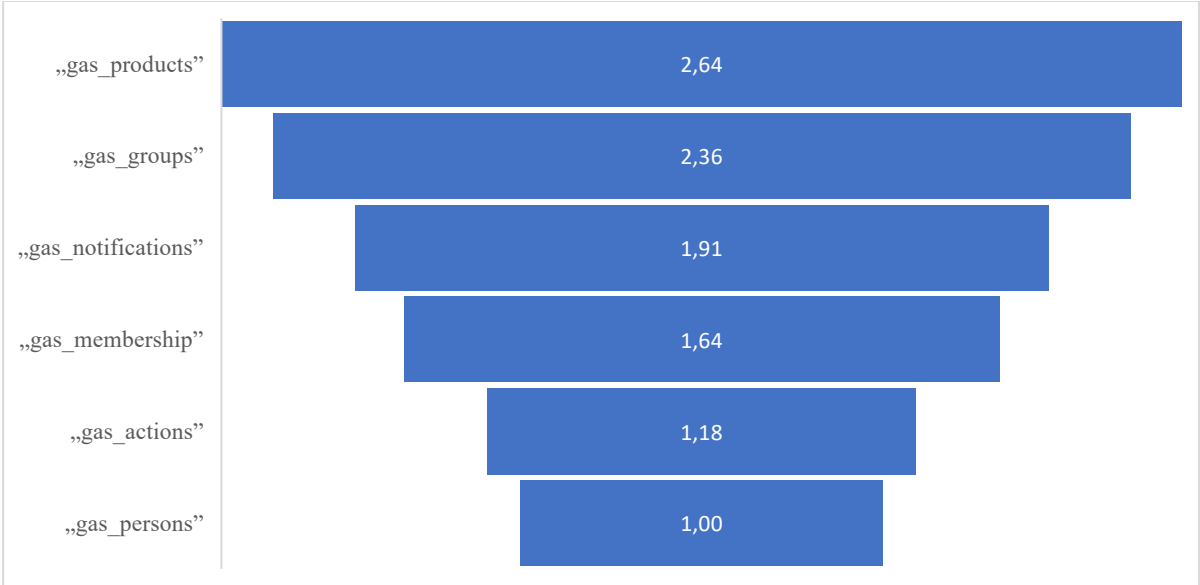
**Fig. 7.1 - Implementation of qualitative research using the Q-Sort method and the "Canvas" business model**

*Source: Own contribution*

After identifying and raising awareness with respect to the perceived benefits, in the second part of the focus group the GAS system was explained for each of the 6 data structures. After this presentation, the second Q-Sort grid was completed. In this way, it was revealed how decision-makers in the companies invited to the focus group perceive the importance of certain classes of data.

After completing the Q-Sort matrix, it was seen that the average of the responses of the 11 participants was divided between the value 0 and the value 3. The most attractive elements

of those presented were for the "gas\_products" and "gas\_groups" data structure. Elements with medium attractiveness were "gas\_notifications", "gas\_membership" and "gas\_actions". Only in case of "gas\_persons", which can store personal data, there was a neutral position. Figure 7.5 presents the respondents' average interest in each element that makes up the digitalization system proposed for the rapid transfer of data.



**Fig. 7.2 - The interest of respondents in the components of the GAS**

*Source: Own contribution*

The sorting exercises using the Q-Sort method helped to raise awareness of the needs to quickly transmit data between the systems used, a fact also confirmed in group discussions. Participants consider that improving customer satisfaction and quality of service is a priority that can only be achieved by accelerating the speed of operation. Most of them believe that the integration with an SMS message forwarding operator would increase the rate of concretization of an order and reduce the refusal rate of the packages in the stores they manage.

Another opportunity identified is to increase revenue by marketing a wider range of products. The use of the "gas\_products" and "gas\_groups" schemes is an accepted solution, a fact also confirmed by the obtaining of a high score. Four of the participants consider that a direct connection between online stores and social networks, which allows for the automatic promoting of the company's offer, is necessary.

Most participants want more effective advertising for their business, but they don't know the variety of data that needs to be provided to advertising companies to promote successful messages.

Almost all participants state that employees demand unreasonably high salaries comparative to the income they can generate during the work hours. For this reason, entrepreneurs want businesses with few employees in order to operate in profitable conditions.

A free discussion was held within the focus group, which concluded that the need for digitalization exists, but it is not very clearly defined. Much of the opportunities for digitalization are not known or not sufficiently exploited.

Due to the numerous opinions and suggestions taken over, scenarios and examples have been identified that can be implemented with the help of the proposed data structures. Through the qualitative research carried out, the validation of the participants regarding the GAS system and the confirmation of the fact that this system can be used to improve the value proposition of the business models was obtained.

Considering the research carried out, figure 7.6 highlights the improvements that can be made to online business models through the use of the GAS system. Since the model is flexible, we can consider that the benefits presented are only a limited part of the benefits it can bring to small and medium-sized enterprises.

Key partners	Key activities	Value proposition	Relations with customers	Customer groups
<ul style="list-style-type: none"> <li>➤ It increases the speed of integration with the company's partners.</li> <li>➤ Integrations with key partners can be reused.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Repetitive activities will be carried out faster, without the involvement of the human factor.</li> <li>➤ You can deploy new tasks that use the available data.</li> <li>➤ Increases the efficiency of recurrent activities.</li> </ul>	<ul style="list-style-type: none"> <li>➤ The customer benefits from several options and services.</li> <li>➤ Increases the speed of serving customers.</li> <li>➤ The value proposition becomes more complex and adapted to current needs.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Increases the degree of personalization of communication with customers.</li> <li>➤ Communication with customers becomes faster.</li> <li>➤ Customers can be informed faster through integration with other marketing systems.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Increases the accuracy of the customer grouping.</li> <li>➤ Customers can be more easily identified based on their membership in a group.</li> <li>➤ New groups of customers can be created based on the available data.</li> </ul>
	<p style="text-align: center;"><b>Key resources</b></p> <ul style="list-style-type: none"> <li>➤ The human resource is relieved of repetitive activities.</li> <li>➤ Existing equipment is used more rapidly.</li> </ul>		<p style="text-align: center;"><b>Channels</b></p> <ul style="list-style-type: none"> <li>➤ Multiple distribution channels can occur by working with multiple partners.</li> </ul>	
<b>Cost structure</b>			<b>Revenue sources</b>	
<ul style="list-style-type: none"> <li>➤ Reducing the costs with each integration with a new partner.</li> <li>➤ Reducing the costs generated by the human factor.</li> <li>➤ Reducing the costs generated by the realization of new software integrations.</li> <li>➤ More efficient use of marketing budgets.</li> </ul>		<ul style="list-style-type: none"> <li>➤ Increasing the sales by diversifying the offer.</li> <li>➤ Increasing the customer base and orders by providing a more advantageous value proposition.</li> <li>➤ Increasing the revenue by increasing customer loyalty.</li> </ul>		

**Fig. 7.3 - Improvements to business models through the use of the GAS system**

Source: Own contribution for the contents of each dial, figure filled in following the "Canvas" Strategyzer AG model, 2018



The pilot study included entrepreneurs from companies that own an online store in various market niches. The objectives set were as follows: (i) to determine whether the needs of the participating entrepreneurs coincide with those identified on the basis of quantitative research, and (ii) to verify that the GAS system is accepted and can bring value to the business model.

In order to achieve the objectives, the Q-Sort and focus group methods were chosen, these being two useful methods for a relevant qualitative research. The Q-Sort method used elements from the structure of the "Canvas" business model created for the analyzed activity. Participants received a "Canvas" structure adapted for an online store and a variety of opportunities that they can use to improve their business.

Following the analysis, it was noticed that the priorities of the entrepreneurs are to improve the quality of services, increase customer satisfaction and increase the revenue flow by expanding the product portfolio and increasing the capacity and speed of operation.

The interest in GAS schemes was higher in product data, groups and notifications. It can be ascertained that the processing of personal data was not of such great interest, a situation clarified in the second part of the research where the focus group method was used.

By creating the focus group, starting from a few questions to open the conversation, it was seen that each participant had different processes, flows and systems in the company. Although at the generic level they had a similar activity, the concrete way of carrying out the activity is unique.

Following the introduction of GDPR legislation, the processing of personal data for marketing purposes is no longer so desirable because there are many restrictions on processing activities that can be violated unintentionally which can expose the company to the risk of considerable fines.

The focus group continued by detailing the processes that happen daily in the online stores managed by the participants. Following these discussions, which were centered on the GAS system, the operating models presented above were created and digitization methods were identified which were visually represented and improved by the Global API Sync system.

The final testing was carried out within 3 companies that each made available 2 online store platforms. Thus, it was possible to identify various technical problems that were solved during the implementation, as well as numerous immediate commercial benefits.

As a result of the researches and technical tests carried out, the feasibility of the GAS system is ascertained, this system being capable of being published online in Beta version to be adopted by the international community of entrepreneurs and programmers.

## **CHAPTER 8. CONCLUSIONS, CONTRIBUTIONS, PERSPECTIVES AND FUTURE DIRECTIONS OF THE RESEARCH**

The last chapter of the paper presents a synthesis of the conclusions of the research and highlights the contributions made to the development of online business models. High competitiveness in the digital environment creates the need to quickly improve existing business models. A summary of the contributions made at each stage of the paper is to be presented.

### **C<sub>1</sub> – Identifying the particularities of an online store and the key elements according to the "Canvas" business model**

- Making a classification of electronic stores according to the main activity type;
- Creating a generic business model for online sales systems, based on the structure of the "Canvas" business model;
- Identifying ways to improve the generic model of an online store by improving the interconnection capacity;
- Analysis of the stages of the process for making a transaction within an electronic commerce store from the moment of publication of the offer to the delivery of the ordered goods;
- Identification of the types of data processed depending on the status of the order;
- Analysis and presentation of the steps that facilitate the operation of an online sales platform to identify the points where the interconnection capacity can be improved;

### **C<sub>2</sub> - Conducting a technical analysis that identifies the main ways of interconnecting electronic commerce platforms**

- Identification of technical solutions for the interconnection of digital sales platforms;
- Conducting multilayer analysis on the elements that support online sales systems;
- Identification of the steps taken to adopt a new digital system;
- Identification of the frequently used trade platforms at international level by performing the "*Comparative analysis of e-commerce platforms*";
- Development of a performance indicator called PSKPI and selection of electronic commerce platforms that are successful on the international market according to the proposed indicator;
- Identifying the technical resources available for the adoption of a new interconnection system in the existing online sales platforms;

### **C<sub>3</sub> - Identification of business development opportunities using online sales systems through exploratory research**



- Obtaining information about how entrepreneurs want to develop their business in the online environment by conducting the "*Pilot study to determine the need for improving online business models*";
- Identifying the operations that the staff of an online store performs to process an order;
- Identifying strategies for digital business development from the perspective of people with decision-making power in the analyzed companies.

**C<sub>4</sub> - Identification of potential solutions to improve an online store by using the "Canvas" business model**

- Design and implementation of "*Research to identify potential solutions for improving online business models*";
- Obtaining and analyzing statistical data about the current state of the targeted business models;
- Extracting the results necessary for improving the interconnection capacity;
- Data modeling through structural equations and creating the conceptual model for validating hypotheses;

**C<sub>5</sub> - Design of the GAS system ("Global API Sync")**

- Designing a complete system that can be proposed in open-source regime to improve the interconnection capacity;
- Designing a business model that can support and incorporate the GAS system;
- Presentation of components that improve business models according to the "Canvas" business model;
- Establishing the competitive advantages of the GAS system over the existing systems;
- Realization of the data architecture of the GAS system, architecture divided into 6 classes of data ("gas\_products", "gas\_groups", "gas\_persons", "gas\_membership", "gas\_actions" and "gas\_notifications");
- Defining the operation and possibilities of extending the proposed model;

**C<sub>6</sub> - Validation of the GAS system (Global API Sync) and deployment in the production environment**

- Obtaining a favorable result regarding the acceptance of GAS by conducting the "*Pilot study for establishing the acceptance of the system*";
- Identifying the attractiveness of each data class included in the GAS system;
- Identifying the main benefits from the perspective of entrepreneurs;
- Identifying possible problems and fears regarding the use of the system;
- Obtaining possible use scenarios for online business models;
- Testing the solution proposed within 3 companies in the production environment for a period between 6 to 24 months;

## LIST OF PUBLISHED WORKS

The papers presented below have been published in the framework of national or international scientific events. They reflect the scientific activity carried out during doctoral studies and the dissemination of research results. So far, the following papers have been published:

- 1 scientific article published in an ISI indexed journal;
  - 14 scientific articles published in the volumes of national and international scientific events indexed by ISI;
  - 4 scientific articles published in BDI indexed journals;
  - 6 scientific articles published in the volumes of national and international scientific events indexed by BDI.
  - 1 article published in unindexed specialized books.
- 
- *Scientific articles published in ISI indexed journals*

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- *Scientific articles published in the volumes of national and international scientific events indexed by ISI*

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