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Identifying Muda in a fast food service process

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Identifying *Muda* in a fast food service process

Abstract

Purpose –

Identification and elimination of *Muda* (any activity adding cost but not value from the customer perspective) is one of the main objectives of Lean service. Whilst there is significant research on implementing lean in manufacturing and some service industries, there is little information related to its application to the fast food service industry. The purpose of this paper is to try to fill in this gap by answering the research question: What type of *Muda* could be identified from customer perspective within the service production processes in the fast food restaurant industry in Spain?

Design/methodology/approach –

An exploratory case study has been conducted. Three multinational companies were selected and several sites observed in Madrid. Three methods were used to gather data: document analysis; direct and participative observation and semi-structured interviews.

Findings –

The paper identifies the seven types of *Muda*: defects, movements, process, inventory, overproduction, transport and time. Results are discussed for Cases A, B and C, showing that A and B present higher potential for *Muda*, compared with C.

Practical implications – Threefold value for practitioners and managers: waste identification is an opportunity for non-efficient processes improvement; observation/analysis from customer perspective reveal that customers perceive these inefficiencies; a guideline/audit tool for future assessments.

Originality/value – The paper contributes to the limited existing literature on Lean service in fast food industry and disseminates this information to provide impetus, guidance and support towards increasing the productivity, efficiency, consistency and quality of service.

Keywords – Lean, Service, Fast Food, Process, Continuous improvement, Waste, *Muda*.

Paper type – Research paper

1. Introduction

Toyota Production System (TPS) defined and established some principles and management practices with the objectives of improving the quality of their products, improving productivity, reducing costs and optimizing production and delivery times (Ohno, 1988; Womack et al., 1990; Monden, 1993; Womack and Jones, 1996; Agrawal, 2010). Lean production term, derived from TPS, was used for the first time in 1990 (Womack et al., 1990). Lean is doing more with less (Womack et al., 1990). Lean systems provide the best solutions to satisfy the needs to all company stakeholders, as investors, customers, suppliers, employees and community (Emiliani et al., 2003), with the objective of creating value for the final customer by eliminating or minimizing waste. Waste (*Muda* in Japanese) is defined as any activity that increases the cost but does not add any value from the customer perspective (Ohno, 1988; Womack and Jones, 1996). Original literature identifies seven types of waste that can be found in any type of process: defects, movements, process, inventory, overproduction, transport and time (Ohno, 1988; Womack et al., 1990; Womack and Jones, 1996; Agrawal, 2010).

Godsell (2009) states that lean management is based in the application of five principles with the aim of eliminating waste. These principles are: a) a precise and clear definition of value (from the customer perspective) for every product or service; b) identification of value flow for every product or service; c) ensure that value flows with no interruptions; d) let the customer pull the value from the producer; and e) seek and aim for continual perfection (zero defects, zero waste). A key element in Lean systems is flexibility, which means that the system has to be continuously revised and adjusted to the production type and volume that is required at any moment (Cuatrecasas, 2002).

There is a growing interest for implementing lean systems in service companies due to the increase of customer expectations, internal pressures to grow revenue and margins, high level of competition, global markets and new regulations (Allway and Corbett, 2002). Lean systems will provide an answer to these challenges and their implementation will bring significant improvements in the service sector (Piercy and Rich, 2009).

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3 In general, processes in service sector present many situations where waste can be found, and
4 it is due to three main reasons (George, 2003): a) service processes are slow, so they become
5 expensive, where quality resents, costs rise and customer satisfaction and long term income
6 may be impacted; b) service processes are slow because there is a lot of work in progress
7 (sometimes as a result of unnecessary complex offering of products/ services); c) in general,
8 few key activities cause the slow-down in processes (80% of delay is produced by less than
9 20% of activities), so they need to be identified and corrected.

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16 The fast food restaurant sector is considered an essential component of industrialized
17 economies since it represents a large part of a country's gross domestic product. The industry
18 sales in Spain for 2017 were 2.243 million euros. The fast food restaurant sector is a highly
19 competitive industry whose value proposition is based on limited menu, limited service and
20 low prices (Ninemeier and Perdue, 2005). Customers and suppliers exert great pressure to
21 companies in this sector in cost and time. Successful quick service restaurants (QSR)
22 compete effectively on price and speed of service (fast delivery) indicating that these
23 restaurants must maintain operational efficiency in order to keep costs as low as possible to
24 offer low prices and consequently low profit margins (Pettijohn et al., 1997; Mason et al.,
25 2013).

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34 While there is significant research information available on implementing lean techniques in
35 manufacturing environments and in some service industries, there is little information
36 available related to its application to the fast food service industry. Therefore, the purpose of
37 this paper is to try to fill in this gap. The main research question that govern the study is:

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41 RQ. What types of *Muda* or waste could be identified from the customer perspective
42 within the service production processes in the fast food restaurant industry in Spain?
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With the aim of providing an answer to the research question, we first carried out a literature review about *Muda* and Lean Service in general, and then, more specifically, about Lean Service in Fast Food restaurants. The next step was to design an exploratory qualitative case study. Three fast food multinational companies (hamburger) established in Madrid, Spain, were selected. Several sites for each of them have been observed and analyzed, and some interviews have been conducted with personnel working for the selected companies. In total,

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3 three methods were used to gather data: document analysis, direct and participative
4 observation and semi-structured interviews. An introduction to QSR industry has been
5 presented, with the case study profiles and the results. Finally, a section with discussion,
6 conclusions and managerial implications is presented.
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10 11 12 13 **2. Literature Review**

14 **2.1. *Muda* and Lean Service.**

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16 The lean production concept has its roots in manufacturing environments in Toyota
17 Production Systems (Ohno, 1988), and it is about doing more with less. The concept of Lean
18 can be described as “an integrated system of principles, practices, tools, and techniques
19 focused on reducing waste, synchronizing workflows, and managing variability in production
20 flows” (Koning et al., 2006). Some of its principles are the continuous improvement, the
21 “zero defect” goal, the leadership and the respect for people always oriented towards the
22 achievement of two main objectives: the removal of waste and value creation for the final
23 customer. Ohno (1988) classified *Muda* in the following seven types:
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31 (1) Overproduction: Production ahead of demand, the Japanese called it “the killer”.
- 32
33 (2) Inventory: All parts, work in progress and finished good not being processed, the Japanese
34 called it “the serial killer”.
- 35
36 (3) Waiting or delay: For the previous process any delay for the continuous flow.
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38 (4) Overprocessing: Doing things that add no value for the customer.
- 39
40 (5) Defects: All work associated with identifying and correcting defects, and in fact, this
41 *Muda* causes that the products cannot be sold or have to be reworked.
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43 (6) Excess transportation: The movement of materials not required to perform the processing.
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45 (7) Excess motion: People or equipment walking or moving more than necessary to perform
46 process.
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53 Emiliani et al. (2003) and Duffy and Wong (2013) add an eighth *Muda* oriented toward the
54 attitude of the human factor. On the other hand, Radnor et al. (2006) categorized eight wastes
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3 for services: delay, duplication, unnecessary movement, unclear communication, incorrect
4 inventory, opportunity lost, errors and people. Bicheno and Holweg (2009) made a similar
5 classification of *Muda* in services and identified seven waste types: duplication, delay, loss
6 of opportunity with the customer, unclear communication, incorrect inventory, movement of
7 customer and error in the service transaction.
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12 Recent studies have begun to identify *Muda* under different academic perspectives in both
13 manufacturing and services. In particular, the studies have focused specifically on using
14 different tools to observe, identify and measure them. For example, Salhieh *et al.*, (2019) the
15 results of the regression analysis showed a significant influence of the ranked “7 Deadly”
16 wastes or *Muda* on warehouse operational performance. The paper develops a road map for
17 implementing waste-reduction practices in the warehouse. Other research like Dinis-
18 Carvalho *et al.* (2018) argued that the results revealed that Waste Identification Diagram-
19 WID (*Muda* identification) is more effective than Value Stream Mapping and participants
20 recognized that most of the WID elements are relevant. Finally, Suárez-Barraza *et al.*, (2016)
21 found that the *Muda* of Ohno’s classification was confirmed, but new common patterns of
22 *Muda* in twenty-first-century organizations also arose. Furthermore, the TKJ diagram proved
23 to be an effective tool of quality to detect it.
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34 When we are looking the origins of Lean in Service in literature we can search since the
35 1970s, there has been an ideal of implementing manufacturing logic in service operations
36 (Levitt, 1972; 1976) with the aim of improving the productivity and the quality of the service
37 delivered to customers. Productivity and quality are lower in service sector than in
38 manufacturing (Biema and Greenwald, 1997; Toussaint, 2010). Service sector have not
39 developed adequate tools that help to accurately measuring the productivity and its
40 improvement (Biema and Greenwald, 1997).
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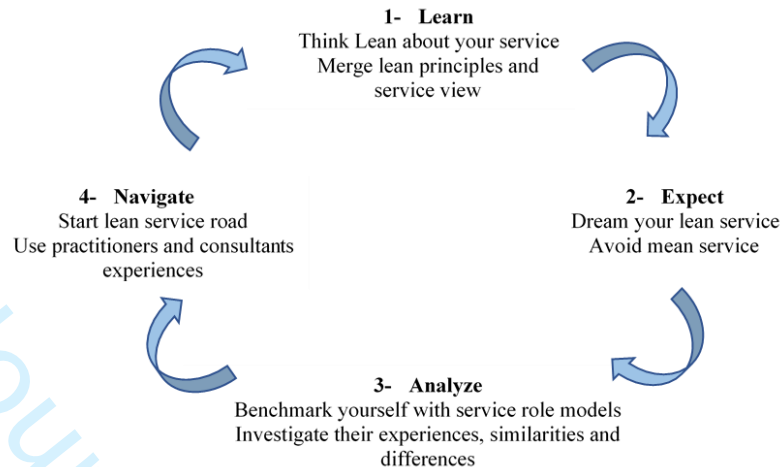
46 The combination of these two concepts have led to the creation of the lean services concept,
47 meaning the arrival of topics such as lean six sigma or service wastes into the service
48 industry. Many authors have struggled to create a definition for Lean service, Bowen and
49 Youngdahl (1998) consider it as the usage of state-of-the-art manufacturing thinking in
50 service operations, more specifically the usage of production principles in service operations
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(Ahlstrom, 2004). In general, some of the most relevant aspects of Lean service are (Suárez-Barrasa and Ramis-Pujol, 2010):

- The organization's strategic and operational goals are oriented towards efficient and flexible compliance with the customer's needs.
- The JIT principle is applied in inventory control for both inputs and outputs of each service.
- The organization's services are run by applying analysis of value maps and flow diagrams to recognize, find and eliminate any activities that do not add value to the process and the service (*Muda*) (Womack and Jones, 1996).
- Staff are trained to develop behaviors and abilities that focus on customer service, and to orient and sensitize customers themselves on how they can contribute in building and guaranteeing quality in the service.
- There is significant investment in mechanisms for staff involvement and participation.

Abdi *et al.*, (2006) focus on the use of the lean approach in service industries. Using the 5 principles developed by Womack and Jones (1996): 1) specify value by service, 2) identify the value service stream, 3) make the service flow, 4) supply at the pull of the customer, and 5) be in pursuit of perfection, proposed one of the first models for Lean Service (Figure 1). According to various authors (Malladi *et al.*, 2011; Damrath, 2012; Robinson *et al.*, 2012), there are 8 wastes in services, which are: inventory, defects, motion, waiting, transportation, over processing, overproduction, and human effort. These ones are similar to the seven wastes from Ohno (1988) in manufacturing.

Figure 1. Lean Service Model



Source: Abdi et al., 2006

2.2. Lean Service in Fast Food restaurants

Bowen and Youngdahl (1998) argue the importance of the transfer of manufacturing logic into service operations, especially since new manufacturing technologies and new models continue being created. As an example, the cases of McDonald's use of a mass-production line approach and Taco Bell's use of Lean service. In the 1960's, McDonald's opted to copy the existing world trend (especially in American auto manufacturers) of mass manufacturing (and the automatization of processes) instead of focusing on innovation. That strategy resulted for McDonald's in a rigid, technology-driven production system designed to produce a limited service offering, although, at the same time it brought growth and profitability to the company. By the 1980's McDonald's was behind its competitors, not being able to compete with their expanded menus and having trouble retaining employees (Bowen and Youngdahl, 1998). Taco Bell opted for an investment in people relative to the investment in equipment, use of technology as support rather than replacement, linkage of compensation with performance. According to Bowen and Youngdahl, (1998) Taco Bell chose to understand what customers valued when going to their restaurants, having customer demand be the one to pull production. Changes were made in the restaurants in order to satisfy those needs, having that approach increase customer service focus and quality. This pioneer authors conclude that some important aspects in Lean service are: reduction of performance tradeoffs, flow production, JIT pull, value-chain orientation, increased customer focus and training, and employee empowerment.

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3 Lean service is a relatively new topic and as a result it has not been deeply studied (Cadavr
4 et al., 2018). While most research has been done on how Lean Service can be applied in
5 multiple service industries, this research has not been equal. Most research has been done on
6 the application of Lean Service in the health and education industries, with few articles
7 related to restaurants and fast food companies (Suárez-Barraza et al., 2012). Various analyses
8 (Sreedharan and Raju, 2016; Sunder et al., 2018) have found that around 2.13% of articles
9 on Lean Six Sigma are focused on the food industry, being one of the least researched
10 industries on this topic.
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20 Vlachos (2015) offers a case study on the use of lean thinking within food supply chains.
21 Food supply chains tend to be complex due to the amount of waste that can occur at any point
22 throughout the supply chain, including short life cycles, poor food preparation techniques or
23 product contamination. Vlachos (2015) argues that with lean thinking, food wastes can be
24 eliminated, a result which would have a positive economic and environmental impact. The
25 article focuses on a tea company in the United Kingdom. The company had implemented
26 lean in three strategies: preparing for lean, diagnosis, and lean operations and control. The
27 study found that lean tools are not being properly adapted in the food industry, especially by
28 SMEs. It found that the main barriers tend to be top management support, knowledge, and
29 operational easiness. Through the development of an action plan, these barriers can be
30 addressed, reducing the probability of failure in lean projects.
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40 Rahimnia et al. (2009) focus their research on lean production and agile manufacturing
41 (leagility) in the fast food industry in Iran. The main question is if those concepts can be
42 applied to a mass service organization and if the lean and agile parts of the system can be
43 distinguished. The article mentions the importance of lead time in the industry, due to the
44 nature of both the fast service and the short life of food. The findings are that despite the low
45 customization in mass services, fast food restaurants have faced changing needs of the
46 customers. To respond to these demands, new strategies can be adopted to be able to serve
47 the customer with short lead times, low costs and high variety.
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54 In a case study developed by Psomas et al. (2018) on Lean adoption in food SMEs in Greece,
55 the current state of Lean principles adoption was measured. A case study approach was
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undertaken with 9 randomly selected food SMEs in Greece. The results show that Lean principles are highly adopted by most participating SMEs, according to the perception of interviewed representatives. The least used strategies by the participating companies, were pull scheduling-just in time, identification of waste, proactive planning, visualization, and structure problem solving. Those areas are the ones that should preferably be targeted for improvement. Lean approaches are especially important in this case due to the short life cycle of food and the economic situation of Greece.

Table 1. Authors in Lean Service implementation

Author	Sector	Tool
Drotz and Poksinska	Healthcare	Value Stream Mapping and 5'S
Suárez-Barraza and Ramis-Pujol	Human Resource Service and Public Sector	Kaizen and Process mapping
LaGanga	Healthcare	"Patient flow"
Antony, Krishan, Cullen, and Kumar	Education	VSM, cause and effect analysis, visual management, pareto analysis, SIPOC, RIW.
Kollberg, Dahlgaard, and Brehmer	Healthcare	JIT, Flow model
Van Rossum, Aij, Simons, Van der Eng, and Dirk	Healthcare	Transition from the "toolbox lean" toward an actual transformation to lean healthcare; no use of specific tools
Cavdur, Yagmahan, Oguzcan, Arslan and Sahan	Construction and Technical Service	Value Stream Mapping

Source: Designed by authors.

3. Methodology

In previous section we have defined the different concepts related to *Muda*, and that there is a gap in literature about how they are implemented in the service sector, and in particular in the QSR industry. Thus, a case study methodology has been adopted (Eisenhardt, 1989; Yin,

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3 1994). This methodology is particularly useful when the research needs to answer the
4 questions “how” and “why” (Yin, 1994). This approach is also considered suitable for
5 research on operational management (Voss et al., 2002).
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9 An exploratory case study has been conducted in this research. Three fast food multinational
10 companies (hamburger restaurants) were selected. Companies have been named A, B and C
11 due to confidentiality and privacy issues, all of them with origin and headquarters in the USA,
12 and also with several stores in Madrid, Spain. A and B opened the first restaurant before 1960
13 in the USA, the first in Spain before 1990. C opened the first restaurant after 1980 in the
14 USA, the first in Spain after 2000. These three firms have been chosen because they are in
15 the top 10 biggest companies in hamburgers QSR in terms of sales and number of stores in
16 the USA, with a relevant presence in Madrid, Spain. Pettigrew (1997) notes that the
17 importance of the size on the sample selection does not lie in the number of cases but in an
18 in-depth study in each case (Pettigrew, 1997, p. 342).
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27 With the aim of ensuring data consistency, three methods were used to gather data: (1)
28 document analysis; (2) direct and participative observation; and (3) semi-structured
29 interviews (Yin, 1994).
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33 Analysis of documentation was done from company websites and store documents as main
34 sources. Direct and participative observation were done by two observers (two authors) who
35 did it in different days, at least four visits each of them to different stores from each of the
36 companies under research, all of them in Madrid, Spain. Then, joint visits were done to three
37 new stores. Thus, in total, more than 27 visits were performed to the chosen stores. Direct
38 observation refers to watching as a visitor, paying attention to details, taking notes, recording
39 messages or taking pictures with a digital camera. This is of great importance in providing
40 study evidence and drawing up the report. Participative observation refers to acting as
41 customers, following all the steps of placing the order, receiving the service, taking the meal
42 to the seating area, having lunch and leaving the restaurant while observing the details
43 (observation, taking notes and pictures as above mentioned). Notes were taken in a field
44 methodological journal.
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54 The aim was to observe the workplaces from the customer’s perspective with the objective
55 to try to evaluate and identify opportunities for *Muda* existence. It is important to reinforce
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3 the idea that our observation is from the customer point of view, so we admit that some
4 assessment for *Muda* could be missing, as everything happening in areas where the customers
5 do not have access (i.e. inside the kitchen or warehouse or some steps in the production
6 process not visible from the customer area). The goal is not to be thorough in all *Muda*
7 identification, but in how the customer could have access to it.
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15 Finally, a total of nine interviews (three interviews in each of the companies under research),
16 were held in Madrid, Spain, between September 2018 and March 2019. Interviewees were
17 store supervisors and operators (see details in Table 2). These interviews strictly followed
18 the research protocol, but some flexibility was adopted, as certain responses required a more
19 detailed explanation in specific subjects. All interviews were transcribed and / or summarized
20 within 48h of being held and were exhaustive in terms of clarity and data saturation.
21 Interviews to several workers of the same company helped to confirm statements from
22 previous interviews and to make clear specific points detected during the observations. Our
23 data analysis sought to both ensure the validity of the construct through the use of multiple
24 sources of evidence and carefully planned data-gathering. We also sought to increase the
25 external validity of the research by making comparisons between the cases of the three
26 companies under research (Yin, 1994).
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Table 2. Case Study interviews

Company (case study)	Job position	Date	Duration
Case Study A	Supervisor	October 2018	20 min
Case Study A	Operator	December 2019	16 min
Case Study A	Operator	January 2019	12 min
Case Study B	Supervisor	September 2018	22 min
Case Study B	Supervisor	November 2018	18 min
Case Study B	Operator	January 2019	14 min
Case Study C	Supervisor	October 2018	18 min
Case Study C	Operator	November 2018	13 min
Case Study C	Supervisor	March 2019	15 min

Source: Designed by authors.

4. Introduction to Quick Service Restaurant (QSR) industry.

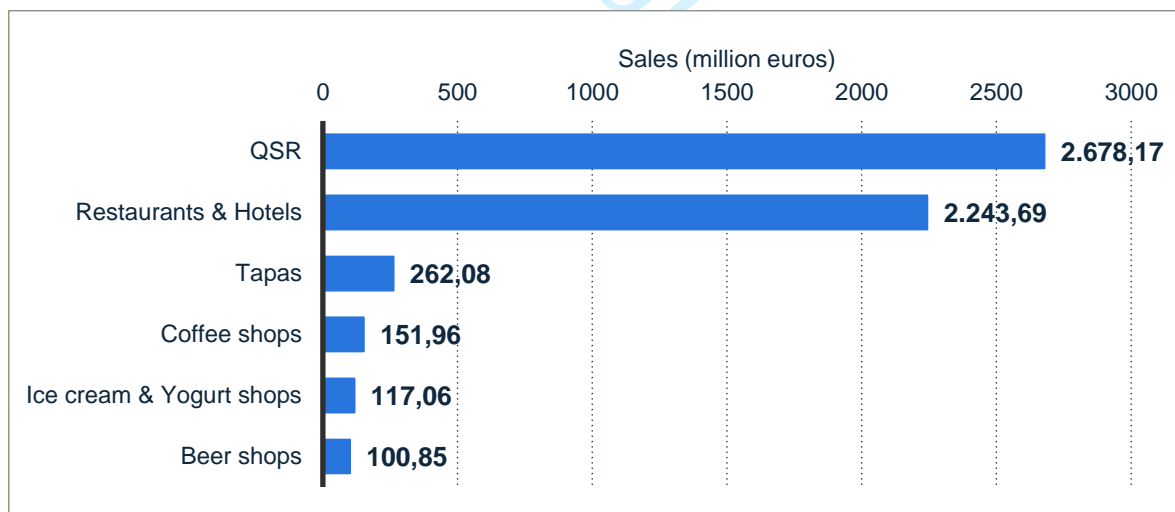
The QSR industry is a highly competitive industry with great rivalry among actors. Its competitive advantage resides in cost (prices are low, and menus and promotions are usually offered) and time (fast delivery is essential to gain and maintain market share). Customers and suppliers exert great pressure to companies in this sector. Entry barriers for new entrants are low, which adds uncertainty and the constant search for ways to block new competitors. We also know that it's an industry very sensitive to the general state of the economy.

This industry is characterized by intense competition and a context of constant change, which causes companies in this sector to continually look for ways to survive. The turbulence in this industry is reflected by the closure of stores, bankruptcies and predictions of large-scale failures. QSR sector is considered as an essential component in any system of industrialized economies since it represents a large part of a country's gross domestic product. It is also one of the main generators of employment. Successful companies in this industry have a network of restaurants with a critical mass of restaurants that help them have operational efficiencies in their supply chain.

The value proposition in this industry is based on limited menu, limited service and low prices (Ninemeier and Perdue, 2005). QSR food is highly processed and prepared on a large scale with standardized cooking and production methods. In most cases, menu items are made from processed ingredients prepared at central supply facilities (or prepared by suppliers) and then transported to individual outlets where the food is reheated and cooked in a short amount of time (Ottenbacher and Harrington, 2009).

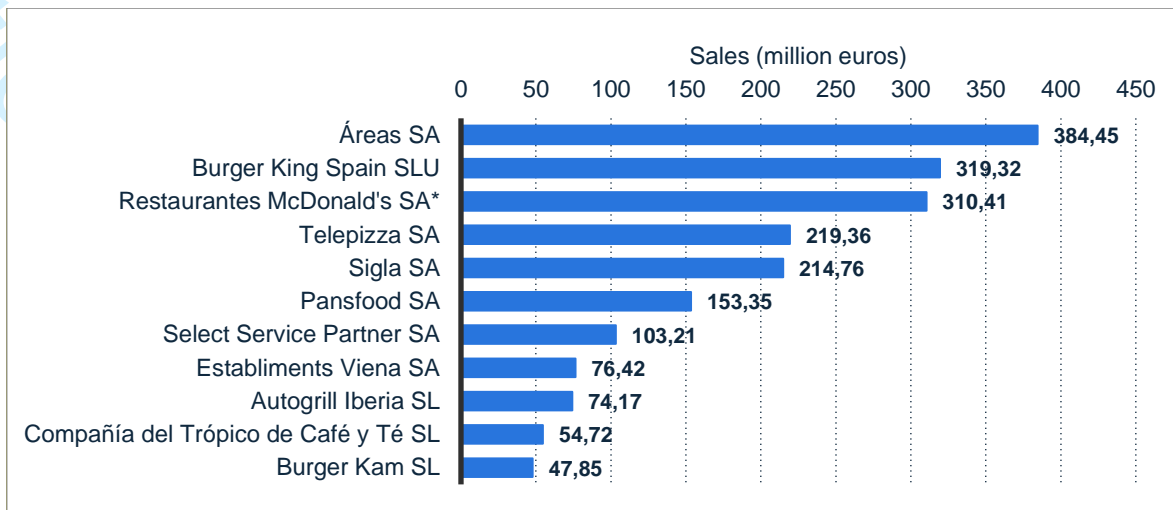
Although historical growth in the QSR business came from adding more stores to their network, year to year profitability growth can be obtained from more efficiency in operations. Successful quick service restaurants compete effectively on price and speed of service indicating that these restaurants must maintain operational efficiency in order to keep costs as low as possible to offer low prices and consequently low profit margins (Mason et al., 2013). Operational efficiency is a key aspect of successful quick service restaurants (Pettijohn et al., 1997). QSR sector is an important part of the economy in Spain. The industry sales for 2017 were 2.243 million euros.

Figure 2: Sales in QSR industry in Spanish market 2017.



Source: La Franquicia en España. Informe 2018, Asociación Española de Franquiciadores.

There are many players in the industry that compete in the sector but the three main brands that get highest market share are Areas, Burger King y McDonald's.

Figure 3: Main players in QSR industry in Spanish market 2017.

Source: La Franquicia en España. Informe 2018, Asociación Española de Franquiciadores.

Common processes for QSR restaurants.

Identifying *Muda* requires analyzing production processes, as well as layouts, as both are related. A typical QSR layout is divided in three main areas: customer area, kitchen and back office. Customer area normally represents a 60% of the layout space and an average restaurant have an average of 150 – 180 seats. It is important that customer rotation ratios are high to meet high occupancy rates needed to make the business profitable. Managing queues is also an important aspect of customer experience at the restaurant.

Over time, QSR companies have worked on new processes and layouts strategies with the aim of improving, but the implementation has not been carried out in all stores at the same time. Thus, big QSR companies owing many stores might present simultaneously different layout designs due to the ongoing implementation process. In our field of study, we have evidenced this situation in two of the case study companies (as they own many stores, some of them more than 20 years old), but not in one case study (a new company being present in Spain for less than 5 years).

Figure 4: Typical areas for a QSR restaurant.



Source: Designed by authors.

The first part of the process to operate a QSR restaurant is similar to the three brands we are analyzing. Customers enter the restaurant randomly according to a Poisson distribution (Heizer, 2017). Orders that are placed through the digital self-serve kiosks or verbal at the Point of Sale (POS) are the kanban that starts the assembly process for the entire order applying an assembly-to-order strategy.

Most QSR restaurants use a kitchen display system (KDS) that manages the process of the order. This system shows the order placed by the customer on screens (or in a printer) located at the kitchen area and indicates to each workstation what are the elements that are in the order, the activities that have to be done and more importantly the order's sequence. With all this information, employees start the assembly process accordingly at the assembly area. The KDS system manages the processing of orders on a First-in First-out basis.

As a general rule, orders follow Assembly-to-Order (ATO) process, but some KDS' systems include a sales forecast based on historical sales and launch orders of typical burgers for peak hours where they expect demand moving to an Assembly-to-Stock (ATS) for products with higher expected demand. The cooking and assembly process of burgers normally is done in batches.

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3 Generally semi-elaborated components (i.e. bread, slice of tomatoes, bacon, lettuce, peppers,
4 onions, mustard, mayonnaise, cheese, eggs) are produced and portioned at vendor
5 installations and delivered to restaurants regularly ready-to-use. Once in the restaurant, they
6 are maintained in storage at storage rooms, freezers or refrigerators. Because food
7 components have short expiration dates, some of them are delivered to restaurants frozen
8 (e.g. meat and potatoes). Every shift, and depending on the expected demand for that period,
9 employees take raw material from storage places at restaurants and distribute them in special
10 bins and recipients at the specified assembly area, normally very close to the assembly's
11 workstation to minimize employees' movements during assembly. In this way, oxidation
12 process of food is reduced to minimum. Once the meat is cooked, the burger is assembled
13 following a stablished sequence of activities and then is delivered to a picking area where
14 another employee is in charge of completing the order with other products such as fries or
15 beverages, to be delivered to customers. Then, customers take their order in a tray and go to
16 seating area to enjoy their meal.

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Once the shift is finished, inventory levels of semi-elaborated and raw materials products are verified and replenished if needed. In case a product has a minimum inventory level, a purchase order is placed for that product. Purchase orders are placed (using a logistic software) to a central distribution center that delivers products two or three times per week depending on volume sales.

5. Results. Identifying *Muda* in QSR industry.

5.1. CASE STUDY PROFILES

The process for Case Study A, B and C operations are similar to the above-mentioned general process for QSR restaurants, but there are some differences between them. Table 3 below presents a summary of similarities and differences.

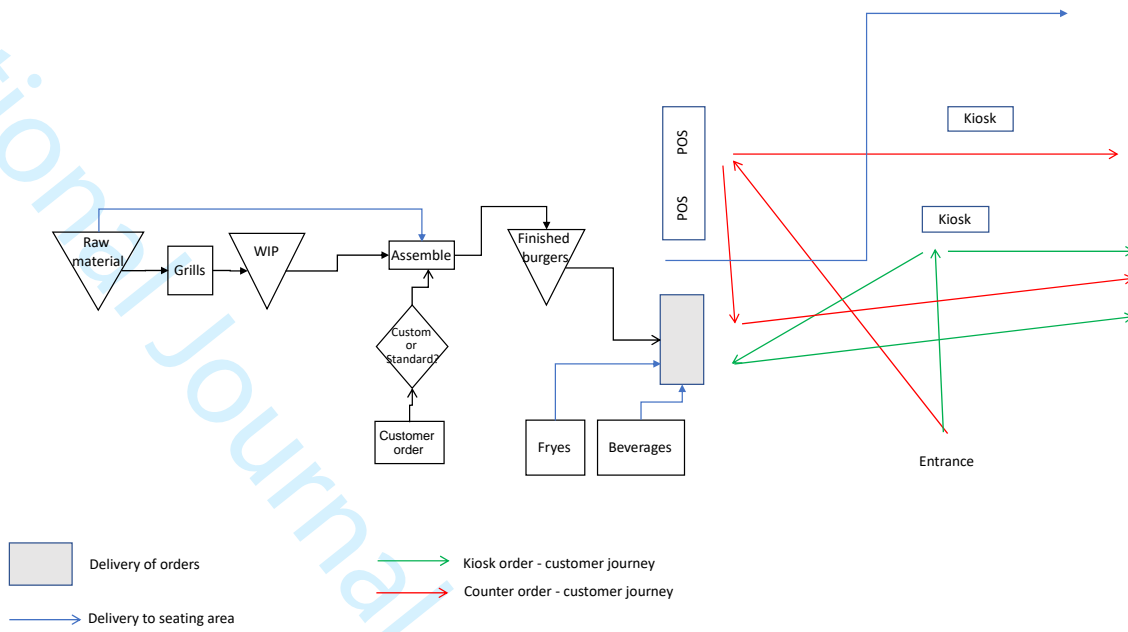
Table 3. Summary of Case Study A, B and C operations.

	Case Study A	Case Study B	Case Study C
Range of products	Wide	Wide	Narrow
Hamburger ingredients	Few	Few	Many
Customization	Low	Low	High
Meat / Fries	Frozen ATS - batch	Frozen ATS - batch	Fresh ATO
KDS	Screens	Screens	Printed paper
Ordering	POS, Kiosk, PDA	POS, Kiosk	POS
Payment	POS, Kiosk	POS, Kiosk	POS
Drinks	POS	Refill	Refill
Delivery	POS, Table	POS	Delivery area

Source: Designed by authors

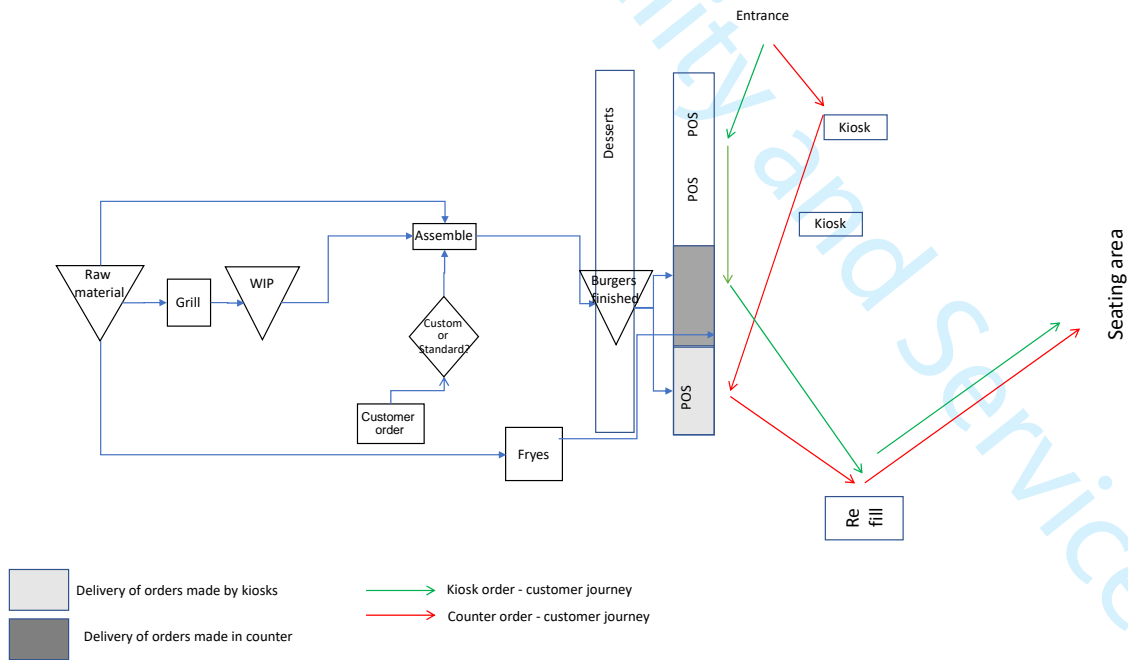
The flow of materials, the preparation process and the customer journey inside the restaurant are different depending on the Case Study. The Figures 5, 6 and 7 represent the flowcharts of the Case Study A, B and C, respectively.

Figure 5: Case Study A flow of materials and customer journey.



Source: Designed by authors.

Figure 6: Case Study B flow of materials and customer journey.



Source: Designed by authors.

- Movements will include unnecessary movement and movement of customer.
- Process will include people and loss of opportunity with the customer.
- Inventory will include incorrect inventory.
- Time will include delay.

Waste identification for case Studies A, B and C is summarized and presented in the following table:

Table 4. RECAP of Findings Case Studies A, B and C.

Waste	Case Study A	Case Study B	Case Study C
Defects	We found no evidence of product defects during our visits (1).	We found no evidence of product defects during our visits (1).	We found no evidence of product defects during our visits (1).
Movements	<p>Customers' moves: <u>Orders:</u> When customers enter the restaurant, they can either go to the digital kiosks or to the counter to place an order, generating confusion and extra movements. For some customers, it is not clear what alternative they should use. <u>Payment:</u> Counter or Kiosk (no matter where the order has been placed). Customers can also place an order in the kiosk and then pay at the counter, generating a two-step process to place the order. <u>Waiting area:</u> Same as ordering counter. Cross-moves from customers, and customers waiting for their orders in front of the counters generate a lack of space and an untidy and confusing area. As a consequence, it becomes a barrier for new customers to place their orders. <u>Refill:</u> There is no refill service. Beverages are delivered by employees and are included in the order delivered.</p> <p>Employees' moves: <u>Production:</u> Employees are assigned to workstations, reducing unnecessary moves and improving specialization. Kitchen not widely open to customers view. Crossing and intersections seem to be frequent in production employees moves in the kitchen. <u>Picking:</u> Completing the order is done by employees at the counter. Condiments are also delivered by employees during picking process. <u>Delivery:</u> At the counter or at table by employee, with plastic trays.</p>	<p>Customers' moves: <u>Orders:</u> As in the case of Case Study A restaurants, when customers enter the restaurant, they can either go to the digital kiosks or to the counter to place an order, generating confusion and extra movements. <u>Payment:</u> Counter or Kiosk (no matter where the order has been placed). Customers can also place an order in the kiosk and then pay at the counter, generating a two-step process to place the order. <u>Waiting area:</u> Same as ordering counter. Cross-moves from customers, and customers waiting for their orders in front of the counters generate a lack of space and an untidy and confusing area. As a consequence, it becomes a barrier for new customers to place their orders. <u>Refill:</u> There is a refill service close to kiosks. Customers do it as they need. Narrow area, not very convenient.</p> <p>Employees' moves: <u>Production:</u> Employees are assigned to workstations, reducing unnecessary moves and improving specialization. Kitchen not widely open to customers view. Crossing and intersections seem to be frequent in production employees moves in the kitchen. <u>Picking:</u> Completing the order is done by employees at the counter. Condiments are also delivered by employees during picking process. <u>Delivery:</u> At the counter, with plastic trays.</p>	<p>Customer moves: <u>Orders:</u> Always on counter. Customers moves are more intuitive and less confusing generating a leaner experience. Exit door separated from entrance door, so clearer and more organized path and flow of people. <u>Payment:</u> Always on counter. Ordering and payment as one step process. Easy and convenient.</p> <p><u>Waiting area:</u> Separated from counter.</p> <p><u>Refill:</u> Refill and condiment are close to waiting area. Customers do it as they need.</p> <p>Employees' moves: <u>Production:</u> Employees are assigned to workstations, reducing unnecessary moves and improving specialization. Kitchen is widely open to customers view, open space. Crossing and intersections seem to be minimized in production employees moves in the kitchen. <u>Picking:</u> Completing the order is done by employees at the counter. No additional condiments are delivered. <u>Delivery:</u> At the counter, the order is wrapped with aluminium foil paper, without trays.</p>

	<p>Customers can either decide to wait for the order at the counter or require the order to be delivered to their table. This generates the need of an additional employee who is constantly delivering orders to tables. In rush hours, there can be up to three persons doing delivery to table. Because identification numbers for tables are distributed randomly at the moment of placing the order and selecting the option "Delivery to table" is a confusing process for employees.</p> <p><u>Cleaning</u>: Intense and continuous cleaning activity, as some customers leave the trays, packaging and food waste on the tables, that need to be clear out. High quantity of packaging. High volume. Trays need to be collected and taken to the kitchen for washing and reuse.</p>	<p><u>Cleaning</u>: Intense and continuous cleaning activity, as some customers leave the trays, packaging and food waste on the tables, that need to be clear out. High quantity of packaging. High volume. Trays need to be collected and taken to the kitchen for washing and reuse.</p>	<p><u>Cleaning</u>: Continuous cleaning activity, but scarce in volume, as only few customers leave the packaging and food waste on the tables to be clear out. Low quantity of packaging. Low volume. No trays, less packaging so less reverse logistics, thus less movements.</p>
Process	<p><u>Final product (burguer)</u>: Assembly-to-Stock (ATS): Although normal production process is ATO, for peak hours some products are produced on an ATS strategy based on expected demand, generating overproduction of some burgers and a potential for waste.</p> <p><u>Work in process (meat)</u>: It comes frozen from suppliers, and it is cooked in batches and maintained in a warmer station waiting for the orders (30 minutes; after that, meat is dehydrated losing consistency and quality).</p> <p><u>Work in process (other)</u>: Bread is toasted by units and the rest of ingredients are produced in batches.</p> <p><u>Process monitoring / work orders</u>: KDS system with screens.</p>	<p><u>Final product (burguer)</u>: ATS: Although normal production process is ATO, for peak hours some products are produced on an ATS process, generating overproduction of some burgers. Employee in the assembly area is working simultaneously in 6 to 10 burgers.</p> <p><u>Work in process (meat)</u>: It comes frozen from suppliers, and it is grilled in 12 unit batches.</p> <p><u>Work in process (other)</u>: Bread is toasted by units and the rest of ingredients are produced in batches.</p> <p><u>Process monitoring / work orders</u>: KDS system with screens.</p>	<p><u>Final product (burguer)</u>: ATO: Production of burgers follows an ATO process.</p> <p><u>Work in process (meat)</u>: It comes fresh from suppliers, and it is grilled one by one, when an order has been placed.</p> <p><u>Work in process (other)</u>: Bread is toasted by units and the rest of ingredients are produced in batches.</p> <p><u>Process monitoring / work orders</u>: The company use no KDS nor screens in their order system. The order is printed in paper (ticket). There is a risk of loosing or damaging the order printed during the process of assembly.</p>

	<p>Task distribution: Similar to Case Study A, it seems that employees are cross trained to perform different activities, but they are specialized in a particular moment. Everyone is in a specific position, with a clear task, all tasks should be balanced although we perceive sometimes that one person is waiting for another one. They work as a work cell for all items except for the hamburger assembly. The employee taking the order is the one to prepare the tray and the picking, and finally is the last step to deliver the order to the customer.</p>	<p>Task distribution: Similar to Case Study A, it seems that employees are cross trained to perform different activities, but they are specialized in a particular moment. Everyone is in a specific position, with a clear task, all tasks should be balanced although we perceive sometimes that one person is waiting for another one. They work as a work cell for all items except for the hamburger assembly. The employee taking the order is the one to prepare the tray and the picking, and finally is the last step to deliver the order to the customer.</p>	<p>Task distribution: It seems that employees are cross trained to perform different activities, but they are specialized in a particular task. Everyone is in a specific position, with a clear task, all tasks well balanced in an assembly line (straight line shape), being the last step the one to deliver to customer. Two colours for employee uniforms: black for supervisors, red for standard employees. There is an excess of grill and frying capacity, so no need of inventory.</p>
Inventory	<p>Raw material: No evidence of raw material inventory (2).</p> <p>Work In Process: Case Study A burger assembly process is based on maintaining burgers cooked in warmer stations. This allows the process to reduce preparation time of burger meat. However, there is a risk of generating waste. Burger meat cannot be maintained in warmers equipment for more than 30 minutes. After that period of time, meat is dehydrated and loose quality. Fries are produced in batches; if not sold quickly, waste is produced. Other ingredients prepared in batches based on demand.</p> <p>Finished Goods: Hamburgers are produced ATO except for peak hours that they keep a WIP inventory (quantities are supposed to be optimized by a forecast calculations software based on historical data).</p> <p>Packaging: Optimized control of packaging material.</p> <p>Trash: Trash has to be maintained inside a warehouse area during the day, using high cost of real estate. Although trash generation is high, Case</p>	<p>Raw material: No evidence of raw material inventory (2).</p> <p>Work In Process: Case Study B 's burger assembly process is based on maintaining burgers cooked in warmer stations. This allows the process to reduce preparation time of meat burger. However, there is a risk of generating waste. Meat burger can not be maintained in warmers equipment for more than 30 minutes. After that period of time, meat is dehydrated and loose quality. Fries are produced in batches; if not sold quickly, waste is produced. Other ingredients prepared in batches based on demand.</p> <p>Finished Goods: Hamburgers are produced ATO except for peak hours that they keep a WIP inventory (quantities are supposed to be optimized by a forecast calculations software based on historical data).</p> <p>Packaging: Only at Refill area an excess of packaging material can be observed.</p> <p>Trash: Trash has to be maintained storage during the day, using high cost of real estate. They do not segregate trash.</p>	<p>Raw material: Bags of potatoes are stored inside the restaurant area (as part of decoration). This reduces space in storage room at back office. No evidence of other raw material inventory (2).</p> <p>Work In Process: Because meat is done on demand when the order is placed (ATO) by the customer, there is no inventory of burgers like in the previous cases. This is an advantage from the point of view of reducing WIP components but could be a disadvantage for capacity constraints during rush hours. Fries are done in a two-step process increasing number of WIP fries.</p> <p>Other ingredients prepared in batches based on demand.</p> <p>Finished Goods: Hamburgers are always produced ATO. So, no inventory at all.</p> <p>Packaging: Only at Refill area an excess of packaging material can be observed.</p> <p>Trash: Trash is lower as Case Study C uses less packaging material. They do not segregate trash.</p>

	Study A segregates trash in different bins (organic, plastics, paper) facilitating recycling process.		
Overproduction	<p><u>WIP</u>: Meat and Fries are cooked in batches ahead of demand (ATS), generating risk of overproduction and lowering quality product. Other ingredients do not generate overproduction, as they are used first in, first out.</p> <p><u>Finished goods</u>: Although normal production process is ATO, for peak hours some products are produced on an ATS process, generating overproduction of some burgers.</p> <p><u>Packaging</u>. There is an over supply of packaging in each order. Every order generates very high quantity of paper and plastic waste, some of them very difficult to recycle.</p>	<p><u>WIP</u>: Meat and Fries are cooked in batches ahead of demand (ATS), generating risk of overproduction and lowering quality product. Other ingredients do not generate overproduction, as they are used first in, first out.</p> <p><u>Finished goods</u>: Although normal production process is ATO, for peak hours some products are produced on an ATS process, generating overproduction of some burgers.</p> <p><u>Packaging</u>. There is an over supply of packaging in each order. Every order generates very high quantity of paper and plastic waste, some of them very difficult to recycle.</p>	<p><u>WIP</u>: Fries are cooked in 2 step batches ahead of demand (ATS). Neither risk of overproduction nor lowering quality product because of the 2 step process. Other ingredients do not generate overproduction, as they are used first in, first out.</p> <p><u>Finished goods</u>: No overproduction.</p> <p><u>Packaging</u>. Supply of packaging is minimized.</p>
Transport	<p><u>Trays</u>. Orders are delivered to customers in trays. After finishing their meals either customers leave their tray on top of trash bins or an employee collect them. Then, the trays need to be cleaned and transported again to picking area to be reused. It represents a waste in movement of people (employees or customers).</p> <p><u>Trash</u>. Packaging provided with orders has a high volume, thus generating the need to have big trash rooms at back office to maintain trash storage during the day.</p>	<p><u>Trays</u>. Orders are delivered to customers in trays. After finishing their meals either customers leave their tray on top of trash bins or an employee collect them. Then, the trays need to be cleaned and transported again to picking area to be reused. It represents a waste in movement of people (employees or customers).</p> <p><u>Trash</u>. Packaging provided with orders has a high volume, thus generating the need to have big trash rooms at back office to maintain trash storage during the day.</p>	<p><u>Trays</u>. There are no trays to deliver orders (they are delivered wrapped in aluminium foil paper), eliminating the transportation and cleaning process of trays.</p> <p><u>Trash</u>. Packaging provided with orders has a low volume, thus generating the need to have mid size trash rooms at back office to maintain trash storage during the day.</p>
Time	<p><u>Menu boards</u>: Many options offered. Menu boards are confusing for customers, at least for not frequent customers. They are very compartmented and have too much information with many colors, texts and prices. Customers spend time trying to identify the product they want, producing queues delays and making the order process slower.</p> <p><u>Payments</u>: Cash payments at POS to orders from kiosk. There is an option to pay in a POS at counter after placing the order in Kiosk. This make an order placing longer than in traditional way at POS and</p>	<p><u>Menu boards</u>: Many options offered. Menu boards are confusing for customers, at least for not frequent customers. They are very compartmented and have too much information with many colors, texts and prices. Customers spend time trying to identify the product they want, producing queues delays and making the order process slower.</p> <p><u>Payments</u>: Cash payments at POS to orders from kiosk. There is an option to pay in a POS at counter after placing the order in Kiosk. This make an order placing longer than in traditional way at POS and</p>	<p><u>Menu boards</u>: Limited options offered. Menu boards are simple and self-explained, so easy to understand for customers and faster to place and process the orders. When some people waiting in the queue, personnel offer help to assist if doubts about the ordering process.</p> <p><u>Payments</u>: Immediate payments at POS at counter just after placing the order. Fast and clear.</p>

	<p>not taking advantage of automatization with kiosks. <u>Waiting area:</u> Customers wait for their orders at the same area where they place the orders generating confusion and delays. It also impacts on customer perception of long waiting times.</p> <p><u>Layout:</u> Layout need to have more flexibility. Tables with 4-seats configuration reduce flexibility and the restaurants lose capacity and reduces free space for customer movement. At the time of inspections utilization was 60%. Proposal: community tables and 2-seat configuration offer more flexibility and improve the time a customer is waiting for a table, improving customer experience.</p>	<p>not taking advantage of automatization with kiosks. <u>Waiting area:</u> Customers wait for their orders at the same area where they place the orders generating confusion and delays. It also impacts on customer perception of long waiting times.</p> <p><u>Layout:</u> Layouts need to have more flexibility. Tables with 4-seats configuration reduce flexibility and the restaurants lose capacity and reduces free space for customer movement. At the time of inspections utilization was 50%. There is also an area with a sofa and armchairs which is unutilized (less than 50%). Proposal: community tables and 2-seat configuration offer more flexibility and improve the time a customer is waiting for a table, improving customer experience.</p>	<p><u>Waiting area:</u> Customers wait for their orders at a different area where they have placed them, so it helps to free space and impacts on customer perception of shorter waiting times (salty peanuts for free help to maximize this perception). <u>Layout:</u> Different entrance and exit doors, helping to reduce times. Layout is more open, easy to access by customers, more flexible, everything at customer sight, improving customers time waiting for a table, as well as customer experience and restaurant capacity. Some examples are: narrower tables; tables around columns (25cm width) with high chairs; combination of traditional tables with high tables in a sharing space area; tables with booth seats. At the time of inspections utilization was 70%. <u>Decoration:</u> more casual, stylish and robust design, simpler and easier to clean and maintain compared to Case Study A and B, reducing the employee times assigned to these activities.</p>
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Notes:

- (1) No Defects detected or reported during the visits. We found no evidence of product defects since product defects are either detected by employees during the production process (ex. Meat overcooked, bread falling down on the floor, etc.) or experienced by customers (ex. Meal too cold, missing components in the burger, etc.). In both cases, we do not have access to this level of information, as our analysis is intended to be from customer point of view with lean eyes. Real and precise information about defects can easily be obtained by the company, as they can record incidences within the production process and with customers (complaints).
- (2) Raw material inventory. No evidences have been reported due to the fact that this research has been carried out from customer's perspective, and customers do not have access to warehouses, just to what they can see inside the restaurant area.

6. Discussion / Conclusion and managerial aspects.

The research question that governs this study is to try to identify the different types of *Muda* that could be identified from a customer perspective within the service production processes in the fast food restaurant industry in Spain. It is important to point that the assessment has been done from the customers perspective, so only areas and processes accessible from this point have been observed. The reason is twofold: first and most important, as the assessment is done from customer's perspective, it means that any customer can see what happens in a restaurant at any time, so detecting inefficiencies will impact on customer experience. Second, audits and internal inspection are not allowed inside production areas, internal warehouses or back offices, so, there is no access to this information. The discussion is based on the comparison of the results obtained in Case Study A, B and C. First, we present a comparison of results about the following types of *Muda*:

Defects.

We found no evidence of product defects in all Case Studies. This is something that we could expect since product defects are either detected by employees during the production process (ex. Meat overcooked, bread falling down on the floor, etc.) or experienced by customers (ex. Meal too cold, missing components in the burger, etc.).

In both circumstances, we do not have access to this level of information, as our analysis is intended to be from customer point of view with lean eyes.

Movements.

Customers' moves: In Case Study A and B, when customers enter the restaurant, they can either go to the digital kiosks or to the counter to place an order, generating confusion and extra movements. Same waiting area for ordering and being delivered the meals (except Case Study A, when orders are taken to the table). Case Study C customer moves are more intuitive and less confusing generating a leaner experience. Exit door separated from entrance door, so clearer and more organized path and flow of people.

Employees' moves: Similar in Case Study A and B, except for "Delivery to table" (only A) which is a confusing process for employees. Very lean, clear for Case Study

C. No trays, less packaging so less reverse logistics for Case Study C versus A and B, thus less movements.

Refill: In Case Study A there is no refill service, so beverages are delivered by employees and are included in the order delivered. Case Study B and C have Refill system for beverages, freeing personnel.

Picking: Case Studies A, B and C: Completing the order is done by employees at the counter (different employees for different tasks). Condiments are also delivered by employees during picking process. Case Study C presents a leaner approach, as no tray is needed.

Process.

Meat: Case Studies A and B are ATS (batches), while Case Study C is ATO.

Fries: All Case Studies A, B and C are ATS.

Final product: Case Studies A and B normal production process are ATO, but for peak hours some products are produced on an ATS strategy based on expected demand, generating overproduction of some burgers and a potential for waste. Case Study C is always ATO.

Tasks distribution: All employees in Case Studies A, B and C are cross trained to perform different activities.

Inventory.

Raw materials: No evidence of raw material inventory, as it is kept in back office areas, and our research is focused on the customer perception, so we do not have access to this area. The only exception is the potatoes bags in Case Study C, which are stored inside the restaurant as part of decoration.

Work In Process: Case Study A and B keep WIP of Meat, but not Case Study C.

All Case Study A, B and C keep WIP of Fries.

Finished Goods: Case Study A and B keep WIP of Hamburgers (mainly during peak hours), but not Case Study C.

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3 *Packaging.* Only at Refill area can be observed an excess of packaging material in
4 Case Study B and C.

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6
7 *Trash.* All Case Study A, B and C produce, store (during working hours) and do not
8 segregate Trash and Waste, but they are lower in Case Study C as it uses less
9 packaging material.
10

11 12 13 Overproduction.

14
15 *Cooking:* Case Study A and B: Meat and Fries are cooked in batches ahead of demand
16 (ATS), generating risk of overproduction and lowering quality product. Case Study
17 C no risk of overproduction. Other ingredients do not generate overproduction, as
18 they are used first in, first out.
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22 *Finished goods:* Case Study A and B for peak hours some products are produced on
23 an ATS process, generating overproduction of some burgers. Case Study C no risk of
24 overproduction.
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28 *Packaging.* Only Case Study A and B present a risk of over supply of packaging in
29 each order.
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31 32 Transport.

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34 *Trays.* In Case Study A and B, orders are delivered to customers in trays. The trays
35 need to be cleaned and transported again to picking area to be reused. It represents a
36 waste in movement of people (employees or customers). Case Study C does not use
37 trays.
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41 *Trash.* Packaging provided with orders has a high volume in Case Study A and B,
42 thus generating the need to have big trash rooms at back office to maintain trash
43 storage during the day. Case Study C presents lower volume.
44

45 46 47 Time.

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50 *Menu boards:* Case Study A and B menu boards are more complex, increasing
51 ordering times, while Case Study C is simple and self-explained.
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54 *Payments:* Case Study A and B payment systems add more complexity, increasing
55 paying times, while Case Study C is faster.
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Waiting area: In Case Study C customers wait for their orders at a different area in where they have placed them, so it helps to free space and impacts on customer perception of shorter waiting times. In the other hand, Case Study A and B use the same area.

Layouts: Case Study C presents different entrance and exit doors, helping to reduce times. Layouts is more open, easy to access by customers, more flexible, everything at customer sight, improving customers time waiting for a table, as well as customer experience and restaurant capacity, compared with Case Study A and B. At the time of inspection utilization was 60% (A), 50% (B) and 70% (C).

Decoration: more casual, stylish and robust design, simpler and easier to clean and maintain compared to Case Study A and B, reducing the employee times assigned to these activities.

Based on previous results and discussion, we propose the Table 4 as a summary of the potential wastes identified for the three Case Study A, B and C restaurants, considering High, Medium or Low the risk for producing waste.

Table 5. Summary of Waste identification is Cases Study A, B and C

	Case Study A	Case Study B	Case Study C
Defects	N/A	N/A	N/A
Movements	High	Medium	Low
Process	High	High	Low
Inventory	High	High	Low
Overproduction	High	High	Medium
Transport	High	High	Low
Time	High	High	Low

Source: Designed by authors.

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5 According to what was found at the crossroads of the case studies and following the
6 identification question that indicates: identify the different types of *Muda* that could be
7 identified from a customer perspective within the service production processes in the fast
8 food restaurant industry in Spain. The contribution of our study with respect to the literature
9 of the subject has five main aspects:
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- 13
14 1. The literature on the topic of *Muda* in organizations generally focuses on an internal
15 process perspective, under the classification of Ohno in Toyota Motor. That is, any
16 activity that does not add value to the process is considered a *Muda* (Ohno, 1988).
17 Orienting the *Muda* from a perspective of the receiver of the output of the process is
18 a topic little studied in fast food restaurant. In fact, it confirms previous works of the
19 visualization of the *Muda* under this optics such as Psomas et al. (2018).
20
21
- 22 2. It seems that the potential *Muda* identified for Cases A and B is presented throughout
23 the Ohno classification, indicating previous work that the work processes of any type
24 of organization the potential for the *Muda* to be generated or presented in Somehow
25 it is HIGH. For example, the work Ann Douglas et al., (2015) presents a similar table
26 of *Muda* in Higher Education, the same goes for the works of Suárez-Barraza et al.,
27 (2016) and Dinis Carbalho et al., (2018).
28
29
- 30 3. Some types of *Muda* identified in our research also confirm the literature of both
31 manufacturing and services, for example, *Muda* in transport, in our findings are
32 shown in the transport of trays and garbage mainly. But we can find, common *Muda*,
33 like the Inventory in WIP in the peak hours of hamburger production. Another
34 common type of *Muda*, is the *Muda* of time (or of delay) when generating excess of
35 options of Menu produces delay in the decision of the client and of course confusions,
36 which can lengthen the waiting lines. Excess delays, excess inventories, and
37 transportation failures are common *Muda* from Ohno's literature (1988), Emiliani et
38 al. (2003), Bicheno and Holweg (2009), and recent literature by Ann Douglas et al.
39 (2015) and Suárez-Barraza et al. (2016).
40
41
- 42 4. The *Muda* in the processes in the fast food restaurants have a very serious
43 consequence at the moment that those of errors or failures arrive at the client. As for
44 example, Waiting for the bad distribution of layouts, confusions or failures in orders
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3 that affect the client. If the service processes are *Muda* and seriously affect the
4 Moment of Truth (Carlzon, 1991) the client can perceive a negative image of the fast
5 food restaurant generating a negative perception of the client. But even more, as
6 Suárez-Barraza et al., (2016) points out in the 21st century, *Muda* does not simply
7 remain a perspective in the client's mind, or in some opinion this can be transmitted
8 via social networks to have a greater negative impact with potential customers.
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14 With this research work it can be concluded that the different types of *Muda* identified by
15 Ohno are feasible to be identified in the flow of services process in fast food industry. And
16 some different varieties of the Ohno classification can be presented as a subcategory that
17 can impact the image or the moment of the truth of the client of this type of restaurants.
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24 This paper offers some practical implications for managers and practitioners in the QSR
25 field: i) the identification of all different types of waste all along the production process
26 provides the managers an opportunity for continuous improvement; this can be achieved
27 through process redesign and / or layout redesign (continuous horizontal flows in U-shape
28 help to prevent *Muda* as waiting, movement or transportation); ii) as the observation and
29 the analysis has been carried out from the customer's perspective, this paper presents an
30 evidence of inefficiencies and bad performance that can be easily detected by QSR
31 customers (and this might impact on a negative customer experience); iii) the results and
32 conclusions could be of interest as a reference or guideline for practitioners to develop an
33 audit tool that could be used for future assessments.
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44 Finally, the main limitations of the study are: i) the data cannot be generalized due to its
45 qualitative nature; ii) the findings refer to the specific context of fast food restaurants in
46 Spain; iii) *Muda* identification has been done from a customer perspective, as it was not
47 possible to collect data from an internal/operational perspective of the process. Future studies
48 could be done with a larger sample of fast food restaurants, with a focus on both internal and
49 external perspectives, as well as other geographical areas.
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Appendix. Extracts from Interviews.

Table A1. Extracts from Interviews. Case Study A

From interview to a supervisor:

“The employee receiving the order is in charge of preparing the drinks and desserts, as well as placing all the elements on the tray”.

“Our layout is divided in two areas: that area (pointing out to it) is a more relaxing environment than the restaurant area”.

“The meat comes frozen”.

“In some restaurants we are implementing delivery to table. This generate need for more employees”

“We have a system that tell us what to produce. This is linked to our demand forecast for the day”

“We need more flexibility in our layout. During lunch time, we don´t have enough seats to accommodate our customers”

From interview to an operator:

“We use a warmer station to maintain meat burgers ready for rush ours”

“During peak times we produce our high sellers products and maintain them in stock for 10 minutes”

“We have new decorations with good-looking materials and art work”

“We have special bins in customer area to segregate trash. Customers can make the segregation themselves”

“We have trash compactors at back office to reduce the size of trash, specially papers and cardboard trash.”

“Kiosks help us to reduce waiting lines”

Source: Designed by authors.

Table A2. Extracts from Interviews. Case Study B

From interview to a supervisor:

“Meat comes frozen, and it is always prepared in batches of 12 units”.

“We have a sophisticated software that helps us to do demand forecasts on a weekly and daily basis. Even in an hourly basis. It also determines the work in process inventory level that we need to have on hand on an hourly basis”.

“The employee receiving the order is in charge of preparing the drinks and desserts, as well as placing all the elements on the tray”.

“We need to be prepared for unexpected demand peaks, as a group of 20 children coming at the same time”.

From interview to an operator:

“Customer refill help us to make less activities to prepare the order”

“We need more flexibility seats. For example, upstairs we have a sofa in the customer area that could be replaced with four tables and eight seats, increasing capacity and flexibility too”

“Kiosks help us to process more orders and reduce waiting time for repetitive customers. First-time customers are a little bit confused or they don't realize that you can place orders from both sides of the kiosks”

“Payment option at counter sometimes is confusing”

Source: Designed by authors.

Table A3. Extracts from Interviews. Case Study C**From interview to a supervisor:**

“Workers use different types of uniforms depending on level of responsibility. Operators are dressed in red, while supervisors in black uniforms”

“We provide with help to customers in case of doubts about the menu. While queuing before placing the order, an assistant offers help to explain the menu and ordering process”.

“Customers can eat for free salty peanuts while waiting for the order to be delivered”.

“Meat is always fresh (never frozen) and it is only grilled when there is an order. Same for the bread toasting. But all other ingredients are prepared in batches”.

“All orders are printed, and this receipt will be the way we communicate all along the production process”.

“Customers enter the restaurant through one door and leave the restaurant through a different one, avoiding bottlenecks and congestion in the customer journey”

“The employees that are in the POS are very well trained to assist first-time customers”

“Customers order at POS and then move to the end of the restaurant to pick up their order, not generating congestion and keeping the line moving”

“We have high capacity equipment in our kitchen. This is the heart of the restaurant.”

From interview to an operator:

“Construction materials are very good. It’s very easy to clean and they are very strong. We are located in a high pedestrian traffic area and sometimes the restaurant is full of people”.

“Customers can refill their beverages. This is part of the waiting process. They can do an activity while order is being prepared making the waiting time less tedious.”

“We keep cleaning the customer area constantly”

“Kitchen is open to show customers what we do. We have nothing to hide, we are very proud of our products and employees”

“We don’t deliver orders in trays. This help us to clean tables faster. Also, in other fast foods, like Case Study A, trays are always wet or dirty”

“We have fewer products but very good ones. Our Menu board is very simple and customers can place an order easily.”

“Condiments like ketchup or mayonnaise are free to serve by customers”

“We do not segregate trash”

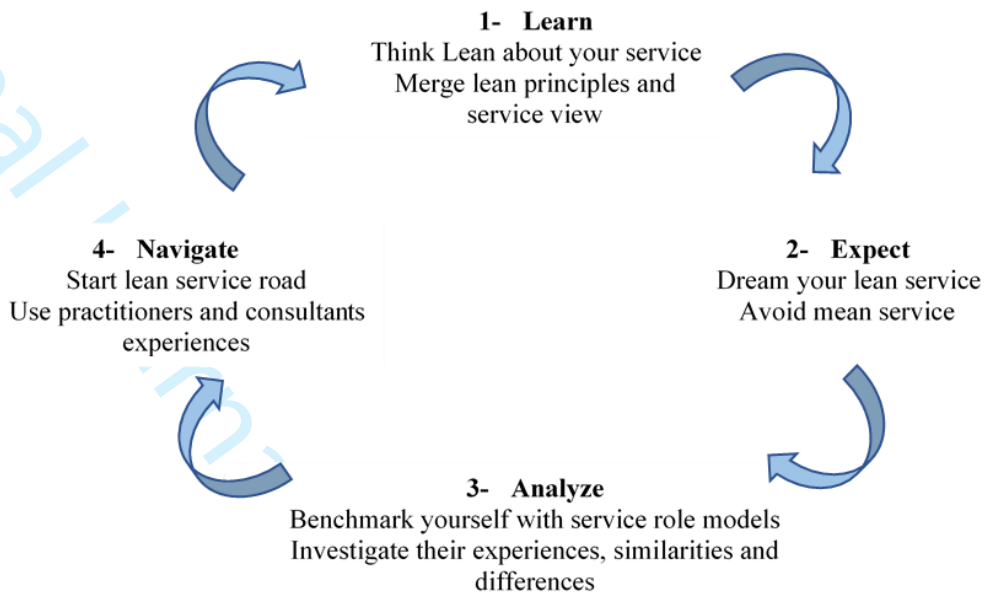
“We cook the burger when it is ordered, assuring high quality burgers. We do not maintain pre-cooked burgers in warmer stations. In the case of fries, we cooked them in a two-step process to make sure that customers have their order on time”

“Aisle in kitchen are wide enough to work two people back to back very comfortably”

“We should have more flexible seats. During peak hours, customer have no place to sit and leave. We installed kind of tables around columns for those customers who don’t mind to eat standing up”

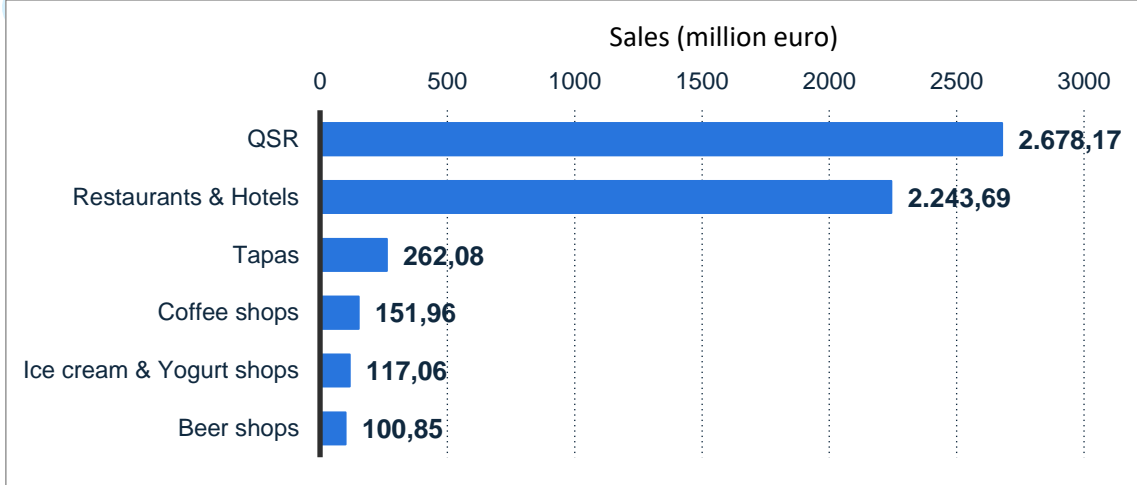
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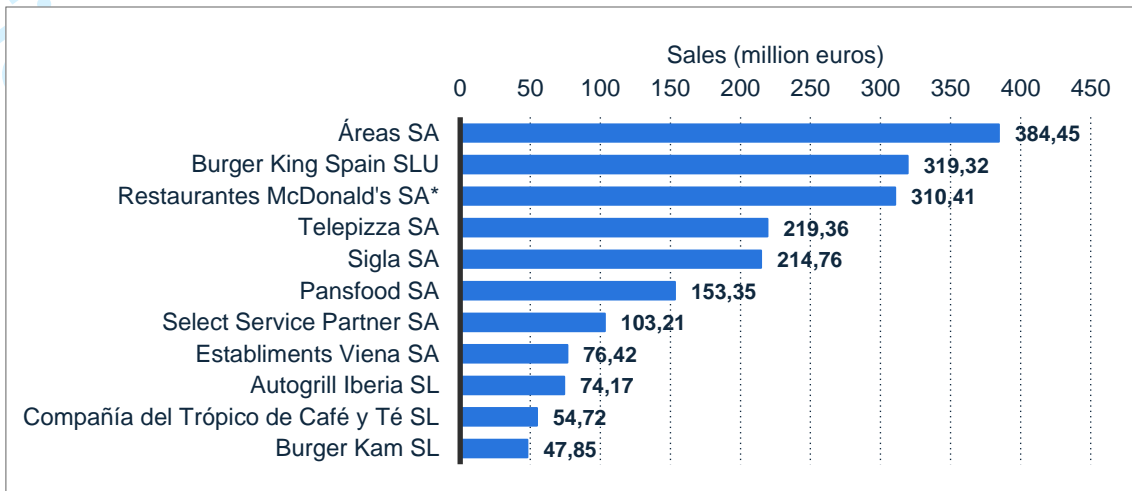
Author	Sector	Tool
Drotz and Poksinska	Healthcare	Value Stream Mapping and 5'S
Suárez-Barraza and Ramis-Pujol	Human Resource Service and Public Sector	Kaizen and Process mapping
LaGanga	Healthcare	"Patient flow"
Antony, Krishan, Cullen, and Kumar	Education	VSM, cause and effect analysis, visual management, pareto analysis, SIPOC, RIW.
Kollberg, Dahlgaard, and Brehmer	Healthcare	JIT, Flow model
Van Rossum, Aij, Simons, Van der Eng, and Dirk	Healthcare	Transition from the "toolbox lean" toward an actual transformation to lean healthcare; no use of specific tools
Cavdur, Yagmahan, Oguzcan, Arslan and Sahan	Construction and Technical Service	Value Stream Mapping

Company (case study)	Job position	Date	Duration
Case Study A	Supervisor	October 2018	20 min
Case Study A	Operator	December 2019	16 min
Case Study A	Operator	January 2019	12 min
Case Study B	Supervisor	September 2018	22 min
Case Study B	Supervisor	November 2018	18 min
Case Study B	Operator	January 2019	14 min
Case Study C	Supervisor	October 2018	18 min
Case Study C	Operator	November 2018	13 min
Case Study C	Supervisor	March 2019	15 min



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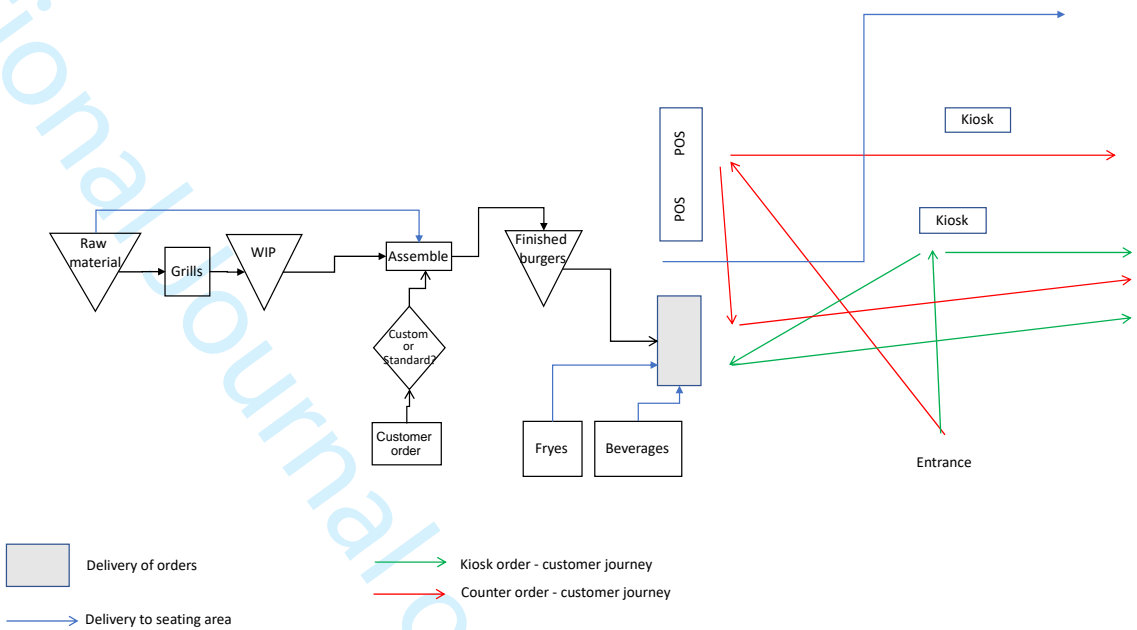
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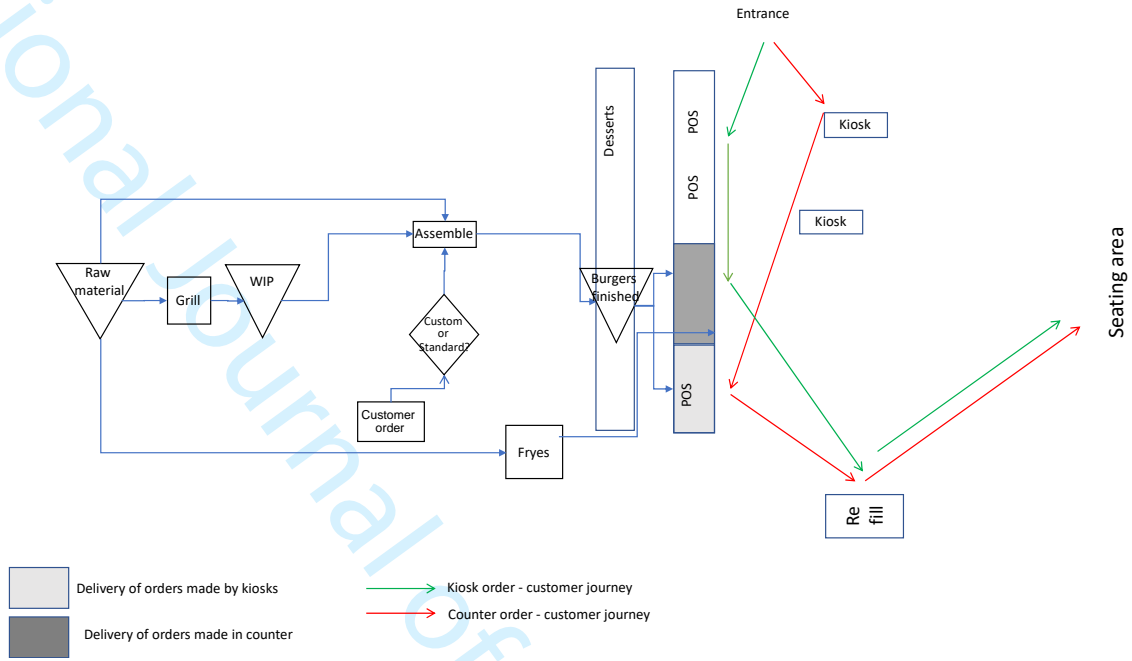


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	Case Study A	Case Study B	Case Study C
Range of products	Wide	Wide	Narrow
Hamburger ingredients	Few	Few	Many
Customization	Low	Low	High
Meat / Fries	Frozen ATS - batch	Frozen ATS - batch	Fresh ATO
KDS	Screens	Screens	Printed paper
Ordering	POS, Kiosk, PDA	POS, Kiosk	POS
Payment	POS, Kiosk	POS, Kiosk	POS
Drinks	POS	Refill	Refill
Delivery	POS, Table	POS	Delivery area

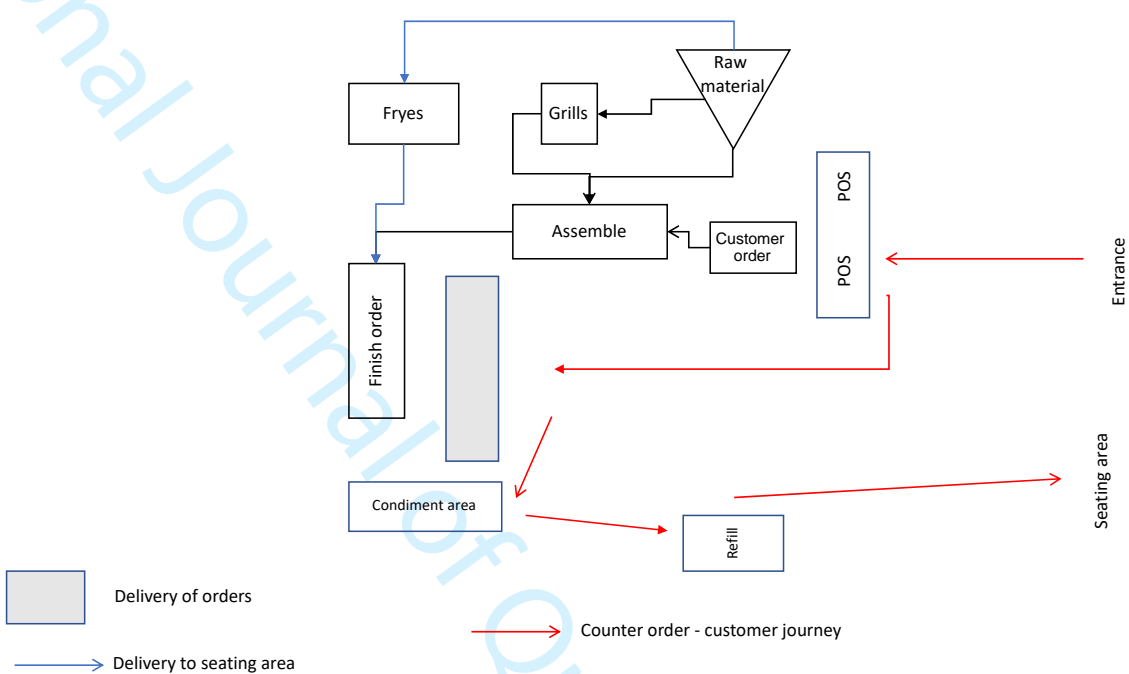
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Waste	Case Study A	Case Study B	Case Study C
Defects	We found no evidence of product defects during our visits (1).	We found no evidence of product defects during our visits (1).	We found no evidence of product defects during our visits (1).
Movements	<p>Customers' moves: <u>Orders:</u> When customers enter the restaurant, they can either go to the digital kiosks or to the counter to place an order, generating confusion and extra movements. For some customers, it is not clear what alternative they should use. <u>Payment:</u> Counter or Kiosk (no matter where the order has been placed). Customers can also place an order in the kiosk and then pay at the counter, generating a two-step process to place the order. <u>Waiting area:</u> Same as ordering counter. Cross-moves from customers, and customers waiting for their orders in front of the counters generate a lack of space and an untidy and confusing area. As a consequence, it becomes a barrier for new customers to place their orders. <u>Refill:</u> There is no refill service. Beverages are delivered by employees and are included in the order delivered.</p> <p>Employees' moves: <u>Production:</u> Employees are assigned to workstations, reducing unnecessary moves and improving specialization. Kitchen not widely open to customers view. Crossing and intersections seem to be frequent in production employees moves in the kitchen. <u>Picking:</u> Completing the order is done by employees at the counter. Condiments are also delivered by employees during picking process. <u>Delivery:</u> At the counter or at table by employee, with plastic trays.</p>	<p>Customers' moves: <u>Orders:</u> As in the case of Case Study A restaurants, when customers enter the restaurant, they can either go to the digital kiosks or to the counter to place an order, generating confusion and extra movements. <u>Payment:</u> Counter or Kiosk (no matter where the order has been placed). Customers can also place an order in the kiosk and then pay at the counter, generating a two-step process to place the order. <u>Waiting area:</u> Same as ordering counter. Cross-moves from customers, and customers waiting for their orders in front of the counters generate a lack of space and an untidy and confusing area. As a consequence, it becomes a barrier for new customers to place their orders. <u>Refill:</u> There is a refill service close to kiosks. Customers do it as they need. Narrow area, not very convenient.</p> <p>Employees' moves: <u>Production:</u> Employees are assigned to workstations, reducing unnecessary moves and improving specialization. Kitchen not widely open to customers view. Crossing and intersections seem to be frequent in production employees moves in the kitchen. <u>Picking:</u> Completing the order is done by employees at the counter. Condiments are also delivered by employees during picking process. <u>Delivery:</u> At the counter, with plastic trays.</p>	<p>Customer moves: <u>Orders:</u> Always on counter. Customers moves are more intuitive and less confusing generating a leaner experience. Exit door separated from entrance door, so clearer and more organized path and flow of people. <u>Payment:</u> Always on counter. Ordering and payment as one step process. Easy and convenient.</p> <p><u>Waiting area:</u> Separated from counter.</p> <p><u>Refill:</u> Refill and condiment are close to waiting area. Customers do it as they need.</p> <p>Employees' moves: <u>Production:</u> Employees are assigned to workstations, reducing unnecessary moves and improving specialization. Kitchen is widely open to customers view, open space. Crossing and intersections seem to be minimized in production employees moves in the kitchen. <u>Picking:</u> Completing the order is done by employees at the counter. No additional condiments are delivered. <u>Delivery:</u> At the counter, the order is wrapped with aluminium foil paper, without trays.</p>

	<p>Customers can either decide to wait for the order at the counter or require the order to be delivered to their table. This generates the need of an additional employee who is constantly delivering orders to tables. In rush hours, there can be up to three persons doing delivery to table. Because identification numbers for tables are distributed randomly at the moment of placing the order and selecting the option "Delivery to table" is a confusing process for employees.</p> <p><u>Cleaning:</u> Intense and continuous cleaning activity, as some customers leave the trays, packaging and food waste on the tables, that need to be clear out. High quantity of packaging. High volume. Trays need to be collected and taken to the kitchen for washing and reuse.</p>	<p><u>Cleaning:</u> Intense and continuous cleaning activity, as some customers leave the trays, packaging and food waste on the tables, that need to be clear out. High quantity of packaging. High volume. Trays need to be collected and taken to the kitchen for washing and reuse.</p>	<p><u>Cleaning:</u> Continuous cleaning activity, but scarce in volume, as only few customers leave the packaging and food waste on the tables to be clear out. Low quantity of packaging. Low volume. No trays, less packaging so less reverse logistics, thus less movements.</p>
Process	<p><u>Final product (burguer):</u> Assembly-to-Stock (ATS): Although normal production process is ATO, for peak hours some products are produced on an ATS strategy based on expected demand, generating overproduction of some burgers and a potential for waste.</p> <p><u>Work in process (meat):</u> It comes frozen from suppliers, and it is cooked in batches and maintained in a warmer station waiting for the orders (30 minutes; after that, meat is dehydrated losing consistency and quality).</p> <p><u>Work in process (other):</u> Bread is toasted by units and the rest of ingredients are produced in batches.</p> <p><u>Process monitoring / work orders:</u> KDS system with screens.</p>	<p><u>Final product (burguer):</u> ATS: Although normal production process is ATO, for peak hours some products are produced on an ATS process, generating overproduction of some burgers. Employee in the assembly area is working simultaneously in 6 to 10 burgers.</p> <p><u>Work in process (meat):</u> It comes frozen from suppliers, and it is grilled in 12 unit batches.</p> <p><u>Work in process (other):</u> Bread is toasted by units and the rest of ingredients are produced in batches.</p> <p><u>Process monitoring / work orders:</u> KDS system with screens.</p>	<p><u>Final product (burguer):</u> ATO: Production of burgers follows an ATO process.</p> <p><u>Work in process (meat):</u> It comes fresh from suppliers, and it is grilled one by one, when an order has been placed.</p> <p><u>Work in process (other):</u> Bread is toasted by units and the rest of ingredients are produced in batches.</p> <p><u>Process monitoring / work orders:</u> The company use no KDS nor screens in their order system. The order is printed in paper (ticket). There is a risk of loosing or damaging the order printed during the process of assembly.</p>

	<p>Task distribution: Similar to Case Study A, it seems that employees are cross trained to perform different activities, but they are specialized in a particular moment. Everyone is in a specific position, with a clear task, all tasks should be balanced although we perceive sometimes that one person is waiting for another one. They work as a work cell for all items except for the hamburger assembly. The employee taking the order is the one to prepare the tray and the picking, and finally is the last step to deliver the order to the customer.</p>	<p>Task distribution: Similar to Case Study A, it seems that employees are cross trained to perform different activities, but they are specialized in a particular moment. Everyone is in a specific position, with a clear task, all tasks should be balanced although we perceive sometimes that one person is waiting for another one. They work as a work cell for all items except for the hamburger assembly. The employee taking the order is the one to prepare the tray and the picking, and finally is the last step to deliver the order to the customer.</p>	<p>Task distribution: It seems that employees are cross trained to perform different activities, but they are specialized in a particular task. Everyone is in a specific position, with a clear task, all tasks well balanced in an assembly line (straight line shape), being the last step the one to deliver to customer. Two colours for employee uniforms: black for supervisors, red for standard employees. There is an excess of grill and frying capacity, so no need of inventory.</p>
Inventory	<p>Raw material: No evidence of raw material inventory (2).</p> <p>Work In Process: Case Study A burger assembly process is based on maintaining burgers cooked in warmer stations. This allows the process to reduce preparation time of burger meat. However, there is a risk of generating waste. Burger meat cannot be maintained in warmers equipment for more than 30 minutes. After that period of time, meat is dehydrated and loose quality. Fries are produced in batches; if not sold quickly, waste is produced. Other ingredients prepared in batches based on demand.</p> <p>Finished Goods: Hamburgers are produced ATO except for peak hours that they keep a WIP inventory (quantities are supposed to be optimized by a forecast calculations software based on historical data).</p> <p>Packaging: Optimized control of packaging material.</p> <p>Trash: Trash has to be maintained inside a warehouse area during the day, using high cost of real estate. Although trash generation is high, Case</p>	<p>Raw material: No evidence of raw material inventory (2).</p> <p>Work In Process: Case Study B 's burger assembly process is based on maintaining burgers cooked in warmer stations. This allows the process to reduce preparation time of meat burger. However, there is a risk of generating waste. Meat burger can not be maintained in warmers equipment for more than 30 minutes. After that period of time, meat is dehydrated and loose quality. Fries are produced in batches; if not sold quickly, waste is produced. Other ingredients prepared in batches based on demand.</p> <p>Finished Goods: Hamburgers are produced ATO except for peak hours that they keep a WIP inventory (quantities are supposed to be optimized by a forecast calculations software based on historical data).</p> <p>Packaging: Only at Refill area an excess of packaging material can be observed.</p> <p>Trash: Trash has to be maintained storage during the day, using high cost of real estate. They do not segregate trash.</p>	<p>Raw material: Bags of potatoes are stored inside the restaurant area (as part of decoration). This reduces space in storage room at back office. No evidence of other raw material inventory (2).</p> <p>Work In Process: Because meat is done on demand when the order is placed (ATO) by the customer, there is no inventory of burgers like in the previous cases. This is an advantage from the point of view of reducing WIP components but could be a disadvantage for capacity constraints during rush hours. Fries are done in a two-step process increasing number of WIP fries.</p> <p>Other ingredients prepared in batches based on demand.</p> <p>Finished Goods: Hamburgers are always produced ATO. So, no inventory at all.</p> <p>Packaging: Only at Refill area an excess of packaging material can be observed.</p> <p>Trash: Trash is lower as Case Study C uses less packaging material. They do not segregate trash.</p>

	Study A segregates trash in different bins (organic, plastics, paper) facilitating recycling process.		
Overproduction	<p><u>WIP</u>: Meat and Fries are cooked in batches ahead of demand (ATS), generating risk of overproduction and lowering quality product. Other ingredients do not generate overproduction, as they are used first in, first out.</p> <p><u>Finished goods</u>: Although normal production process is ATO, for peak hours some products are produced on an ATS process, generating overproduction of some burgers.</p> <p><u>Packaging</u>. There is an over supply of packaging in each order. Every order generates very high quantity of paper and plastic waste, some of them very difficult to recycle.</p>	<p><u>WIP</u>: Meat and Fries are cooked in batches ahead of demand (ATS), generating risk of overproduction and lowering quality product. Other ingredients do not generate overproduction, as they are used first in, first out.</p> <p><u>Finished goods</u>: Although normal production process is ATO, for peak hours some products are produced on an ATS process, generating overproduction of some burgers.</p> <p><u>Packaging</u>. There is an over supply of packaging in each order. Every order generates very high quantity of paper and plastic waste, some of them very difficult to recycle.</p>	<p><u>WIP</u>: Fries are cooked in 2 step batches ahead of demand (ATS). Neither risk of overproduction nor lowering quality product because of the 2 step process. Other ingredients do not generate overproduction, as they are used first in, first out.</p> <p><u>Finished goods</u>: No overproduction.</p> <p><u>Packaging</u>. Supply of packaging is minimized.</p>
Transport	<p><u>Trays</u>. Orders are delivered to customers in trays. After finishing their meals either customers leave their tray on top of trash bins or an employee collect them. Then, the trays need to be cleaned and transported again to picking area to be reused. It represents a waste in movement of people (employees or customers).</p> <p><u>Trash</u>. Packaging provided with orders has a high volume, thus generating the need to have big trash rooms at back office to maintain trash storage during the day.</p>	<p><u>Trays</u>. Orders are delivered to customers in trays. After finishing their meals either customers leave their tray on top of trash bins or an employee collect them. Then, the trays need to be cleaned and transported again to picking area to be reused. It represents a waste in movement of people (employees or customers).</p> <p><u>Trash</u>. Packaging provided with orders has a high volume, thus generating the need to have big trash rooms at back office to maintain trash storage during the day.</p>	<p><u>Trays</u>. There are no trays to deliver orders (they are delivered wrapped in aluminium foil paper), eliminating the transportation and cleaning process of trays.</p> <p><u>Trash</u>. Packaging provided with orders has a low volume, thus generating the need to have mid size trash rooms at back office to maintain trash storage during the day.</p>
Time	<p><u>Menu boards</u>: Many options offered. Menu boards are confusing for customers, at least for not frequent customers. They are very compartmented and have too much information with many colors, texts and prices. Customers spend time trying to identify the product they want, producing queues delays and making the order process slower.</p> <p><u>Payments</u>: Cash payments at POS to orders from kiosk. There is an option to pay in a POS at counter after placing the order in Kiosk. This make an order placing longer than in traditional way at POS and</p>	<p><u>Menu boards</u>: Many options offered. Menu boards are confusing for customers, at least for not frequent customers. They are very compartmented and have too much information with many colors, texts and prices. Customers spend time trying to identify the product they want, producing queues delays and making the order process slower.</p> <p><u>Payments</u>: Cash payments at POS to orders from kiosk. There is an option to pay in a POS at counter after placing the order in Kiosk. This make an order placing longer than in traditional way at POS and</p>	<p><u>Menu boards</u>: Limited options offered. Menu boards are simple and self-explained, so easy to understand for customers and faster to place and process the orders. When some people waiting in the queue, personnel offer help to assist if doubts about the ordering process.</p> <p><u>Payments</u>: Immediate payments at POS at counter just after placing the order. Fast and clear.</p>

	<p>not taking advantage of automatization with kiosks.</p> <p><u>Waiting area:</u> Customers wait for their orders at the same area where they place the orders generating confusion and delays. It also impacts on customer perception of long waiting times.</p> <p><u>Layout:</u> Layout need to have more flexibility. Tables with 4-seats configuration reduce flexibility and the restaurants lose capacity and reduces free space for customer movement. At the time of inspections utilization was 60%. Proposal: community tables and 2-seat configuration offer more flexibility and improve the time a customer is waiting for a table, improving customer experience.</p>	<p>not taking advantage of automatization with kiosks.</p> <p><u>Waiting area:</u> Customers wait for their orders at the same area where they place the orders generating confusion and delays. It also impacts on customer perception of long waiting times.</p> <p><u>Layout:</u> Layouts need to have more flexibility. Tables with 4-seats configuration reduce flexibility and the restaurants lose capacity and reduces free space for customer movement. At the time of inspections utilization was 50%. There is also an area with a sofa and armchairs which is unutilized (less than 50%). Proposal: community tables and 2-seat configuration offer more flexibility and improve the time a customer is waiting for a table, improving customer experience.</p>	<p><u>Waiting area:</u> Customers wait for their orders at a different area where they have placed them, so it helps to free space and impacts on customer perception of shorter waiting times (salty peanuts for free help to maximize this perception).</p> <p><u>Layout:</u> Different entrance and exit doors, helping to reduce times. Layout is more open, easy to access by customers, more flexible, everything at customer sight, improving customers time waiting for a table, as well as customer experience and restaurant capacity. Some examples are: narrower tables; tables around columns (25cm width) with high chairs; combination of traditional tables with high tables in a sharing space area; tables with booth seats. At the time of inspections utilization was 70%.</p> <p>Decoration: more casual, stylish and robust design, simpler and easier to clean and maintain compared to Case Study A and B, reducing the employee times assigned to these activities.</p>
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Notes:

- (1) No Defects detected or reported during the visits. We found no evidence of product defects since product defects are either detected by employees during the production process (ex. Meat overcooked, bread falling down on the floor, etc.) or experienced by customers (ex. Meal too cold, missing components in the burger, etc.). In both cases, we do not have access to this level of information, as our analysis is intended to be from customer point of view with lean eyes. Real and precise information about defects can easily be obtained by the company, as they can record incidences within the production process and with customers (complaints).
- (2) Raw material inventory. No evidences have been reported due to the fact that this research has been carried out from customer's perspective, and customers do not have access to warehouses, just to what they can see inside the restaurant area.

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	Case Study A	Case Study B	Case Study C
Defects	N/A	N/A	N/A
Movements	High	Medium	Low
Process	High	High	Low
Inventory	High	High	Low
Overproduction	High	High	Medium
Transport	High	High	Low
Time	High	High	Low

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From interview to a supervisor:

“The employee receiving the order is in charge of preparing the drinks and desserts, as well as placing all the elements on the tray”.

“Our layout is divided in two areas: that area (pointing out to it) is a more relaxing environment than the restaurant area”.

“The meat comes frozen”.

“In some restaurants we are implementing delivery to table. This generate need for more employees”

“We have a system that tell us what to produce. This is linked to our demand forecast for the day”

“We need more flexibility in our layout. During lunch time, we don´t have enough seats to accommodate our customers”

From interview to an operator:

“We use a warmer station to maintain meat burgers ready for rush ours”

“During peak times we produce our high sellers products and maintain them in stock for 10 minutes”

“We have new decorations with good-looking materials and art work”

“We have special bins in customer area to segregate trash. Customers can make the segregation themselves”

“We have trash compactors at back office to reduce the size of trash, specially papers and cardboard trash.”

“Kiosks help us to reduce waiting lines”

From interview to a supervisor:

“Meat comes frozen, and it is always prepared in batches of 12 units”.

“We have a sophisticated software that helps us to do demand forecasts on a weekly and daily basis. Even in an hourly basis. It also determines the work in process inventory level that we need to have on hand on an hourly basis”.

“The employee receiving the order is in charge of preparing the drinks and desserts, as well as placing all the elements on the tray”.

“We need to be prepared for unexpected demand peaks, as a group of 20 children coming at the same time”.

From interview to an operator:

“Customer refill help us to make less activities to prepare the order”

“We need more flexibility seats. For example, upstairs we have a sofa in the customer area that could be replaced with four tables and eight seats, increasing capacity and flexibility too”

“Kiosks help us to process more orders and reduce waiting time for repetitive customers. First-time customers are a little bit confused or they don't realize that you can place orders from both sides of the kiosks”

“Payment option at counter sometimes is confusing”

From interview to a supervisor:

“Workers use different types of uniforms depending on level of responsibility.

Operators are dressed in red, while supervisors in black uniforms”

“We provide with help to customers in case of doubts about the menu. While queuing before placing the order, an assistant offers help to explain the menu and ordering process”.

“Customers can eat for free salty peanuts while waiting for the order to be delivered”.

“Meat is always fresh (never frozen) and it is only grilled when there is an order.

Same for the bread toasting. But all other ingredients are prepared in batches”.

“All orders are printed, and this receipt will be the way we communicate all along the production process”.

“Customers enter the restaurant through one door and leave the restaurant through a different one, avoiding bottlenecks and congestion in the customer journey”

“The employees that are in the POS are very well trained to assist first-time customers”

“Customers order at POS and then move to the end of the restaurant to pick up their order, not generating congestion and keeping the line moving”

“We have high capacity equipment in our kitchen. This is the heart of the restaurant.”

From interview to an operator:

“Construction materials are very good. It’s very easy to clean and they are very strong. We are located in a high pedestrian traffic area and sometimes the restaurant is full of people”.

“Customers can refill their beverages. This is part of the waiting process. They can do an activity while order is being prepared making the waiting time less tedious.”

“We keep cleaning the customer area constantly”

“Kitchen is open to show customers what we do. We have nothing to hide, we are very proud of our products and employees”

“We don’t deliver orders in trays. This help us to clean tables faster. Also, in other fast foods, like Case Study A, trays are always wet or dirty”

“We have fewer products but very good ones. Our Menu board is very simple and customers can place an order easily.”

“Condiments like ketchup or mayonnaise are free to serve by customers”

“We do not segregate trash”

“We cook the burger when it is ordered, assuring high quality burgers. We do not maintain pre-cooked burgers in warmer stations. In the case of fries, we cooked them in a two-step process to make sure that customers have their order on time”

“Aisle in kitchen are wide enough to work two people back to back very comfortably”

“We should have more flexible seats. During peak hours, customer have no place to sit and leave. We installed kind of tables around columns for those customers who don’t mind to eat standing up”