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INTEGRATING LOGISTICS PROCESSES INTO THE SERVICE OPERATIONS OF A HOME LAUNDRY IN THE CITY OF MANAUS, BRAZIL

A INTEGRAÇÃO DOS PROCESSOS LOGÍSTICOS ÀS OPERAÇÕES DE SERVIÇOS DE UMA LAVANDERIA DOMÉSTICA DA CIDADE DE MANAUS, BRASIL

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ABSTRACT
This research aims to describe the integration of logistics processes with the service operations of a domestic laundry that operates in the city of Manaus. The methodology was a case study, whose data were collected through three sources of evidence (interview, observation and survey), to understand the business model implemented, the steps of the operations process used, the logistics procedures executed and the level of customer satisfaction, with the results generated from content analysis (interview and observation) and descriptive statistics (survey). The results showed that a) the business model is small, focused on individuals, with low operating costs and initial capital, b) the operations process is carried out in seven steps (collection, transfer, washing, drying, ironing, packaging and delivery), with some bottlenecks that can be solved with the acquisition of a specialized machine, c) the service logistics presents challenges in routing, scheduling and increasing customer satisfaction and d) customer satisfaction can be considered high, but can be improved. The conclusion reveals that the organization's logistics processes are integrated with its service operations; however, it is possible that this integration can be further enhanced by addressing the operational and logistics bottlenecks

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encountered.
Keywords: Service logistics, Domestic laundry, Operational processes, Operations system, Logistics system.

RESUMO

A presente pesquisa tem como objetivo descrever a integração dos processos logísticos com as operações de serviços de uma lavanderia doméstica que atua na cidade de Manaus. A metodologia foi o estudo de caso, cujos dados foram coletados através de três fontes de evidência (entrevista, observação e survey), para que se pudesse compreender o modelo de negócios implementado, as etapas do processo de operações utilizado, os procedimentos logísticos executados e o nível de satisfação de seus clientes, com os resultados gerados a partir da análise de conteúdo (entrevista e observação) e estatística descritiva (survey). Os resultados mostraram que a) o modelo de negócio de pequeno porte, focado em pessoas físicas, custo operacional e capital inicial baixos, b) o processo de operações é feito em sete etapas (coleta, transferência, lavagem, secagem, passagem, embalagem e entrega), com alguns gargalos passíveis de serem sanados com a aquisição de uma máquina especializada, c) a logítica de serviços apresenta desafios de roteamento, programação e elevação da satisfação dos clientes e d) a satisfação dos clientes pode ser considerada elevada, mas passível de ser melhorada. A conclusão mostra que os processos logísticos da organização estão integrados às suas operações de serviços, mas é possível que essa integração se eleve ainda mais através da solução dos gargalos operativos e logísticos encontrados.
Palavras-chaves: Logística de serviços, Lavanderia doméstica, Processos operativos, Sistema de operações, Sistema logístico.

RESUMEN

Esta investigación tiene como objetivo describir la integración de los procesos logísticos con las operaciones de servicio de una lavandería doméstica que opera en la ciudad de Manaus. La metodología fue un estudio de caso, cuyos datos se recopilaron mediante tres fuentes de evidencia (entrevista, observación y encuesta), con el fin de comprender el modelo de negocio implementado, las etapas del proceso operativo utilizadas, los procedimientos logísticos ejecutados y el nivel de satisfacción del cliente. Los resultados se generaron a partir del análisis de contenido (entrevista y observación) y la estadística descriptiva (encuesta). Los resultados mostraron: a) el modelo de negocio es pequeño, centrado en personas, con bajos costos operativos y capital inicial; b) el proceso operativo se realiza en siete etapas (recogida, traslado, lavado, secado, planchado, empaquetado y entrega), con algunos cuellos de botella que pueden solucionarse con la adquisición de una máquina especializada; c) la logística de servicio presenta desafíos en la gestión de rutas, la programación y el aumento de la satisfacción del cliente; y d) la satisfacción del cliente puede considerarse alta, pero es mejorable. La conclusión muestra que los procesos logísticos de la organización están integrados con sus operaciones de servicio, pero es posible que esta integración se pueda mejorar aún más resolviendo los cuellos de botella operativos y logísticos encontrados.
Palabras clave: Logística de servicios, Lavandería doméstica, Procesos operativos, Sistema de operaciones, Sistema logístico.

1. INTRODUCTION

One of the significant challenges for scientists and organizational managers is to integrate internal processes with the various realities of the external environment. Integration is a multisectoral and multidimensional phenomenon, which encompasses internal and external aspects of an organization, as a coherent and aligned set of methods and operating models, designed and executed to gain connectivity, interrelationship and collaboration between the various agents and stakeholders to achieve previously defined objectives (Aggarwal et al., 2025; Wang et al., 2025; Salciccia et al., 2025). Logistics processes perform two essential and more noticeable integrative functions. The first is the connection of the organization's operations with the demands and specificities of the external environment, in such a way that they serve as catalysts for the continuous improvement of the organization's relationship

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with its surroundings. The second is the improvement of internal processes, primarily production processes (in industries) and operations, in the case of service organizations. Service organizations are not economically distinct entities from industrial and government organizations, since they all seek to meet the needs of the external environment through their missions. However, operationally they are differentiated in what they create and deliver, which are values (Zailani, 2025; Sha et al., 2025), unlike physical products, even though, like mechanical workshops, they handle material artifacts. This means that their operations are distinct, their business models are differentiated, and, consequently, the architecture of logistics services is also different, as delivering value is more focused on meeting substantive, subjective needs than on meeting basic, bodily needs. Since these needs are more challenging to meet than those met by physical products, this challenge also extends to achieving the desired integration between logistics processes and their operations. In this sense, this study aimed to describe the integration of logistics processes into the service operations of a domestic laundry that operates in the city of Manaus. Three justifications led to its development. The first is that there remains a significant gap in studies on the application of logistics in small-scale services, such as domestic laundries, school transportation, pizzerias, and restaurants, among others. The second justification is that analyzing how logistics processes can be integrated into each stage of internal processes can lead to the discovery of new relational schemes capable of supporting the creation and implementation of new business models. The third justification is practical: it is necessary to distinguish the logistics characteristics applied to industrial laundries from those used to domestic laundries, so that the generation of added value to logistics management can increase customer satisfaction.

2. SERVICE LOGISTICS: THEORETICAL ARCHITECTURE

Service logistics does not have a widely accepted and conceptual definition used in the scientific literature. The study by Savli (2023) defines it as the part that controls the service chain. In contrast, the survey by Okorokov et al. (2021) describes it as the maintenance of the service sector, with connections to production systems, both tangible and intangible, operating within an organization. These two rare conceptual definitions found focus on different aspects as follows: a) there would be a service logistics external to organizations, with similarities to the supply chain, involving the supply and distribution chains, and b) there would be another service logistics, internal to organizations, but connected to the service logistics that operate outside the organization. In a manner equivalent to the supply chain of physical products, service logistics would also be structured in the form of a supply and distribution chain, but for services. The study by Llorach (2021) suggests that service logistics can be organized in several ways, with a focus on the provision of services, like those offered by banks and insurance companies (Reinhart, 2021). It is also essential to consider that service logistics is present in product logistics, especially in after-sales services, serving to increase the well-being and level of satisfaction of consumers and customers (Marjona, 2023). The study by Souza et al. (2023) demonstrates that this logistics is crucial for establishing a personalized relationship with customers, ensuring that their requirements are met and, consequently, value is created and delivered, thereby complementing the values already embedded in the products, whether physical or intangible. It is in this context that the study by Kabdygaliyev and Toktamysova (2023) considers the service itself to be something intrinsically linked to sales, for example, since orders, delivery requests, and Maintenance of purchased products are, ultimately, services. For this reason, the study shows, it is essential to plan services in

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line with the delivery of benefits from the products sold, even though this presents a significant challenge in monitoring and evaluating the quality of these services and, therefore, the logistics that support them.

The studies by Veenstra (2021) and Von Stietencron et al. (2022) focus on the logistics of maintenance services and find that physical products are combined with services, support, and knowledge to produce maximum possible satisfaction, thereby becoming an important competitive factor. This importance grows in direct proportion to the intensification of capital, as it affects costs, expenses, profitability, and safety. It is therefore necessary for service logistics to have its operations planned correctly to avoid delays in deliveries and ensure high customer availability. This also means that it is present and encompasses all logistics activities (Van Duin et al., 2022), particularly in pre- and post-sales services for physical products, which are becoming increasingly essential due to the growing complexity of machines and equipment, as well as the increasing challenges of meeting increasingly stringent customer requirements. As a result, making service logistics a specialized area could be the natural path to this end.

Thus, service logistics can be defined as the process of supplying the needs of each stage of the operations process with the resources necessary to achieve organizational objectives and satisfy its customers. This proposed definition targets organizations that do not execute physical product production systems, but rather organizations that work with and deliver intangible “products,” such as hospitals, cinemas, maintenance services, and public services. The focus of this logistics is, simultaneously, the execution of each stage of its operations process based on parameters previously defined for each stage, while achieving customer satisfaction, which is involved in or is the object of the operations. Service logistics is a component of production logistics, as characterized by the study by Jym and Zahari (2022), which encompasses the services performed throughout the production processes of physical products, particularly in activities preceding the entry of raw materials and following the exit of finished products from warehouses. The unified services theory, proposed by Sampson (2007), aims to consolidate all explanations of the nature of services, encompassing their logistics (Ayoubi & El Kharrim, 2023). This theory distinguishes product production processes from service processes by the centrality of customers in two key aspects: a) dependence on information, and b) in the supply of all operational processes. Service logistics, by its very nature, is responsive (Harmelink, 2022); for this reason, it needs to respond effectively to the supply needs of its customers at each stage of the operational process. It is this simultaneous focus on the execution of services related to satisfaction that characterizes what is known as servitization, as opposed to production. Servitization is, therefore, a service-based business in which the customer's contribution is fundamental to the enterprise's success.

A service can be defined, according to the theory of unified services, as results that tend to be intangible and require intensive labor, unlike non-services, whose production does not depend on inputs from individual customers (Dlamini, 2024). What are considered resources are the customer himself, as well as his belongings and the information he has available, whose design of the operations to be performed can be done using process chain network diagrams (Pearce, 2021). These diagrams can indicate the degree of heterogeneity in the processes because they allow for the visualization of the level of complexity, composition (i.e., the number of activities from start to finish), and nature of the inputs (i.e., customers, information, and materials) used (Wainaina, 2022). The phenomenon of customer co-participation often occurs when customers assist in handling the inputs that enter the service system (mind, body, goods, and information), through direct interaction that, while helping to generate the

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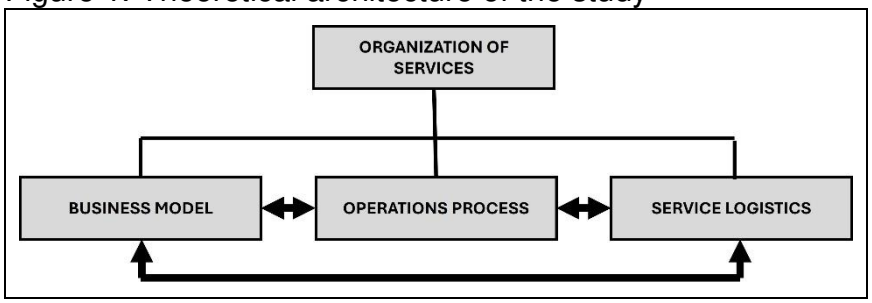
intended results, also hinders the execution of quality programs (Inyo; Githii, 2022).
The theory of unified services, therefore, aims to understand the role that customers play in managing both production and operations (Alam et al., 2022). One of its basic assumptions is that the design of the operations process is linked to customer inputs or to the treatment that the inputs receive throughout the operations process (Saihani, 2021). This is explained by the fact that the operations process, which transforms inputs into intended results, is a value-adding strategy, in which each stage or activity developed generates customer satisfaction (or dissatisfaction), by the customer's assessment of the benefits received (Gerontas et al., 2022), delivered by the operations system, because he is, immediately, the primary beneficiary of the value received by the service that is performed.
Sampson's study (2007) shows that tangibility or intangibility alone is insufficient to define whether a business can be classified as a service. Banking services, garbage collection, and consultancies. It is necessary to examine more objective parameters, such as customer participation, to analyze and evaluate whether the customer is involved in the operations process, whether the operations depend on information, and whether the customer provides the necessary inputs. Laundry services, for example, are businesses structured in two basic ways. The first is when the organization performs parts of the process, such as washing and ironing clothes. Still, the customer provides information to guide operations and some inputs. The second scenario is when the customer performs all the operations themselves, usually by handling machines and equipment, such as washing, drying, and ironing machines. In this particular case, the theory of unified services can be an interesting paradigm for analyzing service systems because it focuses on the operations processes as the unit of analysis (Badr, 2023).

Figure 1. Theoretical architecture of the study



Source: prepared by the authors.

Figure 1 illustrates the theoretical architecture tested in this study, which is based on the theory of unified services. It assumes that a service organization is the materialization of three sets of decisions. The first is about the business model, understood as a structural representation that determines how an organization creates, delivers, and monetizes value (Cañarte, 2025; Önder & Akdemir, 2025; Scharfe, 2025). In this case, the business model creates, delivers and monetizes values based on servitization, both for vertical collaboration (organizations with the same market activity) and horizontal collaboration (organizations with other types of activities), as can be seen from studies such as those by Harmelink et al. (2025) and Pearce (2021). The second group of decisions is related to the operations process, understood as the various ways of transforming inputs into outputs, or, in other words, the process by which inputs are transformed into services. Service organizations tend to transfer all or most of their operational processes to customers because servitization affects the

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results and benefits of services, as evidenced by studies such as those by Niu et al. (2025) and Lu et al. (2025). The operations process impacts and is impacted by the business model, as well as determining and being determined by logistics services. In this regard, the digitalization of processes significantly reduces labor (Sun; Xi, 2025; Kilinc et al., 2025; Messina; Leotta, 2025), contradicting the original perspective of the unified services theory, which stated that services would be highly demanding.

The third group of decisions focuses on the service logistics to be adopted for interconnecting the organization with its supply and relationship chains. Service logistics is understood as the process of transforming inputs into services intended and executed by customers themselves, as outlined in the unified services theory. The relationship with the supply chain is generally established through similarities in the services provided or to support operations, such as the acquisition of machinery and equipment, as well as their maintenance and upkeep. The relationship with the distribution chain is established through various channels, both for disseminating services and for monitoring and evaluating customer satisfaction with the benefits delivered (Yang & Pan, 2025; Dong et al., 2025).

3. RESEARCH METHODOLOGY

This research was conducted as a case study using a qualitative descriptive approach (Yin, 2015; Gil, 2017) in a domestic laundry located in the city of Manaus. The study aimed to analyze the logistics processes applied and their relationship with customer satisfaction levels, utilizing multiple data collection sources and methodological triangulation (Lakatos; Marconi, 2017).

Photograph 1. Organizational environment of the research



Source: photographs taken by the authors.

The units of analysis were the stages of the logistics processes and the organization's customers, whose level of analysis was the logistics processes executed in the organization and the perspective of analysis was synchronic or transversion, whose concern is to describe and explain the current reality, as if it were a photograph (Nascimento-e-Silva, 2021a; 2021b). Photographs 1 show the environment where the research was carried out.

3.1 Guiding questions

Guiding questions are specific questions formulated to achieve the objectives intended

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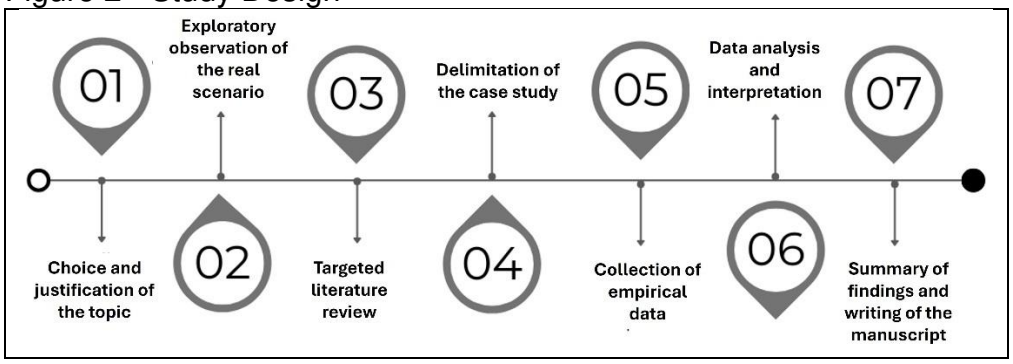
by scientific investigations (Nascimento-e-Silva, 2021a). In this sense, to guide the fieldwork, the following guiding questions were formulated: a) what are the main characteristics of the business model practiced by the laundry, b) what are the stages of the main production processes carried out by the company, c) what are the logistics procedures used by the organization and what are the main aspects of customer satisfaction about the logistics and production procedures carried out by the laundry.

3.2 Study design

This study was developed based on the execution of seven stages. The first was the choice and justification of the theme, focusing on a growing challenge in the sector: the search for efficiency in deliveries at the final stage of the service, known as the "last mile." The second was the exploratory observation of the real scenario, carried out through technical visits and informal monitoring of the laundry's collections and deliveries. The third was the targeted bibliographic review, to construct a theoretical architecture that could be tested empirically. The fourth step involved delimiting the empirical study, which was carried out through the criteria of time of operation, growth in demand, and adherence to good operational practices. Figure 2 summarizes these procedures.

Figure 2 - Study Design



Source: prepared by the authors.

The fifth stage was data collection, through semi-structured interviews with business managers and customer satisfaction surveys. The sixth stage involved data analysis and interpretation, which was performed by generating results obtained through each collection instrument and comparing them, thereby constituting data triangulation. The seventh and final stage involved synthesizing the results and writing the manuscript, which was accomplished through the creation of graphs and tables that summarized the study's findings, followed by the subsequent writing of these results.

3.3 Subjects, population, and sample

The population of this study was the 600 registered customers. The sample consisted of 22 responding customers, selected by non-probabilistic convenience sampling, based on the availability and interest of the participants in contributing to the research. The main characteristics of the sample include: 80% are female, with an average age of over 49 years. Approximately 40% live in the Central-West region of Manaus, while 40% are distributed in the Central-South and West zones. The remaining 20% are in the South and North zones. This spatial diversity helps to broaden the understanding of the logistical challenges faced in the final delivery stage (last mile). The research used semi-structured interviews with the two owners of the laundry to elucidate

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operational practices and logistics management strategies. The interviewees have the following profiles: Owner 1 is male, 55 years old, has completed high school, has 13 years of experience in the laundry sector and almost 20 years working in third-party business management; Owner 2 is female, 46 years old, has incomplete higher education, has 13 years of experience in the laundry industry and approximately 10 years of experience in the management of various businesses. The owners' participation allowed an inside look at the logistics flows, especially regarding the final delivery stage. The company has a solid base of recurring customers, which contributes significantly to the stability of the business. The average growth of 2.5 new customers per month is considered adequate and sustainable, compatible with the company's operational capacity and its personalized service model.

3.4 Data collection instruments

The case study method requires at least three sources of evidence for its results to be considered reliable (Yin, 2009; Nascimento-e-Silva, 2023). These requirements lead to a comparison of the individual results from each source, allowing them to be validated while also broadening and deepening the resulting explanations. This study used three sources of evidence to generate its results. The first was the semi-structured interview, where the researcher knows what they want to know, but is unaware of the answers that will be obtained. The second method was direct observation, which is carried out based on a checklist completed directly in the research environment. Table 1 summarizes the study's dimensions and analytical categories.

Table 1. Dimensions and analytical categories of the study

Analytical dimensions	**Analytical categories**
Business model	What defines a home laundry Target audience of the business Advantages and disadvantages of the business How the laundry business works
Production process development	How the production process is developed What are the bottlenecks in the production process
Service logistics	Challenges of service logistics in laundry

Source: prepared by the authors.

Both the interviews and the observations are structured based on dimensions and analytical categories. The dimensions are the part of reality that one wishes to know. At the same time, the analytical categories refer to the specific aspects of that reality about which the questions will be formulated for the interviewees and on which the observations will be made empirically. The three dimensions focused on by this study are presented in Table 1. The business model dimension was operationalized through the definition of the domestic laundry, the target audience of the business, its advantages and disadvantages, and the company's operational framework. The production process development dimension encompassed the development and bottlenecks dimensions of the production process, whereas the service logistics dimension comprised the challenges associated with the company's service logistics. Table 2 shows the questions formulated in the customer satisfaction survey.

Table 2. Questions from the customer satisfaction survey

1) Among the services we offer, in your opinion, which one is the best?

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2) On a scale of 0 to 10, how would you rate the service provided by our team?
3) What do you look for in our services?
4) In your opinion, which service can we improve?
5) On a scale of 0 to 10, how likely are you to recommend us to a friend or family member?

Source: prepared by the authors.

Customer satisfaction at the laundry was the third source of evidence sought, conducted through survey research. The instrument consisted of five central questions that sought to evaluate services, customer service, values, areas for improvement, and the possibility of recommending the service to new customers. The data collected through this instrument served to validate the data collected through observation and interviews, as well as to expand understanding about the laundry's operational and logistical procedures.

3.5 Data collection, analysis, and organization strategy

Data related to the laundry's owners were collected through semi-structured interviews, conducted in person in a previously scheduled environment. The interviews followed a script with open questions focused on delivery service management, operational routines, and last-mile logistics challenges. The statements were recorded with the participants' permission and later transcribed for analysis. The content was analyzed based on thematic categories, allowing for the identification of management patterns and operational strategies. This collection and analysis technique is aligned with the qualitative approach, which emphasizes the use of multiple sources of evidence and the importance of triangulation to ensure the consistency and validity of the case study (Yin, 2009; Nascimento-e-Silva, 2023).

The customer satisfaction survey was conducted using a structured questionnaire that contained both closed and open-ended questions and was made available digitally via messaging applications. The responses were organized in electronic spreadsheets; the quantitative data were statistically analyzed descriptively, and the open responses were grouped thematically. This form of organizing and interpreting textual data follows the principles of content analysis, as proposed by Bardin (2011) and Nascimento-e-Silva (2023), which emphasize categorization as a crucial step in extracting meanings and patterns from the subjects' responses.

Direct observation was conducted during technical visits to the laundry, previously arranged with the personnel responsible. The monitoring of logistics routines (from organizing collections to final delivery) was recorded in a field diary, with attention to aspects such as routes, schedules, types of packaging, and internal procedures. The descriptive categories systematized the observed data and were later triangulated with the owners' reports and customers' responses. This approach aligns with Minayo (2012) and Nascimento-e-Silva (2023), who emphasize that field observation enables us to understand the practices and meanings within the studied context, thereby contributing to a more in-depth and realistic analysis of the phenomenon.

3.6 Techniques for generating and interpreting results

The results were generated by the types of data collected. The nominal data obtained through interviews and observation generated results related to the analytical dimensions, describing a) how the company's business model is implemented, b) how the production process is executed, and c) how service logistics are operated. The nominal data from the survey research allowed us to know a) what is considered the best service performed by the company, the service provided by the team, the value

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sought and delivered by the company, what bottlenecks exist, and the possibility of recommending the company to other potential customers. The interpretation of the results was based on a comparison of the findings with the empirical study, focusing on the analytical dimensions and the theoretical architecture developed in general, the interpretation sought to answer three central questions: a) what is happening, b) why this happens, and c) how this happens, as recommended by the studies by Nascimento-e-Silva (2020; 2021b).

4. RESULTS AND DISCUSSION

This study aimed to describe the logistics processes integrated into the service operations of a domestic laundry in the city of Manaus. This section presents the findings, following the outline of the study's guiding questions. For this reason, the analysis of the business model used will be given first, followed by an analysis of the production process implemented, then an analysis of the service logistics, and finally, an analysis of customer satisfaction.

4.1 Analysis of the business model

The analysis of the laundry business model was based on four analytical categories: 1) what defines a domestic laundry, 2) the target audience of the business, 3) advantages and disadvantages of the business, and 4) how the laundry business works. According to the respondent, what defines the organization as a domestic laundry is the fact that the washing machines are small, suitable for domestic use, and the clothes are generally for individuals and everyday wear. A larger number of machines is needed to meet the demand for a variety of clothes and increase production capacity. Although your intended target audience comprises both individuals and legal entities, the majority consists of individuals.

Regarding the advantages, the data collected indicated the following: low operating costs, low initial capital, and the fact that the business model used allows for a significantly higher profit margin compared to other laundry models on the market. On the other hand, among the disadvantages, it was discovered that there is a lower production capacity, and the durability of the washing machines considered to be in excellent condition is considerably lower. Table 3 shows the results obtained for the analysis of the business model.

Table 3. Results on the laundry business model

Analytical categories	Results
Characterization of the business	Small-sized machines for domestic use
Target audience	Individuals and legal entities
Advantages of domestic laundry	Low operating costs, low initial capital, and comparatively higher profit margin
Disadvantages of domestic laundry	Lower production capacity and durability of washing machines
Operation of the business model	100% delivery: collection and delivery, collection and delivery only on Tuesdays, Wednesdays, and Fridays, internal operations from Monday to Friday
Systematics of the operations process	Collection of dirty clothes, carrying out operations, and delivery of clean clothes

Source: data collected by the authors.

The business model consists exclusively of collection and delivery services. Collection and delivery are only carried out on Tuesdays, Wednesdays, and Fridays. Production operations are carried out from Monday to Friday, which constitutes internal services,

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without contact with customers. The operational system begins with the collection of dirty clothes from the addresses of customers or those specified by them. Then, the operational procedures requested by customers are carried out (washing, ironing, etc.). The system ends with the delivery of clean clothes to the addresses specified by customers.

From the study carried out, it was observed that the practice brought knowledge that was applied deliberately; however, the entrepreneurs were also able to develop methods and use them in the processes, adjusting to the needs of their customers. According to the results of the questionnaire given to the owners, it was found that the business model has its characteristics, such as 100% delivery collection/delivery (management of customer relationships, being an excellent contact interface); flexibility (collection/delivery schedules according to customer availability); performance objective (focused on the quality of processes); reliability in delivery (being a moment of closer contact with the customer, making delivery a stage with a lot of added value) (Marchesini; Alcântara, 2012).

4.2 Analysis of the production process

The analysis of the production process was based on two analytical categories: the description of how the process is practiced and the identification of its main bottlenecks. The macro process of operations at the laundry analyzed is composed of several subprocesses, which focus on clothes, products, machines, and personnel. These processes, therefore, focus on the end activities and the means activities. Specifically, about the end activities, the operational processes are divided into distinct tasks for collecting, checking, washing, drying, ironing, packaging, and delivering the final products of the laundry. In scientific terms, each specific activity constitutes a subprocess because it represents a sequence of specific tasks; for example, collecting material has an initial stage, several intermediate stages, and a final stage. Table 4 shows the findings of the analysis of the production process implemented by the company.

Table 4. Results of the analysis of the production process

Analytical categories	Results
How operations are developed	Collection, checking, washing, drying, ironing, packaging, and delivery
Bottleneck in the operations process	Occurrence of queues due to a lack of machine capacity
Solutions adopted for bottlenecks	Acquisition of a calendar

Source: data collected by the authors.

The main bottleneck in domestic laundry activities was identified as ironing, which caused delays and queues in the sector, due to the limited and reduced quantity of equipment. The solution to overcome the bottleneck was to invest in the acquisition of a flatwork ironer, a piece of equipment used in industrial laundries to iron large and heavy items of clothing. This equipment will enable temporary monitoring of previous activities, such as washing, and facilitate subsequent activities, including packaging and delivery, to improve agility, speed, and quality.

4.3 Analysis of service logistics

The analysis of service logistics in the laundry was conducted based on the identification of the primary operational challenges encountered in customer service, particularly during the final stage. It was observed that logistics activities, including

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collection and delivery, are carried out using own transport and follow an adapted model known as a milk-run. This logistics strategy involves collecting and delivering loads at multiple points along a single planned route, thereby reducing the number of trips, optimizing time, and lowering operational costs (Rodrigues, Souza, & Oliveira, 2015). This adaptation enables the laundry to collect and deliver clothes from multiple customers on the same route, optimizing resource distribution, reducing vehicle downtime, and increasing operational efficiency. This logistics structure also provides direct contact with customers, which favors the collection of spontaneous feedback and valuable insights into evaluating the quality of the service provided. Internally, the company employs the FIFO (First In, First Out) method to organize its production workflow, ensuring that the oldest items are processed and delivered first, thereby avoiding internal backlogs and delays. In the external phase, that is, during deliveries, the company strategically employs the LIFO (Last In, First Out) method. This approach facilitates the physical organization of packages in the vehicle, positioning orders corresponding to the first stops on the route near the exit door. At the same time, the last deliveries are allocated at the back of the compartment. This enables the movement of packages to be more agile and efficient, thereby reducing downtime at each delivery point. In addition, the company utilizes a visual Kanban system, where each customer is represented by a designated container and positioned on a board divided into columns — generally categorized as “to do”, “in progress”, and “completed”. This model enables precise and continuous visual control of the steps, facilitating the monitoring of each customer’s clothes and increasing the predictability of deliveries. These control and organization methods, such as milk-run, FIFO, LIFO, and Kanban, were observed in the laundry routine, promoting logistics optimization, greater productivity, and customer satisfaction. As evidenced by the study by Rodrigues, Souza, and Oliveira (2015), the application of these concepts in service logistics significantly contributes to reducing waste, increasing reliability, and standardizing operations. Table 5 shows the results of the service logistics analysis performed by the company.

Table 5. Results of the service logistics analysis

Analytical categories	**Results**
Routing challenge	It is necessary to develop a system for collecting out-of-route products.
Programming	It is necessary to recalculate the schedule and operations capacity.
Client knowledge	It is necessary to segment customers to understand their needs.

Source: data collected by the authors.

The adoption of Lean Manufacturing by the laundry, which incorporates lean manufacturing principles, aims to reduce waste and increase production efficiency. This same production organization technology is applied to purchasing and inventory management, adopting the just-in-time concept, which involves acquiring products only to meet production demand, without stocking inputs for production activities. Routing is planned according to service zones, aiming to maximize the efficiency and flexibility of the itinerary.

According to Chirole's study (2018), to achieve its objectives, the PPCP manages information from various areas of the production system and interacts between the three hierarchical levels of planning and control for production activities within the system (strategic, tactical, and operational). This research found that purchasing planning is programmed to meet weekly demand, using the Just-in-time philosophy,

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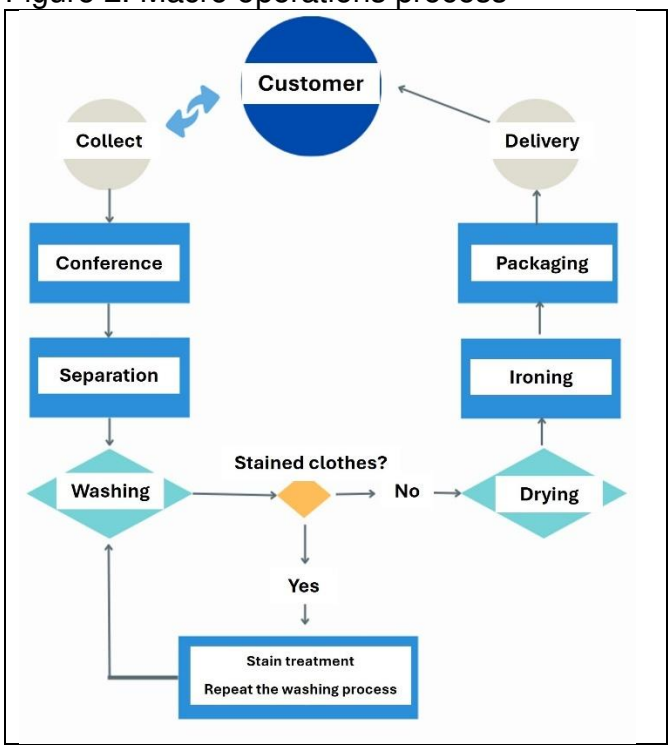
avoiding waste in idle stock (Benton; Shin, 1998), since the company is small and does not require many departments to approve purchases. Figure 2 shows the company's macro operations process.

Figure 2. Macro operations process



Source: prepared by the authors.

A production system is essentially a transformation element designed to carry out operations that produce efficient and effective products or services (Chirole, 2018). To this end, this system receives inputs, also referred to as inputs, which are the necessary elements that must be transformed into outputs. The latter are the manufactured products or services that are produced. According to field research, the transformation elements (dirty laundry), that is, Inputs, are the inputs to be transformed into outputs (clean laundry). It was also found that production operations comprise the macroprocess of the operations, with distinct mappings for each task to be performed. With an overview of the Macroprocess, it is possible to define the mapping of other processes performed, making tasks clear and objective, and adapting standardization according to the specificities of each client (Chirole, 2018). To develop the Macroprocess and process mapping, the Canva and CmapTools platforms were used to illustrate the processes more effectively, as shown in Figures 3, 4, and 5, respectively. Through the study and field research conducted, it was possible to develop a mapping of each stage of the three processes developed in the production environment.

Figure 3. Identification mapping

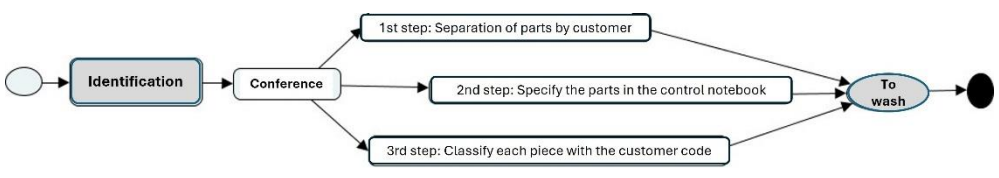


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Figure 4. Mapping of laundry

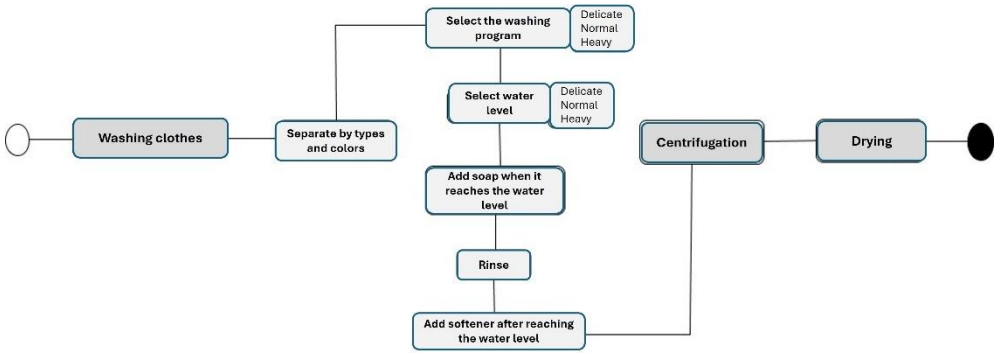
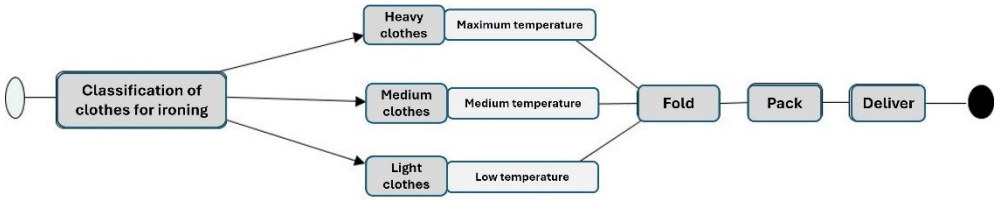


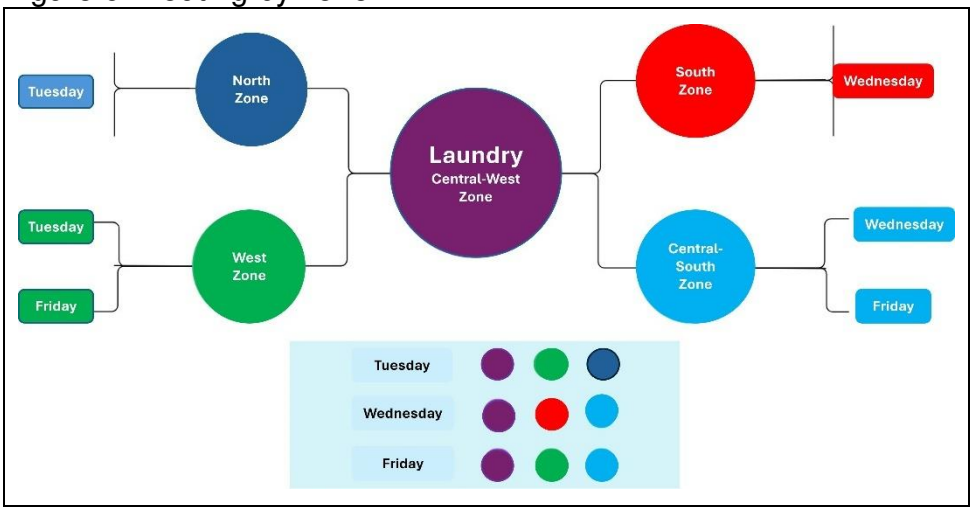
Figure 5. Mapping of ironing



Source: prepared by the authors.

According to a study by Marchesini and Alcântara (2012), the objective of logistics services is to provide time and place utility in the transfer of products and services between buyers and sellers. This research observed that delivery has significantly added value and cannot be outsourced, attributing this stage to a form of interaction with the customer, which highlights the importance of customer studies. Knowing the needs of customers is essential to deliver precisely what they want and not what the laundry imagines they want. Although the operations process aligns with the known needs of current customers, the results of the satisfaction survey highlight the importance of also understanding other aspects of demand that remain unknown. Therefore, it is necessary to make an additional effort to ensure that these demands are known and considered in the laundry operations process, as indicated by the results of the customer survey.

Figure 6. Routing by zone



Source: prepared by the authors.

Using Figure 6, it was possible to develop a routing scheme for the organization. This

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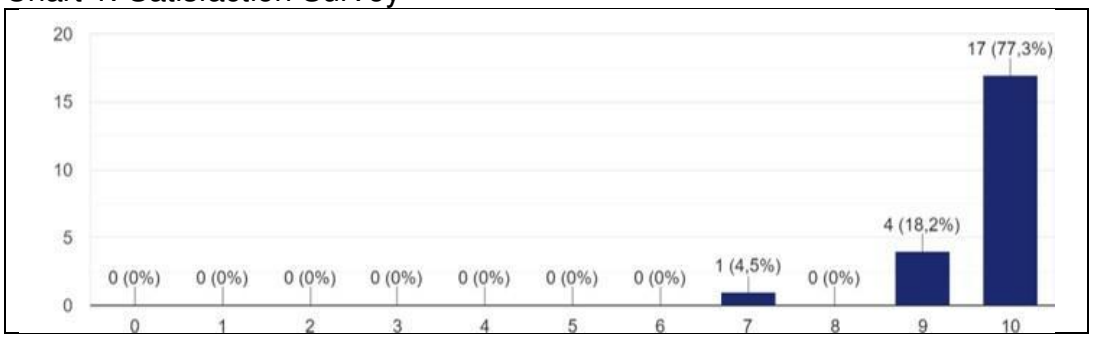
data shows that the laundry has a very strategic location, which significantly facilitates routing between the service areas of the city of Manaus. According to the study by Paura (2016, p. 74), “physical distribution is one of the most complex logistics processes because it involves situations such as transportation, packaging, and routing”.

4.4 Analysis of customer satisfaction

The strategy that can guide the definition of customer service and represents the extension of basic service is perfect order fulfillment (or simply perfect order), as shown by the study by Marchesini and Alcântara (2012). For this survey, the “perfect order” is combined with the team’s overall service and reliability in delivery, a result also observed in the satisfaction survey, as shown in the results in Chart 1, whose scores were concentrated in the value 10, the maximum on the scale, and 9, resulting in 21 of the 22 customers surveyed who gave maximum scores for their satisfaction with the services provided to them.

Chart 1. Satisfaction Survey



Source: data collected by the authors.

The laundry's target audience is individuals and legal entities, with the majority being individuals. The production capacity of the laundry is another differentiator, thanks to the machines and equipment, although the number of items processed daily is lower than that of industrial laundries. As for logistics, the company has its transportation to make deliveries. According to the results of the satisfaction survey, quality and delivery consolidate the importance of logistics, adding value to time and place (Marchesini; Alcântara, 2012), as shown in the results in graphs 2 and 3.

Chart 2. What they look for in services

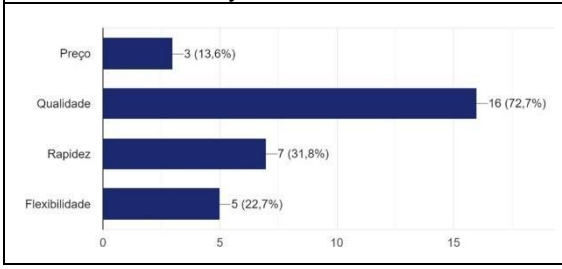
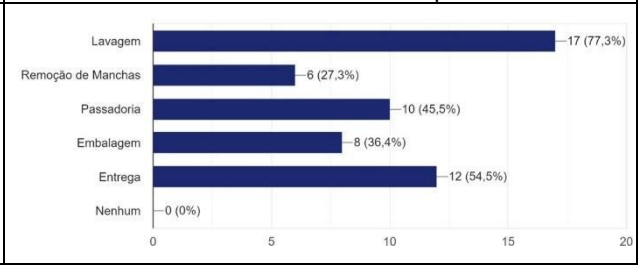


Chart 3. Services that best meet expectations



Source: data collected by the authors.

Chart 4 illustrates the services that respondents believe need improvement to add more value to what is delivered to them. Delivery time is a pressing challenge that needs to be addressed and overcome, as nearly half of the customers have mentioned. This means that this is not a one-off issue affecting only a portion of consumers.

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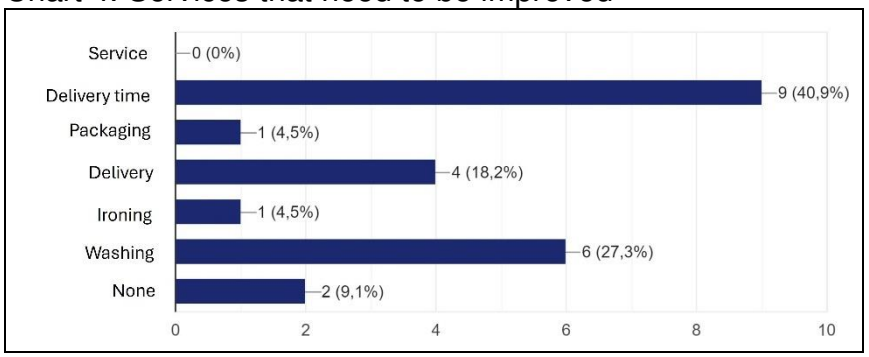
Washing and deliveries also require attention from company managers because they can negatively impact customer satisfaction if one of these issues is present among those who noted problems with delivery times, especially washing, as the sum of these issues is more than half of the respondents. Solving these three problems would bring the services to an acceptable level.

Chart 4. Services that need to be improved



Source: data collected by the authors.

When these results are triangulated with those from the interviews, it becomes clear that queues exist in the ironing sector, which is an intermediate activity between washing and the folding and packaging stages. This finding indicates that ironing is the major bottleneck in the logistics of the domestic laundry services investigated, which explains the low productivity resulting from the machines and equipment used. The consequence is evident in the satisfaction survey, which indicates that the delivery time is a response to the operational bottleneck.

4.4 Discussion of the results

This study showed that the business model implemented by the company studied is, in general, adequate, with one consideration to be made regarding the target audience, which needs to be reviewed. The business was designed to serve individuals and legal entities, but the participation of individuals in revenues and operations can still be considered timid. This means that the company, if possible, needs to invest even more in its efforts to gain a greater share of the organizations and institutions in its customer base. Alternatively, if this is not possible or advantageous, it needs to eliminate this market segment from its operations, at least for the time being. The reason for this is that maintaining customer segments that do not have a significant share in revenues and operations leads to opportunity costs, since these investments could be channeled to more profitable segments.

The organizational macro process, which brings together the means and end activities, can be considered adequate, as can most of the processes that make up each of these dimensions of the division of labor. However, the integration of processes still requires a more thorough review by managers and operators, so that even greater efficiency can be achieved and, as a result, operational and financial effectiveness can be increased and consolidated.

The service logistics practiced by the domestic laundry analyzed present some challenges that can be considered normal for the continuous improvement of its processes. The development of an improved routing system will enable it to achieve several benefits, including optimization of time and financial gains, both by increasing the number of customers and reducing costs. The reprogramming and improvement of

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its operational capacity can also yield synergistic advantages through routing, thereby increasing its productive capacity, whether it maintains existing legal entities as customers or expands its customer base to include individual customers. It is also worth noting that both routing and reprogramming of operational capacity are necessary to consider the needs of customers whose requirements are still unknown.

CONCLUSION

This study describes the integration of logistics processes into the service operations of a domestic laundry operating in the city of Manaus. The results achieved demonstrate that the business model implemented is in line with its internal processes and the service logistics practiced. The harmony found through empirical studies enables the organization to expand its operations by implementing measures that optimize its routing system, reprogram and expand its operational capacity by acquiring the necessary equipment, and segmenting its customers to meet other, yet unknown, needs.

The integration between logistics processes and service operations is what generates the desired internal harmony, found in this study. Logistics processes link the organization to its internal reality, which consists of opportunities and threats. These two uncontrollable dimensions compel organizations to develop action plans that can capitalize on opportunities and mitigate the impacts of threats. This is typically achieved by maximizing strengths and minimizing weaknesses. The organization under study has worked adequately on its strengths, but it needs to go further, eliminating its weaknesses. This is likely to lead to its strengthening in the market segment in which it operates and may open new opportunities. To expand knowledge about integrative studies in service organizations, we recommend carrying out the following studies: a) an analysis of the impact of external environmental components on the integration of logistics processes and operations of service organizations in the city of Manaus; b) a survey of the internal challenges in achieving the integration of logistics processes and operations of service organizations; and c) a study of the types of technologies capable of accelerating the integration of logistics processes with the operations of service organizations operating in Manaus.

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