

Investigating the Effect of VSM on the Performance of Quick-Service Restaurants

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Abstract

Value Stream Mapping (VSM) is a value-based improvement approach that eliminates losses and processing time and maximizes value added time, contributing to enhanced performance effectiveness. In this context, this paper introduces VSM as a different method for restaurant industry and an overall perception for output flow through differentiating wastes, improving cycle time reduction and assessing the value added to the final service. For this purpose, this research follows the qualitative approach to comprehensively investigate the competence of value stream in a Quick-Service Restaurant. This study was based on analyzing and improving the production process of a specific and single product Big Hamburger Meal (BHM) from the classic meals of the case restaurant. The results indicate that implementing VSM principle contributes to operational process enhancement and improvement. The Future State Map indicates an average 20% performance improvement in the critical stages/activities of BHM production. Also, the VSM principles suggest some modifications in six operational activities; negotiation, purchasing, receiving, storing, handling food, and packaging.

1. Introduction

Service is perceived to be the centre of commercial activities, as a cornerstone of the economy. Primarily, according to Fortes (2010), the service sector accounts for 58% of the world's gross domestic product and, for example, the service-related occupations in the United States accounts for 80% of total employment (United Nations, 1999).

In service environments, there are immense disconnections, and it is essential to identify these connection issues and deal wisely with them to guarantee that the whole efficiency is enhanced (Gill, 2012). An important distinction is that the customer consumption and distribution process take place concurrently in the service sector, which creates serious difficulties in monitoring the efficiency of the service production prior to delivery (Shou et al., 2017).

In restaurant environments, the dilemma is how to produce effective and successful performance (Elshaer et al., 2018). It is important to explore the Value Stream Mapping (VSM) method for waste reduction contributing to successful performance. VSM is a foundational method for solving this issue (Henrique et al., 2016). VSM needs adjustments / estimations to; address obstacles by modelling (Parthanadee and Buddhakulsomsiri, 2014), waste detection map (Dinis- Carvalho et al. 2015), and exploit lean advantages (Seth et al., 2017). VSM is vital and distinctive for lean where it helps comprehend service management situation and rational connections among waste coverage, traffic flows and its effect on processing times, drag and flow. It also supports authentication of linkages among controls and processes. It utilizes either quantitative or qualitative research based methods to verify that judgments are made on the bases of empirical scientific data processing (Seth et al., 2017). Lean production systems have gained worldwide adoption as a core characteristic of organizations that build value streams more skilfully than their rivals (Fukuzawa, 2019).

Subsequently, the research poses two questions; How to distinguish wastes and improve cycle time reduction in restaurant environments using VSM? Second, do process steps add value to the final service? Indeed, this second question demonstrates this information that any step has a duty to increase task performance effectiveness. Thus, these activities can be distributed into three main groups: 1: value adding activities, 2: non-value-adding, but inescapable activities, and 3: non-value-adding activities. Overall, by addressing these two questions, the study fills the gap of distinguishing mechanism of value-adding activities from trivial ones in order to provide optimum value to the customer through a proper value creation cycle. For a better understanding of the research conducted, the research was divided into five sections, namely: introduction, VSM concept, VSM process, methodology, and results and discussion.

2. Literature Review

2.1 VSM Concept

VSM is a comparatively recent addition to lean management tools. VSM involves both the stream of information and product/service (Kilpatrick and Osborne, 2014). It is recognized as an essential market management approach that captures all the inter/intra-company level data in examining the whole operation, catching material and information streams upon the schedule (Seth et al., 2017). It has the possibility to enhance multifaceted workflows by assessing the consumer's needs by identification and classification (Poksinska, 2010; Nowak and Karbach, 2017). Also, VSM is an instrument that is optimal at the beginning of the process of transition for the development of lean businesses (Ben-Alaya, 2016; Dadashnejad and Valmohammadi, 2017).

In the same context, VSM is characterized as all actions and proceedings (both value-added and non-value-added) in which a product/service journey from suppliers to consumer and that utilize the same commodities alongside the main stream of process (Dadashnejad and Valmohammadi, 2018). It facilitates the management of any

process via an end-to-end viewpoint (Herzog et al., 2008). It can be used to reduce waste and augment the whole (Hibbs et al., 2009; Khurum et al., 2014). Also, VSM offers an incentive to recognize value-added initiatives that help follow the objective of eliminating waste with a view of cumulative value (Kilpatrick and Osborne, 2014). So, organizations would then be able to reduce financial costs and shift towards further value formation for the consumer (Dadashnejad and Valmohammadi, 2018).

When designing a method for tracking activities using VSM, it is important to first decide task distribution, before transmuting the scheduling into the Process Flow Map (PFM) and finally evaluating the report utilizing VSM (Omar and Ku Aman, 2015). VSM is a method that should be implemented when observing group work count on determining proficiency of performed tasks. When using VSM, the process starts with the prioritization of the task, followed by the transformation of the assignments into a process flow map and culminates in the review of the report using VSM (Omar and Ku Aman, 2015; Dadashnejad and Valmohammadi, 2017; Dadashnejad and Valmohammadi, 2018).

An evaluation of VSM's real outcome is critical. Consequently, this review aims at investigating whether VSM is appropriate for usage in service facilities especially restaurants. In addition, it inspects the efficiency of VSM in the layout, procedures and consistency of service settings in the restaurant industry.

2.2 VSM Process

VSM aims at reducing redundant process steps and adjusts time. Those features are non-value adding (Jimmerson, 2010). Concurrently, these process steps and time that improve process excellence (face-to-face) contact with the service provider (Mazzocato et al., 2012), are targeted to be enlarged. These are services that consumers would be keen to pay for (Waldhausen et al., 2010) and are recognized as value adding (Jimmerson, 2010).

According to Adair and Murray (1994) the first step in VSM is to realize customer value necessities by (1) planning the existing process, step by step, (2) computing its key characteristics in a quantitative way, (3) distinguishing a typical process flow from a consumer value added viewpoint, and (4) harmonize the current processes with the consumer ideal and make the required modifications. Subsequently process maps could be comprised of:

- Classifying non value-adding activities
- Excescent activities
- Assessing cycle time
- Touching examination points
- Accumulating costs

Looy et al. (1998) assured that a high-level process mapping method comprises of three steps:

- (1) Mapping the process of service inside the diverse divisions and blueprinting the activities within that process.

- (2) Defining the determinants of activities, as well as the funds outlay on each activity (employees spent actual time on every activity during delivery process).
- (3) Working to develop productivity indexes by linking the amount of each determinant to the expenditures incurred on each activity.

According to Monden (1998) tasks could be categorized into three groupings: incidental process, value-added process, and Muda (any activity that a consumer is not keen to pay for). Incidental work is a process such as inspection that does not add value to the service, but necessary in the existing production system. Value-added works add value to the service, such as the ending assembly of a product/service. Finally, non-value added processes, or Muda, are well-identified as any activity that does not add value to the service and is not essential by the present production system. Mudas can be categorized into seven groups (seven deadly wastes). Those seven deadly wastes contain overproduction, transportation, waiting, over processing, motion, defects, and inventory (Womack and Jones, 1997). Dennis (2008) and Lacerda et al. (2016) describe waste using a Japanese expression “muda”. The delineation of the seven wastes that the lean philosophy seeks to eradicate could also be: 1) overproduction; 2) waiting time; 3) nonessential transportation; 4) nonessential processing; 5) inventories; 6) motion; 7) defects; 8) manpower. So, the timeline between the customer’s order and the service’s delivery shall be considered and the interrelated wastes should be excluded in order to decrease its time.

Rother and Shook (1999) were the first to introduce VSM for lean and (Tapping et al., 2002) regulated it. They proposed the first step as the assortment of a product/service family, as an objective for enhancement and in making of recent or ‘As-is’ positioning map for the selected product/service value stream, and for future or ‘To-be’ status of VSM. It is a consequence of sum of process analysis techniques. It depends on flow plans, process charts, time-task plotting, and work-flow analysis among other techniques and methods to detect each action in a service value stream (Heizer and Render, 1999).

VSM is a ‘process of right detecting the streams of information and materials as they currently occur summarizing them visually and then foreseeing a future state with much enhanced performance’. The concept of that distinctive mapping helps capture the cycle times’ positions, inventory in different stages and information stream across the supply chain. The current (or ‘as is’) status is mapped to visualize a snap of how things are completed and where the enhancement possibilities lie. Future or ‘to be’ state map also display how things could be executed considering cycle time necessities (Jones and Womack, 2000; Seth and Gupta, 2005; Joshi and Naik, 2012; Batra et al., 2016).

VSM targets to recognize all fatalities of present value stream, and it will take important actions to eradicate them. It could be asked, through all steps of this technique, one main question: Does this step improve task performance efficiency (Rader and Shok, 2006; Dadashnejad and Valmohammadi, 2018).

Two streams encompass the map: information and material. Information flows regulate the movement of information amongst the consumers, suppliers and producers whereas, material flows are diagrammed as stated by process stages. In each stage the following information is gathered:

- Cycle Time (CT): a time required for an operation to be finalized;
- Switching Time (TT): a time required for a process to shift from product/service to another one;
- Value-creating time (VCT): what adds value to product/service or the consumer's paying for a specific time;
- Lead Time (L/T): the required time to stream over all stages of production process i.e. starting at raw material to a final product/service delivery to the consumer.
- Efficiency: a percentage of worthy products to all products (Rader and Shok, 2006).

To assess the performance of team members, this formulation could be useful (Cox and Llc, 2004): $PE = VA/CT$

- Process Efficiency (PE): depend on the time in which value is added against the total time during the process.
- Value Added (VA): a time when the benefit is directly added to the method allocation.
- Cycle Time (CT): a time needed to perform a task from start to end.

Lasa et al. (2008) study the VSM in five stages: collection of product family, present state mapping, upcoming state mapping, description of the work schedule, and execution of this strategy. VSM helps the mechanism to be enhanced by defining the waste and its origins, so long as a “map” of information (Xie and Peng, 2012).

VSM involves two parts: analysis of value stream, in which the present value flows is envisioned, and design of value stream, where wastes are exposed and reduced during the process of production. The technique aims at a lean, active and consumer well-ordered value stream, with short lead time and diminished inventories (Nash and Poling, 2011; Haefner et al., 2014).

3. Methodology

3.1 Justification of case study approach

There have been several explanations for using the case study approach for this analysis. Operational data seem to be more observable in case study context since they are anchored in work experience. This functionality helps create, validate and even optimize the organizational comprehension of concepts (Eisenhardt, 1989). This method is more suitable for exploring applied studies, since it contributes to a

reshaping of interpretations without having methodological generalizations and also provides the value of evidential justifications (Ellram, 1996).

The case study approach encourages a theory to be examined regards to its real-life environment, promotes a dynamic discussion amongst hypotheses and facts. It enables the integration of various types of gathered data, such as business reports and observations (Yin, 2003).

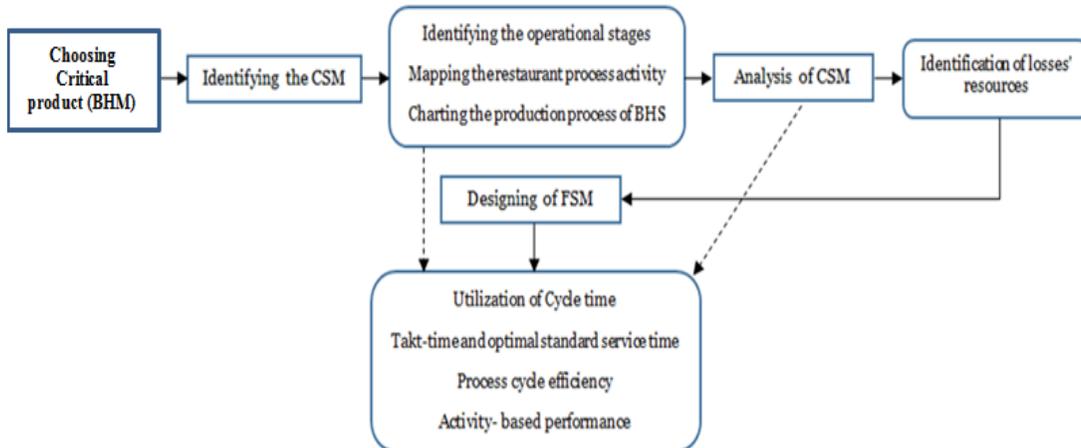
3.2 Research-based framework

In the service industry, there is limited research that discusses utilizing VSM in depicting, analyzing, and planning the performance of current and future states of operations. Such studies were conducted primarily in the manufacturing domain. A comprehensive analysis of VSM in the continuous improvement process was carried out. Both current and potential condition for the whole operation process was formulated to improve the performance and reduce time wastes.

The case restaurant is a chain quick-service restaurant located on Cairo Alex Desert Rd. The restaurant capacity is about 100 seats and, in its lunch menu, breakfast menu and special menu, is serving different types of sandwiches and seven to twelve valuable meals. The restaurant is affiliated with McDonald's, which does not report product revenue and earnings (Spencer, Frank, and McIntosh, 2005). However, as recommended by many academics, selecting appropriate product is of significance to apply the VSM (Rother and Shook, 1999; Womack, 2006). In this study, Big Hamburger Meal (BHM) was nominated to apply VSM. The core point of this selection is the repetitiveness of the process of producing BHM and the effectiveness in data collection, due to the following reasons (Bojanic et al., 2007; Spencer et al., 2005):

- The high consumption or the average number of BHM consumed per person per year,
- It is introduced around the world with a similar set of ingredients (i.e., a sesame seed bun, two all-beef patties, lettuce, pickles, special sauce), and
- The case restaurant was facing operational problems with this product in terms of low staff performance and extending processing time.

It is critical for the business to specify the real problem before applying the VSM analysis, unless the operational activities would not be prioritized upon through exercising the VSM (Womack, 2006). The main objective of this study, therefore, entails analyzing flows of in-process and finished products' production and inventory activities in order to explore the best practices and improve the current performance of operational activities. To achieve this objective, the process analysis is conducted out by gathering data through participating directly in measuring the time consumed in completing the operational activities, in addition to retrieving some facts from the operating company documents. Implementing Value Stream Map as a methodology is shown in Figure 1.



Note: BHM= Big Hamubrger Meal; CSM= Current State Mapping; FSM= Future State Mapping

Fig.1. The methodology of implementing Value Stream Map (The researchers).

4. Results and Discussions

Instead of expensing money on external factors like décor and ambience, QSRs should invest more on the core competency: offering fast service and cheap food for their customers. In order to achieve this desire, their operating costs must be decreased first. Restaurants must allocate more of their expenses to value-creating operations and activities and diminish non-valuable activities. Therefore, they must measure and weight up their operational activities' outcomes in terms of cost, time, and outcomes.

So, at this stage of the study, a comprehensive current state for the operational processes is discussed. According to McVay et al. (2013), it is required to develop an information collection plan that provides a whole picture about every step for each stream of the examined restaurant's operations in order to improve the implementation of actions. Unconsidered details in the production line may provide valuable hints to waste and likely changes that may be overlooked (Balaji *et al.*, 2020). Therefore, in this study, observing, measuring and recording with stop-watch was used to record the actual cycle time for production line operations, as well as customer's arrival time, waiting/queuing time and departure time during peak periods in August and September 2019 with 5 iterations for each operation.

Table 1

Cycle time for each operational stage (100 BHM)

Operational activities		Time (Minutes)					Average (Minutes)
Budgeting and Negotiating	Communication	38	55	45	50	55	109.5
	Contacting suppliers	30	30	25	22	20	
	Budgeting	37	30	40	35	35	
Purchasing	Ordering supplies	40	35	45	35	55	168.0
	Filing	110	120	135	130	135	
Receiving	Checking	65	60	60	75	65	143.0
	Counting	25	25	20	25	25	

Continued

	Moving to the restaurant	20	20	25	25	20	
	Inspecting	30	25	30	35	40	
Stocking	Assembling	50	70	40	50	45	168.0
	Storing	75	70	65	60	65	
	Filing	45	50	60	45	50	
Pulling out & Handling food materials	Toasting bun	85	90	95	90	95	275.0
	Retrieve meat	75	80	85	65	85	
	Prepare toppings	65	70	60	60	65	
	Handling extras	45	40	40	45	40	
Packaging	Selecting the package	36	42	45	50	50	122.6
	Adding condiments	35	30	40	35	35	
	Revising the order	50	45	45	40	35	
Service/ delivering		90	95	110	80	75	90.0

The collected data serves to track the main activities of restaurant's operations that consumes the time or are responsible for operating resources. These statements facilitate the formulation of calculating cycle time, lead time, and process cycle efficiency. The effectiveness of collected information and material flows was investigated by conducting three value stream mapping tools: process-activity mapping, process efficiency formulas, and control chart. Based on the collected data of the average time, the Value Stream Mapping for production operations of the restaurant was built based on VSM basic concept – see Figure 2. According to Hines and Rich (1997), VSM was used to identify the total lead time and identification of waste.

Focusing on waste constitutes a systematic mechanism to determine the reasons of low performance and fundamental management problems. In activity operations context, according to Hines and Rich (1997), there are three types of activities that are conducted. These can be classified into:

- (1) Non-Value Adding (NVA): Pure waste entails unnecessary activities that should be reduced entirely. Examples of this would involve waiting time, excessive storage of intermediate materials and dual product handling.
- (2) Necessary but Non-Value Adding (NNVA): under the current operational procedures, there may be some non-value adding procedures but necessary, including unpackaging supplies and shifting a tool through one hand to another.
- (3) Value-Adding (VA): Value adding operations include the production or raw materials' processing.

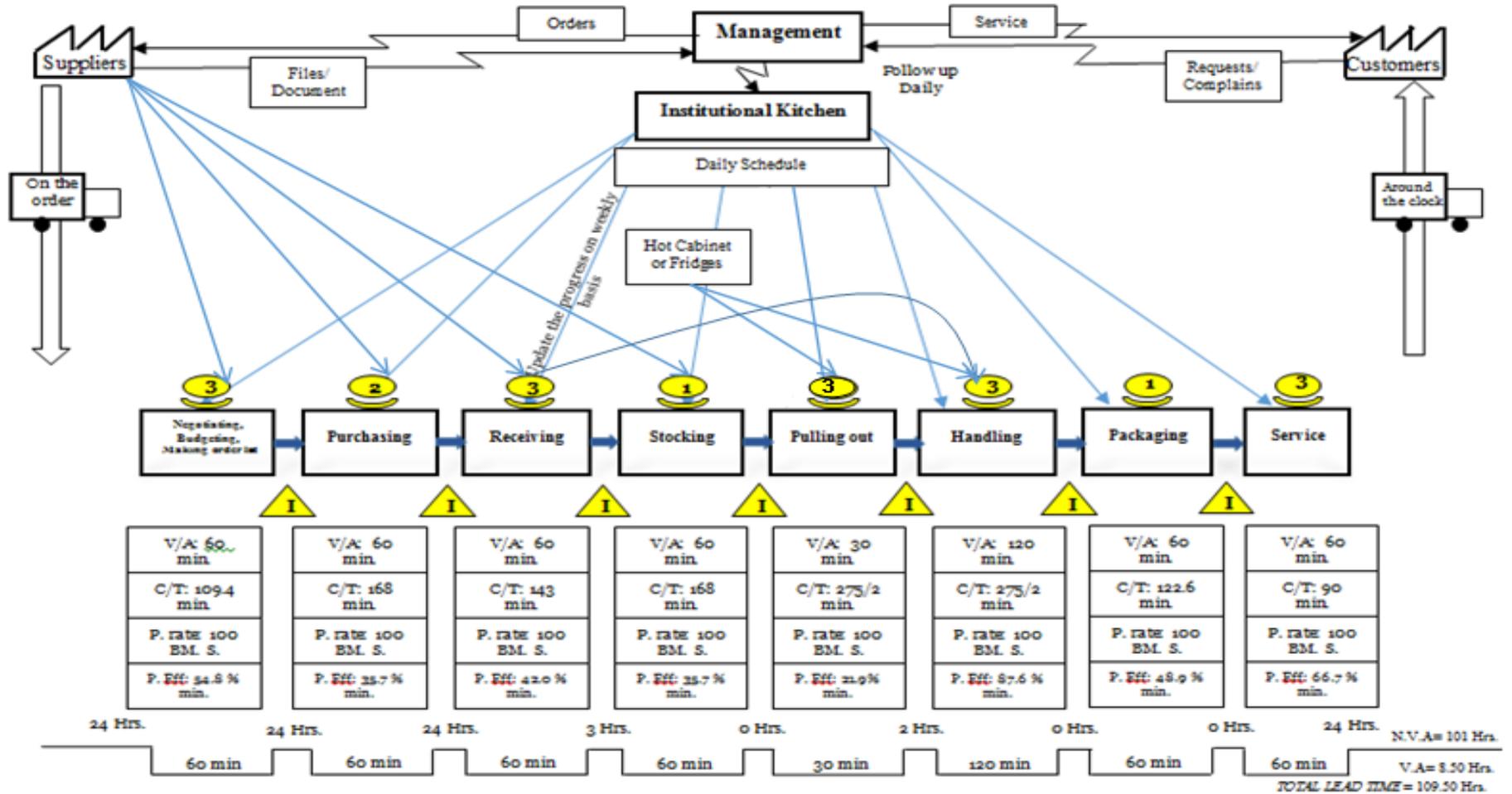


Fig.2. Process Activity Mapping (The researchers).

Note: Counted based on handling 100 customers.

Value stream analysis is a significant opportunity to improve the operational cycle (Taylor, 2005) through reducing variability (Zheng et al., 2008) and identifying opportunities for various lean techniques with the aim of reducing wastes, improving performance, and enhancing service time accordingly. The duration was recorded for each individual task/activity. The time spent during preparing and producing the item was marked as VA, while the time consumed during non-productive operations such as inspecting, stocking, pulling out, packaging, rest and standby times were categorized as NVA.

The critical metric of efficiency for any service operation is the percentage of the total cycle time spent in value-adding activities to all produced items. The metric used to answer this question is Process Efficiency (P.Eff.) that relates the amount of value-adding time to the total lead time of the process.

Based on data shown in table 1 and figure 2 and using the following equation, the process efficiency of the whole restaurant's operational process is 7.76%.

$$\text{Process Efficiency (P.Eff)} = \frac{\text{Value adding- time}}{\text{Total lead time}}$$
$$\text{P.Eff} = \frac{8.5}{109.5} = 7.76\%$$

The equation of process efficiency was applied to every stage of the whole operation cycle, five out of seven of the operational stages were found to have a lot of wastes that impact the operations' performance hard. Except for negotiation and service processes, the process efficiency of the rest operational stages were all under 50% as Purchasing process was 35.7%, Receiving 42%, Stocking 35.7%, Pulling out 22.9%, and Packaging 48.9% (as shown in Figure 2).

Takt time is another perspective to identify the performance of the operational process of the case restaurant. The time required to produce one BHM refers to Takt time in this study. The following equation is used for this purpose.

$$\text{Takt time} = \frac{\text{Available working time per day}}{\text{Current productivity rate per minute}} = \frac{960}{0.9} = \mathbf{10.66 \text{ Minute.}}$$

Given and comparing our case study's calculated Takt time (10.66 minutes) with the optimal standard service time of chain fast food restaurants (1.5 – 2.0 minutes), there are a variety of activities and tasks that generate waste of time. The proportion of NVA is considerably high compared with the overall lead time in the production cycle.

Apart from BHM, the case restaurant also offers special meals like: spicy meals, classic meals, extra value meals. The case restaurant is known for standardized operations where all products undergo the same procedures, as the employees follow

one technique and apply the same steps for producing the other menu items. Coincidentally, most of the menu items show inappropriate profit performance, where sales rate was around the moderate level during the period of the study. Therefore, developing a flow diagram to provide a complete picture about the five stages that collectively compose the production process of the BHM was essential. Figure 3 shows Control Chart of the Production process of BHS.

Many activities were identified of producing the BHM – see Figure 3, following to the first three stages of the whole process activity mapping (budgeting, negotiating and producing). Receiving, stocking, pulling out, handling and packaging the BHM, are critical steps in which each arriving supplies are personally brought into the kitchen and inspected by the employee for quality (freshness and damage) during its travel. Upon inspection procedures, a supply is taken directly to the proper storage areas (e.g., freezers, cabinet, etc.). Before serving the BHM to customers, the best quality should be guaranteed in the handling process through assuring that meat is at the correct temperature, the freezers and refrigerator are either timely altered or the items (produce, dairy, and other products) are discarded. It's therefore useful to mention that all the kitchen members are responsible for tasks/ steps of preparing the raw materials as well as their tracking to get items produced.

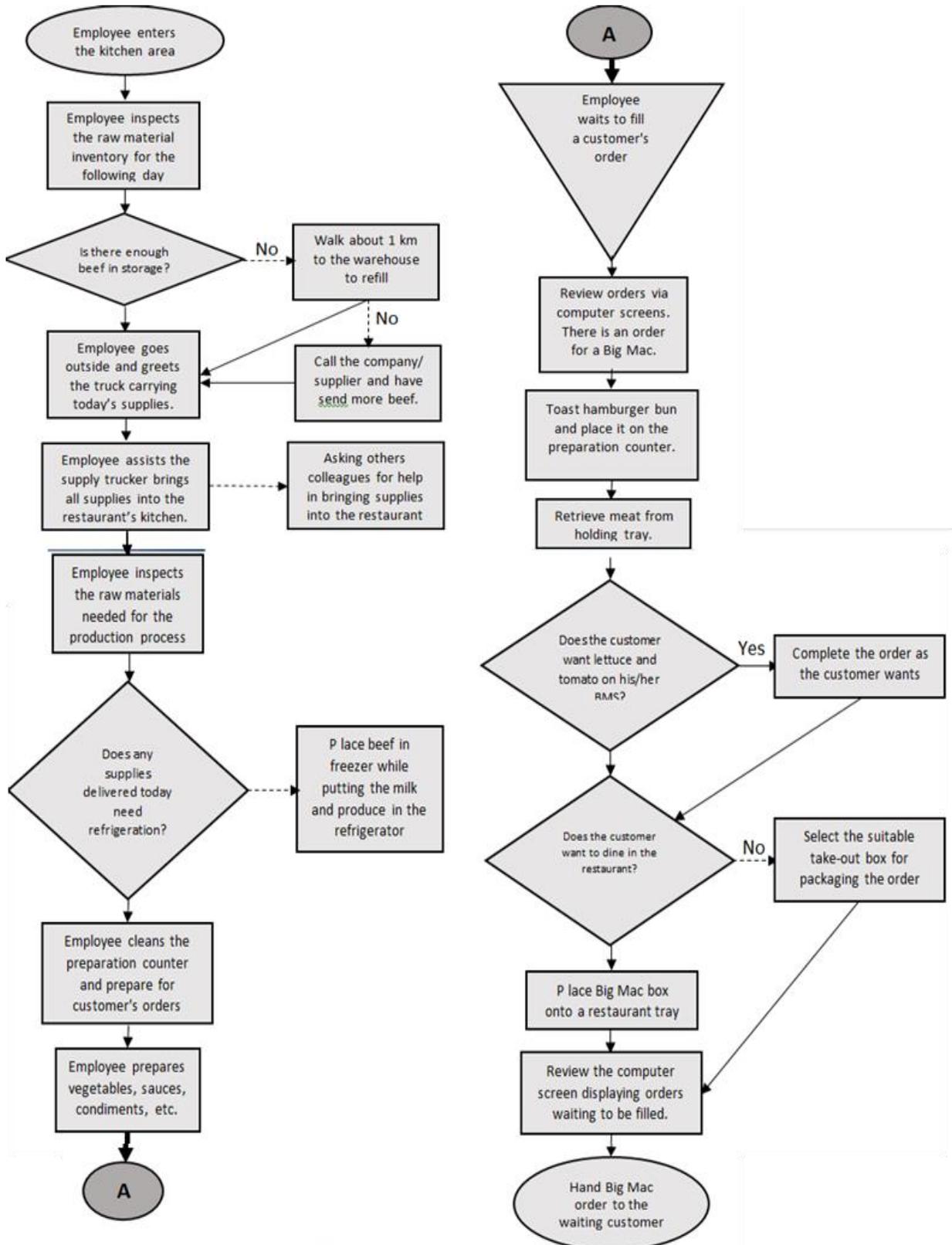


Figure 3: Control Chart of the Preparation of BHS (the operating company' instructions).

Source: The operating company' instructions

In order to deeply identify the types of waste present in the current state map of the case restaurant, the researcher captured in Table 2 both the value added and non-value added activities of this process of the BHM production during an 8-hour shift. Inspecting each stage in the cycle of production which has a number of different steps was the aim in order to get detailed analysis of the current state of VSM.

Table 2
Inspection of the current state activities

Inspection / Audit				Ranking				
Area Reviewed:		Description		A = 0 Perfect Score				
Date:				B = 1 1- 2 problems identified				
Reviewed by:				C = 3 3or more problems identified				
Category				Evaluation			Avg.	Std. Dev.
		0	1	3				
Operations Management & Transportation	Negotiating and Budgeting	1.1	Preparing the budget and filing the documents for the next financial period.	0	3	1	1.50	1.000
		1.2	Negotiating with subordinates.	4	0	0	.00	.000
		1.3	Deciding what is needed and not needed.	3	1	0	.25	.500
	Purchasing	2.1	A Proposal Request is created.	3	1	0	.25	1.000
		2.2	Have all agreements with suppliers?	3	1	0	.25	.500
		2.3	Managing deals and payment.	4	0	0	.00	.000
		2.4	The purchasing ledger and stock records are updated.	1	2	1	1.25	1.258
	Receiving	3.1	Adhering to the outlined procedures of receiving process of different supplies.	1	1	2	1.75	1.500
		3.2	Inspecting the weight and quality of all products.	0	2	2	2.00	1.154
		3.3	Moving the received items smoothly and promptly.	1	2	1	1.25	1.258
		3.4	Arranging all remaining items neatly.	2	2	0	.50	.577
	Storing	Stocking	4.1	Marking, defining an easily identifiable spots for all materials.	1	2	1	1.25
4.2			Storing items in its specified, appropriate place.	2	2	0	.50	.577
4.3			Storing unneeded items in another appropriate place.	2	2	0	.50	.577
Operations Management	Handling food materials	5.1	Pulling items out (fridges or shelves).	3	1	0	.25	.500
		5.2	Preparing process (Washing, Peeling, Cutting and frying items).	2	1	1	1.00	1.414
		5.3	Stuffing and dressing process.	2	1	1	1.00	1.414
Service	Packaging	6.1	Picking up the suitable "box" for the sold item.	1	2	1	1.25	1.258
		6.2	Reaching the suitable "box" easily.	1	2	1	1.25	1.258
		6.3	Filling and wrapping the items up.	2	2	0	.50	.577
	Service/delivering	7.1	Handing the items to customers.	2	1	1	1.00	.000

As tabulated in Table 2, capturing the different steps composing each stage in the cycle of product-production was the aim in order to get a detailed analysis of the current state of VSM. As consequence, *four* main categories were identified to have critical problems that may hinder the streaming of the whole process, namely operations management, transportation, storing, and service.

- (1) Operations that includes managing raw materials' supply and the production process.
- Raw Material Supply: As per the orders, the raw materials come from different suppliers. In reality, managers waste their time in making arrangements in order to ensure the on-time delivery and the reasonable prices. However, ideally managers should have had proper communication and coordination with procurement and suppliers as depicted on the current state map in order to keep the streaming status of their business operations. According to Figure 1, the process efficiency of negotiating and purchasing activities is 54.8% and 35.7% respectively. Time spent on negotiating and making orders indicate ineffective and weak planning techniques were being conducted. This is because time is mostly consumed on the manual checking of storage and less on semi-automated inventory check and purchasing. Automating the system or assigning the responsibility of supervising the production and stores to one person would facilitate controlling of production and storing together to avoid unnecessary delay or inefficient performance. The planning of a good quality batch quantity of the main raw materials and supplies to be supplied regularly based on arrangements with suppliers optimizes efforts required for production and service especially that employees assist the supply trucker bring the materials into the restaurant kitchen and start to inspect the raw material packages. This would reduce movement and delay by removing redundant process steps, which contributes much to the consequent operational activities and subsequently to defects - the core of VSM according to Jimmerson (2010).
 - Production: Looy et al. (1998) claimed that a high-level production cycle requires mapping the service tasks within the different divisions and organising the operations within that process. Therefore, the BHM production process was segregated into basic four stages: toast hamburger bun, retrieve meat, mixing and adding toppings, place the order on a tray/ into a takeout bag. The timeline shows that the process consumes about five-and-six minutes (average = 5.33) from preparing the customer's order to serving until the sandwich is toasted, tomato and lettuce are added. The four stages of BHM production seem to be appropriate but the average of making a sandwich needs to be minimized. It was observed that the employees on the service counter lack the vocational and technical skills needed to handle the raw items (tomatoes, onions, and lettuce) promptly, as well as ensuring that meat patties remain moist and hot. This can result in delays in the production and serving of the items.
 - Staff: As human asset of the 5 powers (People, Price, Place, Product, and Promotion), the case restaurant gives a significant consideration for training as

depicted in the restaurant hierarchy – see Figure 4. The restaurant's employees undergo good training for specialized activities such as front counter, drive-thru, and grill area. However, it's useful to mention that there is not job specification for people in the kitchen area, tasks/ duties are not assigned to specific employees. In addition to the production responsibilities, kitchen employees are required to personally inspect the whole premise on a regular basis, including the cleanliness of the dining area, the restroom, the area behind the counter, the stock area, as well as the area outside the restaurant. Such deviation from the main duty could affect the employees' performance negatively. Employees must grasp their duties in order to effectively perform their tasks and achieve the business' goals. In this essence, Looy et al. (1998) stated that it is important to identify the determinants of activities and the actual time spent by workers on any operation to ensure the effective implementation of VSM.

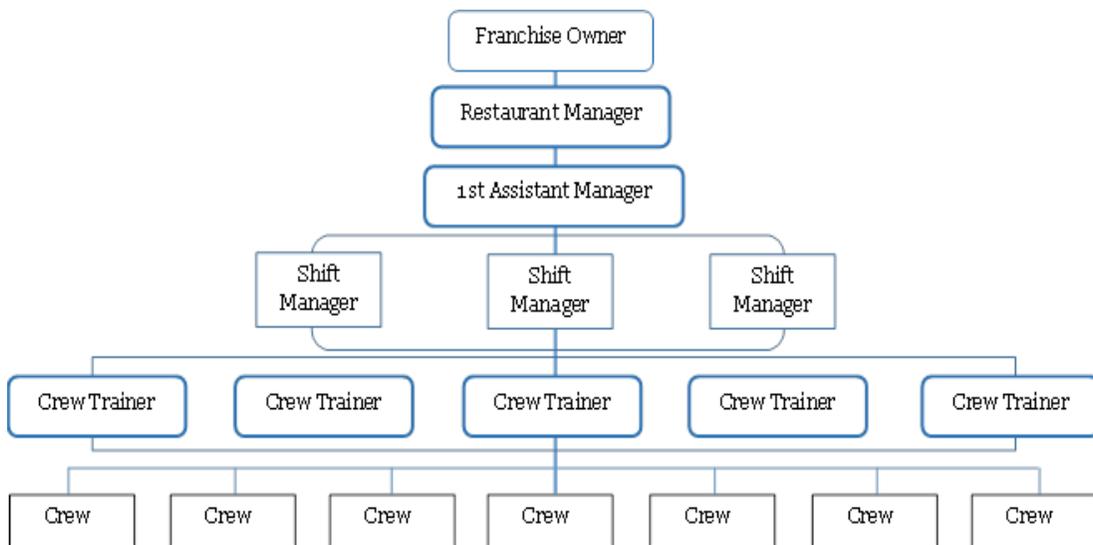


Figure 4: Typical in-store hierarchy (the restaurant's documents).

(2) Transportation - movement around and inside the restaurant.

- Transportation involves movement of goods. Viewed objectively, any movement in the restaurant may be perceived as waste and needs to be dramatically reduced. Movement of materials around and inside the restaurant consumes 3.11 minutes for every BHM. The restaurant management needs to work on supplying the required raw materials on time by contracting with efficient suppliers in addition to choosing a warehouse near the restaurant to minimize the time of transportation. Such notion is confirmed by Ben-Alaya (2016), and Dadashnejad and Valmohammadi (2017) who claimed that VSM is the ideal method for the creation of lean business.

(3) Stocking – where the raw materials waits for processing.

- Stocking: The raw materials and other supplies are stocked in different areas: in the warehouse of the operating company, in the stock room of the restaurant, freezers

and refrigerators, and close to the counter. The allocation of socking area could affect negatively employees' performance within the restaurant. Moreover, the restaurant had no regular inventory management system at the time of this analysis, except for the materials availability indicator. A manual costing system tracked stocks of raw materials as a replication of the same data into the accounting system.

- (4) **Serving:** Includes packing the BHM into a takeaway box or serving it with the appropriate condiments on a tray to customers.

As depicted in Table 3 the case restaurant’s value stream analysis was found to have a collection of non- value-added activities/procedures that collectively contribute to bring the performance goes down, from the complicated purchasing process to packaging the product.

Table 3
Sources of wastes for each operational activity

Wastes	Operational activities				
	Purchasing 35.7%	Receiving 42%	Stocking 35.7%	Pulling out 22.9%	Packaging 48.9%
Production variety	Weak management system		Different of stocking areas		Lack the vocational and technical skills
Delay	Inappropriate communication	Inappropriate communication	Ineffective inventory management system	Unnecessary motion	
Transport	Inappropriate communication and negotiation		Unnecessary movements		
Inappropriate Packaging				Lack the vocational and technical skills	Symmetry of packages
Excess or lack of Inventory	Manual checking of storage		Manual checking of storage	Manual checking of storage	
Unnecessary Movement	Unclear job specification	Unclear job specification	Unclear job specification	Unclear job specification	Unclear job specification
Defects		Lack the vocational and technical skills			Lack the vocational and technical skills

According to the proceeding analysis and using VSM, the approach begins with the prioritisation of the task, followed by the conversion of the assignments into a process flow map (Omar and Ku Aman, 2015; Dadashnejad and Valmohammadi, 2017; Dadashnejad and Valmohammadi, 2018), and culminates in the analysis (Table 3) that depicts sources of wastes for each operational activity. The restaurant’s

operations could be improved significantly in terms competitive bases of operational activities and job specification. Therefore, a Future State Map needs to be implemented to improve the value-adding activities and diminishing the non-value adding activities in the current state map. Among the improvement aspects is the implementation of the strong management system to arrange and increase the materials availability, develop the employees' awareness, specify their responsibilities, and save their movements.

Hence, the improvement focused on reducing the time of purchasing and receiving in terms of transportation and improving the performance of employees in terms of minimizing unnecessary movements.

(1) Reducing time of transportation, through;

- Contracting with a complete supply company.
- Selecting near and appropriate store place for all supplies.
- Developing effective inventory management system.

(2) Minimizing the unnecessary movements of employees, through;

- Developing the technical and vocational skills of employees.
- Developing a full job description for the restaurant crew.
- Unifying the standard of service delivery.

As a consequence of the previously mentioned analysis and discussion, the future state map is introduced to explore a systematic way to restructure operations flow considering the number of operators responsible for different streams – see Figure 5.

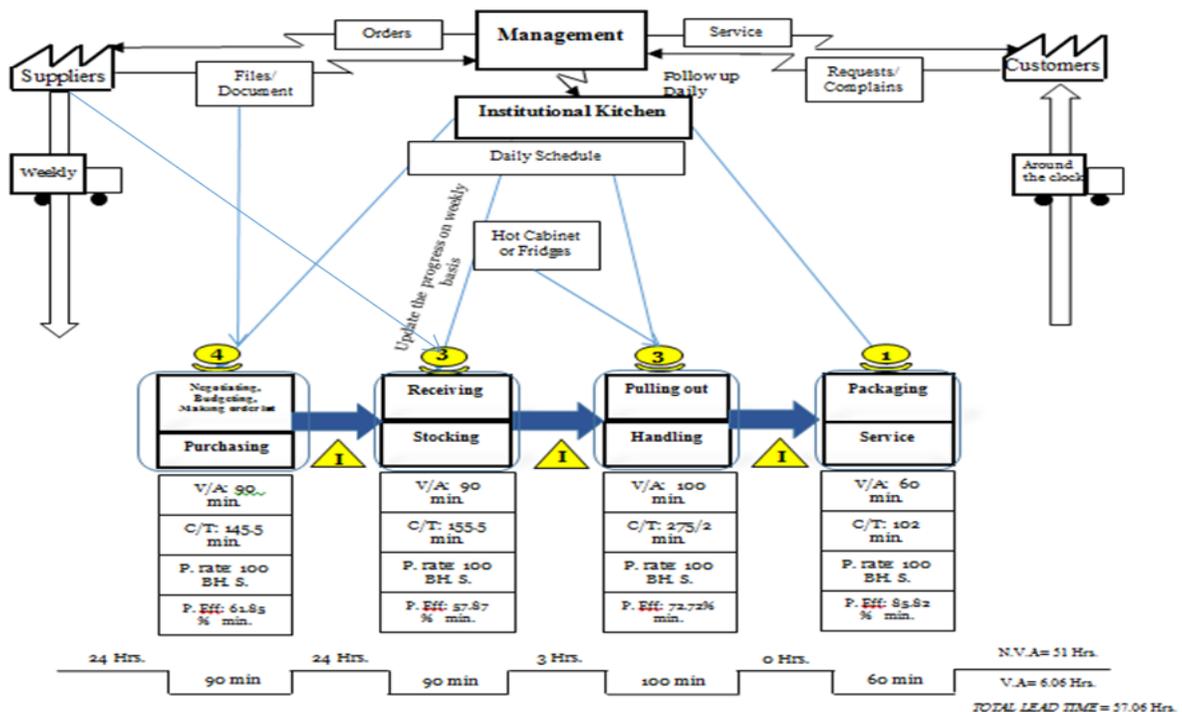


Fig. 5. Future State Mapping (The researchers)

The flow of raw materials was restructured at the operations level. As shown in Figure 6, budgeting, negotiation, and purchasing takes place before the supply of raw materials that happen weekly, based on a tight communication with the employees and using an effective inventory management system. The holding time between pulling out the materials from the stock area and handling/ processing process was removed because of developing the vocational and technical skills of employees in addition to selecting appropriate places and equipment for storing and keeping the materials. Service process is also enhanced notably through improving the steps of packaging orders, as designing symmetry packages save the time and improved the performance of employees.

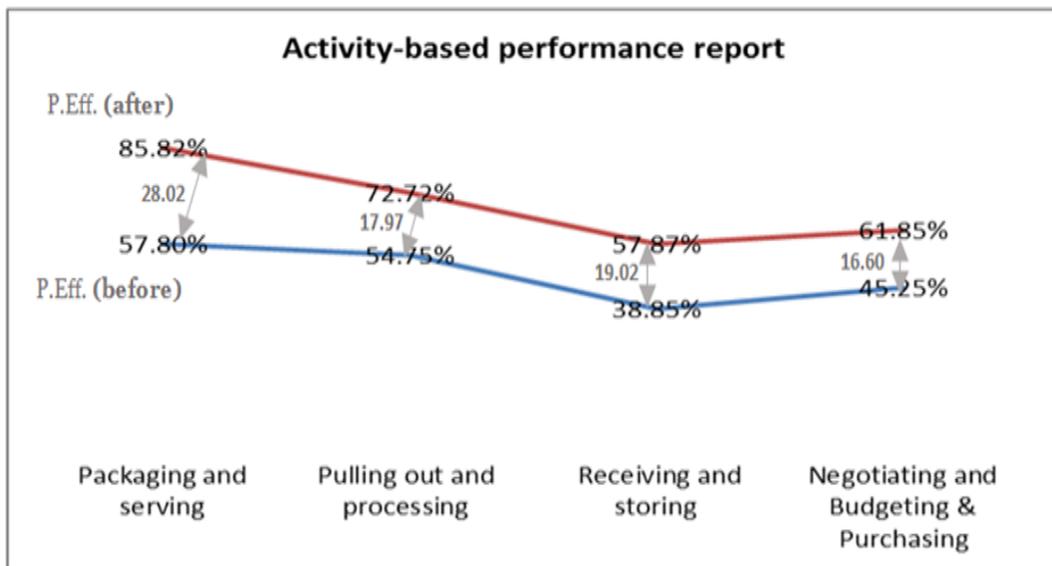


Figure 6: Activity- based performance report (The researchers).

As shown in the performance report, the process efficiency of the operational activities is enhanced significantly in terms of before and after. In more details, activities of packaging and serving, pulling out and processing, receiving and storing, and negotiating, budgeting and purchasing were improved by (28.02, 17.97, 19.02, and 16.60% respectively).

5. Conclusions

The current restaurants business in Egypt is ever growing. To keep this growing, QSRs have to emphasize on improving their performance in terms of high standards of quality to their customers at a quick service. A critical factor to accomplish this is the restaurant's ability to apply a system that allows systematically and continually minimizing its operational loss and improving its overall performance. VSM is one of the significant techniques adopted by a number of business enterprises worldwide to enhance and improve the whole performance of operation (Taj, 2008). However, it's indicated through literature that applying VSM in the restaurants business, especially among QSRs, is limited. Thus, this paper investigates the application of VSM in the

restaurants sector, as its successful adoption in QSRs can represent a significant philosophy for them to confront the challenges of a competitive food-service market.

Depending on the type, size and amount of resources of restaurants, their performance may differ. Normally, recruiting additional employees to perform a specific activity may result in improving either period of time or quality. Improving service speed or quality level can, however, lead to an increase in costs.

Reducing both the product's cost and lead time is critical in today's competition-driven economy. This relationship between service time and product cost has been achieved successfully via adopting VSM methodology. Time-cost decisions are complicated and need selection of appropriate tracking methodology for each operational task. In this paper, VSM was proved to be a successful philosophy to cut costs and reduce the food processing lead time, transportation, stocking, changeover time of a chain QSR.

The Future State Map indicates an average 20% performance improvement in the critical stages/activities of BHM production. Such improvement in the way of system management will reflect directly to the overall performance and if extended to other menu items, it will contribute significantly in cost saving. In this context, the processing lead time was minimized from 275 minutes/100 BHM to 137.5 minutes/100 BHM that will reflect on the operational costs accordingly. This reduction in lead time could help the restaurant produce BHM with the optimal standard service time specified by the operating company. In terms of receiving and stocking, process of efficiency was enhanced from 38.85% to 57.87% while the time of packaging and serving of BHM was also reduced to reach one minute to the customers after completing the order. This was reached by maximizing value creating time through identifying the opportunities of improvement at all operational stages. Enhancing the restaurants' relationship with the wholesalers, for example, was a critical decision to reduce the inventory's loss in the operational activities and in the store; the movements of raw materials and finished products decreased accordingly. This was a good decision taken by the case restaurant to be able to better satisfy the customer's demand. To cater to a broad customer base, it is important for QSRs' sector to produce items as quickly as possible while maintaining or decreasing prices. VSM, in fact, is a significant management approach for overcoming the critical QSRs' dilemma of delivering speed service at low cost. Through the technique of VSM, they will be able to accomplish this goal.

This study was based on analyzing and improving the production process of a specific and single product (BHM) from the classic meals of the case restaurant. Therefore, this managerial aspect deserves further studies and future research, for example: addressing the methodology of VSM for its application to the management of the service process. Additionally, future studies could address integrating VSM with a costing technique to completely achieve a comprehensive operations picture.

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استكشاف تأثير مخطط تدفق القيمة (VSM) على أداء مطاعم الخدمة السريعة

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المخلص

يعتبر مخطط تدفق القيمة (VSM) بمثابة منهجية تحسين تقوم على تقصي الأنشطة التي تحقق القيمة المضافة كما تهدف إلى القضاء على الأنشطة التي لا تضيف قيمة مما يسهم في النهاية في تعزيز فعالية الأداء. تقدم هذه الورقة منهجية VSM كطريقة مختلفة لتحليل تدفق الأنشطة في صناعة الخدمة بالتطبيق على مطاعم الخدمة السريعة والتي تُعنى بسرعة الخدمة في المقام الأول. ومن هنا، فإن الهدف الرئيس لهذه الدراسة هو تحليل تدفقات أنشطة الإنتاج والتخزين والمنتجات النهائية من أجل استكشاف أفضل الممارسات وتحسين الأداء الحالي للأنشطة التشغيلية بالتخلص من الأنشطة الزائدة. ولتحقيق هذا الهدف تم إجراء تحليل للعمليات السابقة من خلال جمع البيانات من خلال المشاركة المباشرة في قياس الوقت المستغرق في إتمام الأنشطة التشغيلية، بالإضافة إلى الاستعانة ببعض الحقائق من مستندات شركة إدارة المطعم. اتبعت الدراسة المنهج النوعي للتحقيق الشامل في كفاءة تدفق القيمة في مطعم الخدمة السريعة من خلال دراسة حالة أحد مطاعم الخدمة السريعة. تمكن الباحثان من رصد وتطبيق هذه المنهجية على مدار شهرين في أوقات ذروة تشغيل المطعم مما ساعد في رسم خرائط الحالة الحالية لعملية التشغيل بالمطعم، ثم تحليلها والتعرف على مصادر الأنشطة ذات القيمة المضافة وغيرها من الأنشطة من خلال تطبيق معادلات بعض المفاهيم (وقت الدورة الكامل Cycle Time – الوقت الفعلي لإنتاج عنصر Takt-Time – كفاءة دورة العملية Process Efficiency – وأشار النتائج إلى أن تطبيق مبدأ VSM قد أسهم في تعزيز وتحسين العملية التشغيلية. كما اقترحت مبادئ VSM بعض التعديلات في ستة أنشطة تشغيلية على الإدارة أن تتركها؛ التفاوض والشراء والاستلام والتخزين والتعامل مع المواد الغذائية والتغليف.

معلومات المقالة

الكلمات المفتاحية

مخطط تدفق القيمة؛
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