SOLUTIONS BASED ON THE INTERNET OF THINGS IN DISTRIBUTION CHANNELS AND THEIR INFLUENCE ON THE ELEMENTS OF THE BUSINESS MODEL

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ABSTRACT

Objective: The objective of this study is to analyze how the implementation of solutions based on the Internet of Things in the distribution channels of Distribuidora Cereal Goiano influences the elements of the business model.

Theoretical Framework: In this topic, the main concepts and theories that underpin the research are presented. The Business Model, Logistics and specifically the Distribution Channels and the Internet of Things stand out, providing a solid basis for understanding the research context.

Method: The methodology adopted for this research comprises qualitative research. Data collection was carried out through semi-structured interviews, spontaneous observation and documentary sources.

Results and Discussion: The results obtained reveal that the elements of the Goiano Cereal Distributor's business model are positively influenced by the implementation of solutions based on the Internet of Things in the distribution channels, or that it maximizes the efficiency and effectiveness of the studied company.

Research Implications: The practical and theoretical implications of this research are discussed, providing insights into how the results can be applied or influence practices in the field of logistics and the application of IoT solutions. These implications may include distribution of consumer goods, planning logistical routes and distributing food more efficiently.

Originality/Value: This study contributes to the literature by demonstrating the applicability of solutions based on IoT technologies for solving logistical problems. The relevance and value of this research are evidenced by the way in which these solutions generate efficiency gains for logistics managers.

Keywords: Internet of Things (IoT), Distribution Channels, Business Model, Logistics, Operational Efficiency, Food Distribution.

SOLUÇÕES BASEADAS EM INTERNET DAS COISAS NOS CANAIS DE DISTRIBUIÇÃO E SUA INFLUÊNCIA NOS ELEMENTOS DO MODELO DE NEGÓCIO

RESUMO

Objetivo: O objetivo deste estudo é analisar como a implantação de soluções baseadas em Internet das Coisas nos canais de distribuição da Distribuidora Cereal Goiano influencia nos elementos do modelo de negócio.

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Referencial Teórico: Neste tópico, são apresentados os principais conceitos e teorias que fundamentam a pesquisa. Destacam-se o Modelo de Negócio, a Logística e especificamente os Canais de Distribuição e a Internet das Coisas, fornecendo uma base sólida para a compreensão do contexto da investigação.

Método: A metodologia adotada para esta pesquisa compreende uma pesquisa qualitativa. A coleta dos dados foi realizada por meio de entrevistas semiestruturadas, observação espontânea e fontes documentais.

Resultados e Discussão: Os resultados obtidos revelaram que os elementos do modelo de negócio da Distribuidora Cereal Goiano são influenciados positivamente pela implantação de soluções baseadas em Internet das Coisas nos canais de distribuição, o que maximiza a eficiência e eficácia da empresa estudada.

Implicações da Pesquisa: As implicações práticas e teóricas desta pesquisa são discutidas, fornecendo insights sobre como os resultados podem ser aplicados ou influenciar práticas no campo da logística e da aplicação de soluções IoT. Essas implicações podem abranger distribuição de bens de consumo, planejamento de rotas logísticas e a distribuição de alimentos de maneira mais eficiente.

Originalidade/Valor: Este estudo contribui para a literatura ao demonstrar a aplicabilidade de soluções baseadas nas tecnologias IoT para a solução de problemas logísticos. A relevância e o valor desta pesquisa são evidenciados pela maneira como essas soluções geram ganho de eficiência aos gestores logísticos.

Palavras-chave: Internet das Coisas (IoT), Canais de Distribuição, Modelo de Negócio, Logística, Eficiência Operacional, Distribuição de Alimentos.

SOLUCIONES BASADAS EN INTERNET DE LAS COSAS EN LOS CANALES DE DISTRIBUCIÓN Y SU INFLUENCIA EN LOS ELEMENTOS DEL MODELO DE NEGOCIO

RESUMEN

Objetivo: El objetivo de este estudio es analizar cómo la implementación de soluciones basadas en Internet de las Cosas en los canales de distribución de Distribuidora Cereal Goiano influye en los elementos del modelo de negocio.

Marco Teórico: En este tema se presentan los principales conceptos y teorías que sustentan la investigación. Se destacan el Modelo de Negocio, la Logística y específicamente los Canales de Distribución y el Internet de las Cosas, brindando una base sólida para comprender el contexto de la investigación.

Método: La metodología adotada para esta pesquisa compreende uma pesquisa qualitativa. A coleta dos dados foi realizada por meio de entrevistas semiestruturadas, observação espontânea e fontes documentais.

Resultados y Discusión: Los resultados obtenidos revelan que los elementos del modelo de negocio de Distribuidora Cereal Goiano están influenciados positivamente en la implantación de soluciones basadas en Internet de las Coisas en los canales de distribución, o que maximizan la eficiencia y la eficacia de la empresa estudiada.

Implicaciones de la investigación: Se discuten las implicaciones prácticas y teóricas de esta investigación, proporcionando información sobre cómo los resultados pueden aplicarse o influir en las prácticas en el campo de la logística y la aplicación de soluciones de IoT. Estas implicaciones pueden incluir la distribución de bienes de consumo, la planificación de rutas logísticas y la distribución de alimentos de manera más eficiente.

Originalidad/Valor: Este estudio contribuye a la literatura al demostrar la aplicabilidad de soluciones basadas en tecnologías IoT para la resolución de problemas logísticos. La relevancia y el valor de esta investigación se evidencian en la forma en que estas soluciones generan ganancias de eficiencia para los gerentes de logística.

Palabras clave: Internet de las Cosas (IoT), Canales de Distribución, Modelo de Negocio, Logística, Eficiencia Operacional, Distribución de Alimentos.

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1 INTRODUCTION

The Internet of Things has attracted a lot of attention, especially from technology professionals, as it is seen as a new way of introducing innovative electronic features to products and services throughout the world market. The term Internet of Things means the ability of objects to interconnect through the use of the internet, performing their functions with minimal or no human interference; it provides several solutions in the areas of leisure, construction, domestic and business areas (Gomes & Bergamo, 2018).

In the 1980s, activities and initiatives similar to those currently carried out with the Internet of Things were already called ubiquitous, pervasive, calm computing and environmental intelligence. In 1999, the Internet of Things theme began to gain greater visibility and the number of research based on the subject began to increase significantly, where the term was used for the first time to define the interconnection between objects that operate in digital networks, with the aim of to provide real-time data whether automated or not, which could then be transformed into information that assists in decision-making in specific departments (Dos Santos et al., 2015).

The authors Galegale et al. (2016) corroborate Dos Santos et al. (2015) stating that the applications of the Internet of Things in business mainly benefit supply chain management, as by connecting objects to smart sensors, they will be able to collect information on the situation involved, enabling the manager to make decisions in real time. Due to the new concentration of the internet, the so-called Internet of Things, various accessories and other objects have the possibility of connecting in a network, relating to each other, making it possible to perform their functions without human interference in the use of these objects (Gomes & Bergamo, 2018).

When observing the degree of automation that the Internet of Things is capable of providing to an object, the possibility of implementing it in the distribution channels of the company studied is noted. In this way, it opens up the need for a more in-depth study on the aforementioned subject that the research proposes, which can guarantee optimization in the company's processes and also a new perspective for the science of administration. Given this, the research object is presented with a case study of a distributor. This is a wholesale food company located in the municipality of Dom Eliseu – PA, whose main activity is physical distribution, that is, it stores, prepares orders and transports finished products without transforming them. This company brings a new case of academic research to management science, adding new experience and scientific knowledge to it.

The distributor finds itself in a scenario that seeks to improve its logistics operations...
through the implementation of the Fusion DMS routing system that will be integrated with the Winthor system, an ERP (Enterprise Resource Planning) system already implemented in the company. The routing system assembles the loads and routes to be taken by the vehicles, as well as geomonitoring, where the distribution center can remotely monitor the vehicles on their routes in real time through the internet and sensors attached to the trucks from the company. This study analyzes the implementation of solutions based on the Internet of Things, in this case, the routing system applied in distribution channels, and its influence on the business model of a distributor, with the objective of analyzing how the implementation of Internet-based solutions of Things in distribution channels influences the elements of the business model. In this way, the research becomes relevant because it contributes to the company studied and other wholesale companies in the food sector, also for companies whose core activity is distribution. The case study may also serve as support for future research related to the Internet of Things theme applied to the management of innovative business models.

2 THEORETICAL REFERENCE

2.1 BUSINESS MODEL

The name business model gained strength from the second half of the 1990s, through the processing, storage and sharing of information at reduced costs, mainly aimed at customers of information technology and telecommunications companies, creating a new way of exercising a business (Gomes & Okano, 2019). For Gomes and Okano (2019), contemporary business modeling was considered to provide a new way of thinking about management, making it a relevant contingency factor for the implementation of information and communication technology in organizations, which guaranteed new types of interactions between agents involved in business.

Investment in information technology, according to Marinho et al. (2015), improves the development of companies in terms of productivity, increasing their performance, and becomes a significant value for organizations involved in a given business environment. According to Pereira et al. (2019), there is no agreement in the literature on the definition of what the business model is. However, this work will use the Business Model Generation or Business Model Canvas definition, developed by Osterwalder and Pigneur (2011), where the company logically describes its creation, delivery and capture of value, through nine components that serve as guidance for the implementation of an organizational strategy.
According to Osterwalder and Pigneur (2011), the nine components are crucial to encompass the four main areas of a business, such as: customer segmentation, supply, infrastructure and economic effectiveness, where it is possible to outline organizational strategies, as well as structure systems and processes of a company. These nine interrelated components that make up the Canvas model are: customer segments, value proposition, channels, key partners, key resources, key activities, customer relationships, cost structure and revenue sources (Osterwalder & Pigneur, 2011). According to Bonazzi and Zilber (2014), the nine components of the Canvas Model encompass three pillars of business modeling: (i) value creation, which is governed by the value proposition, key resources, key activities and main partnerships; (ii) value delivery, where it is controlled by channels, customer segment and customer relationship; (iii) capturing value through the cost structure and revenue sources.

Osterwalder and Pigneur (2011) describe that key partnerships, key activities, key resources and cost structure are related to the organization's efficiency, while relationships with customers, channels, customer segments and revenue sources are related to perceived value, by the market. For Bonazzi and Zilber (2014), the Business Model Canvas is the most complete representation compared to other business model theories present in the literature as it treats the internal and external environment of an organization with greater detail and interrelationships between the components. In the following topic, the area of logistics is addressed, a topic closely linked to the present study.

2.2 LOGISTICS

Logistics was considered for a long period as a purely auxiliary activity and not essential for business success. Until recently, logistics was used to assist in operational and marketing activities, performing functions such as transportation, storage, distribution of goods from transformation to consumer (Andrioli et al., 2016). However, this way of perceiving it is changing in recent decades, when it is seen as an increasingly relevant factor in achieving and maintaining competitive advantage in companies, being a strategic part of it.

According to De Souza et al. (2013), the concept of logistics began its applications in the 20th century, mainly concerned with the transportation and distribution of agricultural production. Between the 1940s and 1960s, the logistics process focused on recognizing efficient practices in the flow of materials, as well as in the management of stocks, transportation, purchasing and storage. After a decade, the integrated vision of logistics began, focusing on total costs, information management systems and cost accounting. At the beginning of the
1970s, considered the era of customer focus, the centralization of logistics productivity was noted. And then, between the 1980s and 2000s, the specificity lies in the total management of the supply chain, which will be focused at all times on meeting customer needs (De Souza et al., 2013).

In the term logistics, several elements are added that make it even more comprehensive, that is, it refers to the flows of materials, information and products that encompass all links in the supply chain. Therefore, the chain in which the company operates obtains competitiveness with properly implemented logistics operations (Santos, 2019). It is understood that in the areas of logistics and supply chain management there is a focus on meeting the companies’ greatest objectives, such as offering products in the expected quality specifications, at the appropriate time, in the correct quantity, in the right place, and with constant improvement of after-sales services provided (Faria et al., 2015).

Supply chain management is a grouping of functional activities that have countless repetitions throughout a channel where the raw material becomes a finished product and adds value to the final consumer, that is, the supply chain is integration of all commercial and industrial processes, starting from the final consumer to the initial suppliers, generating products, services and information that add value to customers. In this way, the process must start with him and return to him, balancing the entire supply chain to serve him (Ballou, 2010; Da Silva & Braga, 2018).

The primary objective of logistics is to guarantee a level of service that meets customer needs, reduced total costs, seeking to present more flexibility in logistics practices and more speed in operational administration (Resende, 2017). For Resende (2017), the company's ability to plan and manage its information and supply chain is fundamental, enabling a holistic view of the company's routine activities, as well as that of partner companies. Therefore, to guarantee competitive advantage, companies need to be alert to the design of their interconnected processes, in order to allow efficiency and effectiveness to the entire logistics chain. In the following topic, the topic of distribution channels is addressed, an element directly linked to logistics, where the implementation of solutions based on the Internet of Things is analyzed.

2.3 DISTRIBUTION CHANNELS AND THE INTERNET OF THINGS

Distribution channels concern the way in which products and services move from the factory to the final consumer and, as the goods have little difference between them, the greater the search for efficiency in their distribution (Lemos & Tortato, 2009). According to Lemos
and Tortato (2009), distribution channels are made up of representatives, intermediaries, companies specialized in distribution, wholesalers and retailers. In them, adequate management of the various types of strategies to be used is necessary, because, as the goods flow towards their consumer, there is a grouping of values in relation to the type of good transported and the difficulty in the delivery route.

Distribution strategies are determined based on the company's structure and geographic range of operations, which can be intensive, selective or exclusive distribution. They can be related to the intermediaries of the companies that make up their distribution channels, wholesalers, retailers and the market in which they operate (Kato, 2004). According to Freitas (2019), to choose the most appropriate distribution channels, some factors must be taken into account, such as the characteristics of the product in terms of weight and dimensions, market characteristics in relation to purchasing power and location, training of intermediaries and the advantages and disadvantages of operating without the use of an intermediary in delivering the product to the final consumer.

According to Freitas (2019), there are three classifications for distribution channels: Vertical, Hybrid and Multiple, which are defined based on the way in which products reach the final consumer. Vertical distribution channels are understood as linear process flows in which responsibilities are passed from one channel to another, where the manufacturer and wholesaler do not have direct contact with the end consumer. This contact with the end consumer is made by retailers (Freitas, 2019).

Hybrid distribution channels are comprised of two or more intermediaries in the supply chain. In this type of channel, several simultaneous actions are operated, which increases service efficiency and, unlike the vertical channel, the industry has direct contact with the end consumer (Freitas, 2019). According to Freitas (2019), multiple distribution channels make use of different distribution channels in order to serve different types of end consumers and increase sales volume.

The Internet of Things has attracted a lot of attention, especially from technology professionals, as it is seen as an opportunity to introduce innovative electronic features to products and services in the global market (Santos & Sales, 2015; 2018). In the 1980s, activities and initiatives similar to those currently carried out with the Internet of Things were already called ubiquitous, pervasive, calm computing and environmental intelligence (Dos Santos et al., 2015). For Gomes and Bergamo (2018), the term Internet of Things means the ability of objects to interconnect through the use of the internet, providing various solutions in the areas
of leisure, construction, domestic, business and other areas, which optimizes people's daily lives.

The Internet of Things has the capacity to provide significant changes in the way man and machine interact, reducing non-adaptive interaction obstacles and human limitations. Thus, with improvements in the implementation of the ubiquitous Internet of Things, the use of non-intelligent interfaces will be reduced (Santos & Sales, 2020; 2021; Dos Santos et al., 2015). Weber and Weber (2010) still maintain that, although radio frequency is the most cited technology in the architecture of the Internet of Things, this is not the only technology available. Other application options are wireless sensors, tags (2D and QR code labels) or nanoparticle inks.

For this case study, the concept of Physical Distribution is used, which, according to Ballou (2014), is the branch of logistics that deals with the transportation, storage and processing of orders for finished products, that is, it operates with products that companies do not intend to transform them later. When referring to storage space, Nogueira (2012) states that, to make better use of it, it is recommended to use a stock locator system together with equipment and management programs that are capable of managing all stock within the warehouse, as well as having qualified people to handle these resources. Another element that makes up physical distribution is transportation, which, according to Nogueira (2012), all products from a company need to be moved from one place to another, following the entire supply chain until they reach the hands of the final consumer. This movement can be carried out through multiple combinations of routes, which present peculiar performance characteristics. Transport directly influences delivery time, product safety and service reliability.

To reduce the cost of transport and improve the service provided, the concept of routing is used, which, according to Ribeiro and Machado (2009), is a method that can be implemented in companies using software. The shortest routes method are solutions based on computerized networks, where these routes are maintained in databases and they contain the best paths that vehicles should take. According to Nogueira (2012), to operationalize all these elements of physical distribution mentioned above, there are specific information systems, such as: WMS (distribution center control systems), TMS (transport control system) and ERP (control system) integrated company).

According to Cardoso (2014), devices, such as sensors and actuators coupled to the system controllers, provide the interface between user and system. These controllers are responsible for activating the actuators and monitoring all these sensors. In this way, when the
vehicle enters the system's field of operation, it will be detected by the presence sensors and the reading will be carried out using radio frequency identification. Based on this information received, the controller will activate the actuators, which can be gates and light signals, then, automatically, the vehicle's passage is authorized. According to Penna (2017), all information captured by sensors is sent and stored in the system, and, with the support of maps, the routes where the greatest consumption or waste of fuel occur are traced in real time. In this sense, relevant information is obtained for decision-making and rapid route changes that optimize the arrival of a given vehicle at its final destination.

According to Ramachandra (2016), the application of the Internet of Things to supply channels, in terms of fleet monitoring, can improve control of the speed necessary for the vehicle to reach its destination at the right time. In this way, for example, the sensors and actuators automatically inform the need to increase or decrease the vehicle speed, in numbers, so that the driver does not cause congestion in the organization's entire fleet of vehicles, providing greater fluidity to the logistical routes drawn up by the system. According to Nogueira (2012), in order to increase efficiency and effectiveness in the operations of all the applications mentioned above, the use of ERP is recommended. The ERP system allows the company to integrate and automate its business, covering areas such as finance, logistics, human resources and general administration; with data sharing and standardization of organizational processes, where all these operations are synchronized to the company's database in real time (Hékis et al., 2013).

3 METODOLOGIA

Characterizing the study, it is qualitative research which, according to Sampieri et al. (2013), is qualitative as it aims to assimilate and detail the phenomena, which are studied from the perspective of participants in the natural environment related to the researched context. The research strategy is a single case study which, according to Gil (2017), involves an organization, a group, an individual or a phenomenon. In this research, a single case study was adopted, as it refers to a wholesale company in the food sector, whose main activity is distribution, this characteristic being essential for the research study proposal, which is the implementation of solutions based in Internet of Things in distribution channels.

In this way, the research modality is the rare case study that, according to Gil (2017), taking into account previous information, the case of the distributor fits the specifications of the analysis category. And, because there are no other companies with similar characteristics within
the radius of the researcher's institution, a single case study was adopted. In data collection, a mixed form was used, which, according to Moresi (2003), is the name used to describe a set of questions that are asked and written down by an interviewer face to face with the person interviewed.

As sources of evidence, semi-structured interviews, spontaneous observation and documentary sources were used, in which administrative documents were used in this research, such as: organization chart and service orders. As research validation criteria, two of these criteria were defined according to Yin (2001), which are: construct validity and reliability. In validating the construct, two validation tactics were used. The first tactic used is the use of multiple evidence, such as: forms, interviews, documents and spontaneous observation. While the second tactic used is the review of the report by key informants. In reliability, according to Yin (2001), the tactic of the case study protocol was used, which has all the processes, helping to conduct the research, as well as the norms and actions that the researcher must follow to guide themselves in the case study.

4 PRESENTATION, ANALYSIS AND DISCUSSION OF DATA

The distributor is a wholesale food company located in the municipality of Dom Eliseu – PA, whose main activity is physical distribution. This company has 108 employees divided into four departments, such as: commercial, finance, operations and administrative. Of these 108 employees, 1 is president/director; 7 are managers and 100 are operational.

<table>
<thead>
<tr>
<th>Positions</th>
<th>Functions</th>
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<tbody>
<tr>
<td>Administrative manager</td>
<td>Manage administrative and financial</td>
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<tr>
<td>Commercial Manager</td>
<td>Manage business relationships</td>
</tr>
<tr>
<td>Warehouse Manager A</td>
<td>Operate logistics systems</td>
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<tr>
<td>Warehouse Manager B</td>
<td>Supervise logistics operations</td>
</tr>
<tr>
<td>IT Manager</td>
<td>Manage information and communication technologies</td>
</tr>
<tr>
<td>Financial manager</td>
<td>Manage business finances</td>
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<tr>
<td>Operational Manager</td>
<td>Manage general logistics</td>
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<tr>
<td>Operator A</td>
<td>IT Operator</td>
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<tr>
<td>Operator B</td>
<td>Administrative operator</td>
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<td>Operator C</td>
<td>Logistic operator</td>
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<tr>
<td>Operator D</td>
<td>Logistic operator</td>
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In the current scenario, the company seeks to improve its logistics operations through the implementation of the Fusion DMS routing system. This system assembles the loads and
routes to be taken by the vehicles, as well as geomonitoring, where the distribution center can remotely monitor all its vehicles on their journeys in real time through the internet and sensors attached to the trucks, from the company.

For the reader's information, table 03 lists the generic names of all survey respondents with the date and duration of the interview with each of them. To name them, only their positions in the company in question were used. The operations department is made up of three managers, called Operational Manager, Deposit Manager A and Deposit Manager B, followed by other departments and management: Finance; Administrative; Commercial and IT (Information Technology). While for employees at the operational level, the following names were used: Operator A, B, C and D. In this way, all interviewees in this research are identified.

4.1 FACTORS DIFFICULTING IMPLEMENTATION AND IMPLEMENTATION OF THE FUSION DMS ROUTING SYSTEM

The organization has some characteristics that make it difficult to implement and implement the Fusion DMS routing system, as the employees who operate the system know its purpose in the company. However, they have difficulties operating it correctly, assembling loads and routes. Nogueira (2012) states that there is a need for distribution centers to have qualified people to carry out operations by recording inputs and outputs in the integrated system, in order to avoid inaccuracies.

Warehouse Manager A explains the difficulties encountered in operating the Fusion DMS system: “Our operations could improve through training with more qualified people, with even more knowledge than us, as I believe that our knowledge is not as broad.”

The company has employees who have the expertise to learn how to use the system, however, as there is no adequate training with employees who operate the Fusion DMS system, it makes the implementation and implementation of the system in the organization difficult.

Perceptions about this Fusion DMS system training are expressed by some interviewees:

Operator A: “At Fusion, their training is all done remotely, we had a lot of problems with their support, as we opened a ticket and it took one to two hours to be answered and then it was quickly closed, that’s how their training works.”

Warehouse Manager A: “the Fusion system is quite extensive and the training that was given to us was not well given, the feeling I had was that it was a simple demonstration that was given to us of the system”.
Operator B: “that was a brief presentation, which they called training, but I don’t consider it training”. Therefore, Nogueira (2012), states the need for training employees in the execution of daily operations of management systems within warehouses and distribution centers, since in the case of implementing the Fusion DMS system, training is not adequate for the training of employees who operate it.

In relation to operational employees, such as: drivers, helpers and delivery people; they may be resistant to the new routines that the implementation of the routing system will require, such as the use of Fusion DMS Mobile, an application installed on smartphones compatible with the routing system. In this way, Dos Santos et al. (2015), highlights that the implementation of new technologies aims to improve the relationship between man and machine. The Finance and IT Managers comment on how it could be slowed down, and the consequences of this difficulty for those involved:

[...] This has to come in an accessible way so as not to complicate anyone, I know there will be a difficulty for drivers, because they will have to be following it on their cell phones, carrying out the entire process there, completing the ; that they are starting to make a delivery. I know that human beings are complicated, and we will have difficulty in this matter (Financial Manager).

IT Manager: “you need to have an open mind to new technologies and not see them as something that will make your work difficult, but rather, easier”. Another factor that makes it difficult to implement the routing system in the company is the architecture that does not have maximum coverage for tracking vehicles on their routes, due to the lack of internet connection in some places where vehicles need to make their deliveries. Therefore, the system will not have 100% monitoring of logistics routes until it has connectivity in all locations where trucks need to travel.

In Warehouse Manager B’s argument, the factor that makes implementing the routing system difficult is the following: “In this routing, it depends on tracking, and as we work a lot with rural areas that the system doesn't map, I think it's impossible, at the moment, yes, in our area” (Deposit Manager B).

However, this issue of non-tracking of fleets in rural areas can be resolved through the implementation of GPS tracking and satellite systems, cited by Penna (2017), which maps all locations across the globe.

According to Ramachandra (2016), the application of the Internet of Things to supply channels, in terms of fleet monitoring, sensors and actuators are the components that
automatically inform the center and drivers about necessary actions during journeys, providing greater fluidity in the logistical routes traced by the system.

The lack of knowledge about these components is evident according to some interviewees:

“ [...] Labels are very important for efficiency and not having errors with the merchandise barcodes, and the sensors are used from receipt of the merchandise until the moment of checking, when the product is released, and the actuators, I have no knowledge” (Depot Manager A).

“ [...] This is true of everything, as soon as the separation begins, the barcode of each product is already beeped. When we complete an order, we already label it with the delivery address, so it is useful at all times... sensors... I don't use it... actuators... we don't work” (Depot Manager B).

Analyzing the opinion of the interviewees, there is a misalignment of knowledge among employees regarding these components in the company's architecture, which makes the implementation and implementation of the system difficult.

4.2 FACILITATING FACTORS FOR IMPLEMENTATION AND IMPLEMENTATION OF THE FUSION DMS ROUTING SYSTEM

Regarding access to technology, the employees who operate the system already have knowledge of the company's ERP system, which makes it possible to implement new technological resources in the organization in order to maximize the efficiency of operations, as employees quickly absorbed the functionalities of the existing management system. In this case, the routing system will be integrated into the company's ERP system, where the load assembly routine will be replaced, automating this process, which is currently manual through the ERP.

In this way, according to Nogueira (2012), the efficiency, effectiveness and speed of operations are increased by integrating them into a single computational environment, which, corroborating the authors Hékis et al. (2013), all these operations are synchronized to the single database in real time, eliminating the search and duplication of information in different systems, increasing precision and consistency between the departments involved.

The order of service for the position of Warehouse Manager highlights, among the activities to be carried out, the search for the use of new technologies and assistance to the board
and sectors of the company, making this a factor that can facilitate the implementation of the routing system.

This integration, which will facilitate the assembly and routing of loads, can be understood from the comments of some interviewees:

“[...] Fusion, it replaces a Winthor routine, right, which is load assembly, so, instead of using Winthor for load assembly, Fusion is used, and the information from the Fusion, they are integrated with Winthor, right, via database connection” (IT Manager).

“[...] is issued, here you download the order, create the separation map and start separating. Once the load is assembled, today, we assemble it manually, right, we are not using Fusion yet [...] we created very high expectations to save time when it comes to assembling cargo with Fusion” (Operational Manager).

Thus, the implementation of the Fusion DMS system integrated with the ERP system already used in the company will provide greater convenience to users due to their familiarity with the distributor's ERP.

Regarding the technical training of employees, the company has an IT department, which increases the company's affinity with digital equipment, enabling the replication of knowledge within other departments that will use the new technologies implemented through the Fusion DMS routing system. integrated with ERP, this is emphasized by Nogueira (2012) in the need for qualified people to handle integrated management systems. According to the IT Manager and some interviewees, it is possible to observe this technical training of the IT department in relation to knowledge replication:

“[...] I help in the support part, right, providing customer service, in this case, it is the users in the support base, in the knowledge base, right, showing how the system works, so that all users have good management of the system, and at the end of it all, the end consumer is served faster and more accurately” (IT Manager).

“[...] When there is a problem, an anomaly in the system, I am the one who helps with the IT manager in support” (Operator A).

“[...] We work as a knowledge replicator in the company, right, so our IT role is to learn more and more about the system so that we can replicate it to the user to have a better ERP experience and thus improve our service and, consequently, the company will profit from this faster and more efficient service to the user” (IT Manager).

“[...] The knowledge is passed on through the IT team, who inform the appropriate people who need to know to perform their role, that is, the IT staff comes to me and does the training with me” (Operator D)
The company has an internal architecture suitable for implementing solutions based on the Internet of Things due to investment in IT infrastructure, which encompasses multiple digital devices, such as computers and smartphones permanently connected to the internet. These are of great relevance for assembling the control center and implementing the routing system in the company. Investment in IT infrastructure, according to Marinho et al. (2015), has positive effects on organizations in relation to productive efficiency, improving their performance.

This factor that facilitates the implementation of solutions based on the Internet of Things in the company, is observed by the IT Manager:

“ [...] IT is an investment, where the company invests in technology so that it can have a return on this investment during the process of using these new technologies, in our case, our manager's mind is more open, and he It has really met our needs as we requested it from the board” (IT Manager).

Employees do not have concrete knowledge about tags, sensors and actuators, however, the IT department has expertise in these accessories relevant to the implementation of the routing system, making it possible to replicate the knowledge necessary to implement the new routines necessary to operationalize the system.

The affinity with these components, on the part of some collaborators who will replicate the knowledge, is observed by some of the interviewees:

“ [...] We use this on a daily basis, right... we are always looking for innovation, improvements to these technologies, including, we are trying to organize our system, which today we use radio frequency, for us use the system via cell phone, via the Android system” (IT Manager).

Operator A: “At the moment we use 2D tags for addressing [...] the sensors we can adapt during delivery [...] the actuators work on the trucks to confirm the location”. In this way, the replication of knowledge of these components can be carried out in the implementation of the routing system through these interviewees in the company.

4.3 RELATIONSHIP OF THE BUSINESS MODEL WITH DISTRIBUTION CHANNELS

This topic presents the company's business model and distribution channels. Regarding this, it will be described how the company creates, captures and delivers value, and then it will
be investigated how each of these elements relate to distribution channels. In table 04, based on the data collected in the research, the company's Canvas Business Model is presented.

The company's value creation highlights the transportation of goods, quality products, speed, punctuality and reliability in delivery. According to Bonazzi and Zilber (2014), this value creation is supported by key activities and key resources, such as: purchase of merchandise, storage, order processing, loading and unloading of trucks, quality supervision, physical space, center distribution, trucks, managers, drivers, helpers and delivery people.

This creation of company value is expressed by some of the interviewees:

“[...] look, we offer... punctuality, quality, availability, attendance, respect... it's... variety, that's basically it... we, too, need to provide working conditions for the employee so that he can provide good service, check and supervise to maintain quality” (Administrative Manager).

“[...] provision of services so that we can unload and have the goods there, the physical, right, for us to be supplying to our customers, we need the person to issue the notes, there is the process of receiving the goods, the one who is there to check to see if it is in agreement” (Financial Manager).

**Figure 1**

*Company Canvas Business Model.*

![Company Canvas Business Model](image)
In capturing the company's value, described by Bonazzi and Zilber (2014), it is presented through the comparison between its cost structure and its sources of revenue. In its cost structure, according to Osterwalder and Pigneur (2011), all expenses to operationalize the business model are listed, such as: salaries and charges; taxes; vehicle maintenance and supply; and other operating expenses. While the sources of revenue are payment for products sold and delivered. The cost structure and revenue sources are explained by the Finance Manager:

“[…] we have expenses with some investments to expand routes, we have acquired properties, we have costs with employees, technology... and our delivery costs are thrown into the expenses we have with trucks, and are thrown on top the cost of the merchandise... and our biggest source of income comes from the sale of our products” (Financial Manager).

Value delivery is demonstrated by how the value proposition reaches your customer segments. The company's customer segmentation is made up of legal entities in the food sector and also individuals in general. Customer segmentation is commented by the IT Manager as: “We serve individuals and legal entities”.

The channels, according to Osterwalder and Pigneur (2011), detail how the company communicates and reaches its customer segments to deliver its value proposition. These channels include sales, communication and distribution. There are two types of sales channels, the first is in the physical store, where the customer can purchase their product at the company's counter; the second is through sales representation, in which the company representative travels to its customers to offer products. The sales channels used in the company are expressed by some interviewees as follows:

“[…] There is the counter, right, in this case, the customer comes here directly, takes the order and, automatically, carries out the process that goes there to the CD, and there they print it, deliver it and finish it [...] and there are external sellers, who send these files that generate the order and finalize and assemble the load to be able to deliver” (Financial Manager).

IT Manager: “First, we sell over the counter, the customer buys immediately and takes it immediately [...] we have external salespeople who make face-to-face sales to customers”. While, communication channels are used four modalities to get in touch with your customers, these are telephone calls, emails, leafleting and social networks.

Operator A and the IT Manager comment that the communication channels work as follows:
“[…] We use Whatsapp a lot, which, nowadays, is a very comprehensive tool, which covers a lot of communication. We also use cordless and wired phones... Email is widely used for sending invoices, receiving invoices, sometimes the client does not have an email, we send them directly to the client's Whatsapp” (Operator A).

IT Manager: “Through social networks, such as Facebook, Instagram and also through printed media such as pamphlets.”

Finally, in distribution channels, the company applies multiple distribution channels, described by Freitas (2019), where it uses different distribution channels in order to serve different types of end consumers and increase sales volume, i.e., the company carries out sales and deliveries in both wholesale and retail. For this distribution, the company uses its own fleet of vehicles. Regarding distribution channels, the IT Manager explains that:

IT Manager: [...] “We sell retail and wholesale [...] deliveries are made by truck, motorcycle, pickup truck here in the region”.

In its relationship with customers, the company seeks to strengthen it by registering customers in the ERP system to later congratulate and carry out special promotions aimed at them, as well as holding raffles for basic food baskets for customers. This relationship with the customer is expressed by some of the interviewees:

“[…] Our salespeople, in addition to providing good service, are familiar with the customer. I, as a commercial manager [...] we have a supervisor who we visit at least every two months on the routes so that we can have a relationship with the customer” (Commercial Manager).

“We always try to pamper the customer a little, with breakfast, we give gifts, we go to the customer's house to see if the customer is well, sometimes we do raffles for basic food baskets for customers” (Operator A).

The influence that distribution channels have on the elements of the business model are as follows: in creating value, according to Nogueira (2012), transport directly influences delivery time, product safety and service reliability, that is, Distribution channels influence the main value propositions, which are speed, punctuality, transport quality and reliability. While for value capture, distribution channels directly influence the structuring of costs and sources of revenue, as, according to Lemos and Tortato (2009), distribution channels are concerned with the way in which products and services transit from the factory to the final consumer.

Also to reduce the cost of transport and improve the service provided, the concept of routing is used, which, according to Ribeiro and Machado (2009), is a method that can be implemented in companies using software. The shortest routes method are solutions based on
computerized networks, where these routes are maintained in databases and they contain the best paths that vehicles should take. Therefore, with the implementation of the Fusion DMS routing system, which employs the concept of the Internet of Things, it is possible to reduce costs with transportation, vehicle maintenance, fuel and overtime, as well as increasing the revenue stream on account efficiency in deliveries.

Finally, the influence of distribution channels on value delivery is direct, as they are the distribution channels that enable customers to access the products offered by the company. They are also the ones who improve relationships with customers, because, according to Faria et al. (2015), in the logistics sphere there is a focus on meeting the companies' biggest objectives, such as offering products in the expected quality specifications, at the appropriate time, in the correct quantity, in the right place, and with constant improvement of the services provided after-sales. sell to customers.

5 CONCLUSION

The objective of this work was to analyze how the implementation of solutions based on the Internet of Things in distribution channels influences the elements of the business model. When analyzing the factors that hinder the implementation of solutions based on the internet of things, it is possible to consider that access to technology is a critical point, as even employees who have access to the technologies available in the company do not master the possibilities that technology offers, resulting in in resistance on the part of employees in the use of technologies available at various levels of the company's operations. The inconsistency of the network infrastructure present in the region is also observed as a critical factor, as it makes satellite tracking impossible for all necessary routes, forcing the company to invest in complementary solutions to overcome this limitation.

Regarding the factors that facilitate implementation, it is possible to consider that the employees who operate the Fusion DMS system are unique human capital for the company, as they have experience and mastery of the solution possibilities that can be implemented by the system. This potential can be expanded by the company's IT department that has the practice of replicating knowledge between departments, which, aligned with the company's investment plan, can enable an accelerated harmonization of the knowledge and resources necessary for a successful implementation.

Regarding the company's business model, the transport of goods, quality products, speed and punctuality in delivery stands out in terms of value creation. In capturing value, it was
presented through the comparison between its cost structure and its sources of revenue. In its cost structure, all expenses to operationalize the business model were listed, such as: investments in infrastructure, salaries and charges, taxes, vehicle maintenance and supply, and other operational expenses. While the sources of revenue are payment for products sold and delivered.

Value delivery is demonstrated by how the value proposition reaches your customer segments. The company's customer segmentation is made up of legal entities in the food sector and also individuals in general. Finally, in distribution channels, the company applies multiple distribution channels, where it makes use of different distribution channels in order to serve different types of end consumers and increase sales volume, that is, the company carries out sales and deliveries both wholesale and retail.

The influence that distribution channels have on the elements of the business model are as follows: Transport directly influences delivery time, product safety and service reliability, that is, distribution channels influence the company's main value propositions, company which are speed, punctuality, quality of transport and reliability. While implementing the Fusion DMS routing system, which employs the concept of the Internet of Things, it is possible to reduce costs with transportation, vehicle maintenance, fuel and overtime, as well as increasing the revenue flow due to efficiency in deliveries.

It is concluded that with the implementation of the Fusion DMS system in the company, it is possible to optimize logistics routes to save time, reduce expenses and increase revenue, providing the improvement of the company's entire business model. This research was limited to collecting information on how the implementation of solutions based on the Internet of Things in distribution channels can influence the elements of the business model, taking as a reference a wholesale food company located in the municipality of Dom Eliseu – PA, in the year 2019.

The results obtained in this research can contribute to other organizations that are in the process of implementing and/or implementing routing systems based on the Internet of Things, as well as being used to optimize logistics operations with the application of information and communication technologies. As suggestions for future research, it will be possible to inspire new research that is linked to management and automation systems such as ERPs, TMSs and WMSs, as well as the analysis of innovations in the business model and supply chain management. The action research modality can be carried out in the company studied, as well as in other organizations that are in the process of implementing new technologies and, in
addition, the line of research related to the Internet of Things applied in business organizations can be continued.

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