PRODUCTION PROCESS QUALITY MANAGEMENT STRATEGIES WITH DIGITAL TECHNOLOGY OF READY-TO-EAT FOOD INDUSTRY IN GLOBAL EMERGENCY SITUATION

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ABSTRACT

This study was conducted as a qualitative research-based analysis. It has the following objectives; one is to examine production process quality management of the ready-to-eat food production in global emergency situation. The second is to arrive at a strategy to quality manage the production process with the use of digital technology. The research was conducted by using an in-depth study of a ready-to-eat food company that has recorded the highest related revenue in Thailand. Research tools employed were interviews, voice recording, software packages for analyzing qualitative data. Data were collected from study activities and in-depth interviews. The findings were as follows; 1) the three case studies companies use digital technology in production process quality management. 2) the companies can devise a strategy to lower its production cost, reduced production time, reduce the error rate and resulting in higher quality and safety products as well which enable the company to deliver the highest value to its organization in the manufacture of products to the customers. Moreover, the company build trust in cleanliness and safety for businesses to survive this global emergency.

KEYWORDS: 1) QUALITY MANAGEMENT STRATEGIES 2) PRODUCTION PROCESS 3) DIGITAL TECHNOLOGY 4) READY-TO-EAT FOOD INDUSTRY 5) GLOBAL EMERGENCY SITUATION

1. Introduction

In the food industry it is the main industry in Thailand. The food industry is important in that it uses almost all of the ingredients in the country. Helped create a large number of downstream industries. It is also an industry that tends to grow in line with the economic recovery. This is especially true with ready-to-eat products that have grown higher than the overall food and beverage market. By 2020, the value of the ready-to-eat food market is at 20,200-20,500 million baht, expanding by 3-5 percent, which has contributed to growth from an increase in distribution sources close to consumers such as convenience stores. The growing popularity of eating out due to some limitations such as lack of time and space for cooking. Urban lifestyle Single-family life on the rise Including a variety of novelty products resulting from the entrepreneur's product development competition. (Kasikorn, 2020)

This is in line with the current global emergency situation that has resulted in the food industry changing trends. In addition to the above factors, safety is the most important issue. Consumers also want food that has an innovative, different immune system. Making ready-to-eat food has a high growth rate Consumers are more likely to buy food to eat at home. Increased self-cooking activities And the popularity of online purchases has grown to become New Normal.

CJ CheilJedang's 2020 HMR Trend study found that after the coronavirus outbreak Consumers focus on saving time in food preparation. By eating ready-to-eat meals at home, an increase of 83 percent, an increase of 23 percent compared to the previous year. Because the food group is ready to eat And ready-to-cook food It is one of the safest options in the times of the coronavirus crisis, as consumers can keep them for a long time. Reduce the risk of shopping in the market. Or a store that is crowded And with the current food production technology Making frozen food in addition to being stored for a long time Still able to maintain quality and complete nutrients.

This is an opportunity and an important factor that motivates Thai ready-to-eat food processing companies to adjust their strategy to meet the market needs. Which must build confidence in the brand In production facility And providing consumer information To ensure food safety It is important to have a process that monitors the quality and safety of food production with modern digital technology. To reduce costs, reduce time, reduce error rates And resulting in higher product quality and safety, as well as The company is able to deliver the highest value to the organization to produce products to the customers. Moreover, the company builds trust in cleanliness and safety for businesses. Survive in this global emergency too (Food Institute, 2020)

Research objectives
1. To study the production process quality management of the ready-to-eat food production in global emergency situation.
2. To study the strategy to quality manage the production process with the use of digital technology.

2. Literature review
Production process

Production is a process in which economic resources or inputs (com-posed of natural resources like land, labour and cap-ital equipment) are combined by entrepreneurs to create economic goods and services (also referred to as outputs or products).

A production function is usually defined as a schedule (or table, or mathematical equation) show-ing the maximum amount of output that can be produced from a fixed

amount of resources, given the existing technology or the art of production. In short, the production function is a catalogue of a firm's output possibilities. (Jim, 2019)

Production process quality management

Quality control is a key component of a well-run business. A quality control program helps to ensure your small business is delivering a consistent product, service and customer experience. Developing quality control processes allows your business to operate without you, making it easier to expand into new locations, delegate duties and even sell your business when the time comes. (Score, 2019)

The quality system in the food industry is as follows:

1) Good Manufacturing Practice (GMP) is a practice and proven quality assurance system from a global group of food academics to ensure food safety. It is trusted and accepted by consumers. By relying on many factors that are interrelated Therefore, if all the prescribed guidelines can be followed, the food will be of the highest quality, standard and safest.

2) Hazard Analysis and Critical Control Point (HACCP) Analysis of product hazards to consumers Along with the formulation of control measures And fix the problem Together with the use of laboratory analysis (Lab) to confirm the efficiency of the HACCP system used in the product manufacturing process. Give consumers confidence in the quality and safety of that food product (Ministry of Industry, 2018).

3) Total Quality Management (TQM) A focus on achieving customer satisfaction. Process improvement From receiving raw materials until the product or service to the customer must have quality and process improvement continuously. So that mistakes and losses can be reduced. To a minimum or no, all employees in the organization must be involved. Because the operator will know the problem And can be improved as best Mixing up activities Quality must reflect all activities of the organization. And have the correct measurement (Rawat , 2009)

Digital technology

Another technology used in industrial plants. Is to work automatically using robots (Robotic Process Automation: RPA) is a program that allows businesses to create robots to perform various tasks as specified. With each robot that is built will work accordingly The format was set differently. To be used for repetitive work in different ways Instead of employees having to do the work themselves, robots can be used to do that job on their behalf in order to increase productivity and reduce costs in the long run. The robot innovation in the factory will be as follows (Sumipol, 2019)

1.Multi-purpose robot Much of it is developed primarily as a robot "arm". Both to handle and transfer work smoothly The device can also be installed to perform other tasks such as fine-work assembly.

2.Welding robots One of the important robots in the Thai manufacturing industry. Since the automotive manufacturing industry has a high use of robots. The welding robot looks like a robotic arm with a steel tip at the end They often work in conjunction with a conveyor system that sends materials into the distance.

3. Product and material sorting robots are robots that are widely used in industrial plants. Including warehouses, especially Amazon and Alibaba, that have developed their own factory sorting robots.

4. Safety Inspection Robot that the more the industry develops Safety is even more important. Many jobs are too risky for humans to perform or in hard-to-reach areas. For those reasons, factory safety inspection robots have come into play, such as detecting leaks in factories.

5. Plastic molding robots Plastic molding robots are responsible for handling. Plastic injection molding according to application Into a large number of finished products in a short time, such as plastic pipes, equipment parts to utensils, plates, cutlery

Production process quality management strategies

Reijers, & Liman Mansar (2005) 's The Devil's Quadrangle concept is based on four dimensions of efficiency: time, cost, quality and flexibility. In principle, the design of business processes reduces the time required to handle cases, reduces the costs required to execute processes, improves the quality of the services delivered, and increases the ability of business processes to handle.
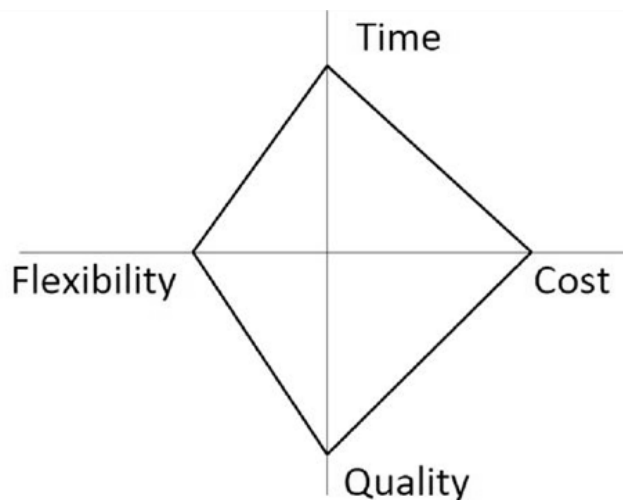

Figure 1 : The Devil's Quadrangle
Source: Reijers, & Liman Mansar, 2005

Cost side If there is a positive impact Shows that the production process costs are reduced Estimate with different types of expenses such as fixed or variable costs, human or systemic use, processing or management or support.

And quality If there is a positive impact Shows that there are fewer errors and mistakes Have reduced waiting times Evaluated by external and internal factors, quality products and processes meet international quality standards such as GMP, HACCP or TQM.

Consistent with the lean manufacturing strategy The main goal of the strategy is to deliver value to customers, focusing on the value creation process to improve value creation. It is also less focused on asset and technology optimization and the flow of products and services based on customer demand (Collins, 2016). It can reduce production costs by increasing labor productivity. Reduce production time Reduces inventories and cuts errors and material waste in half. Therefore, lean manufacturing strategy It is an easy and efficient way to perform production and quality processes.

Research framework
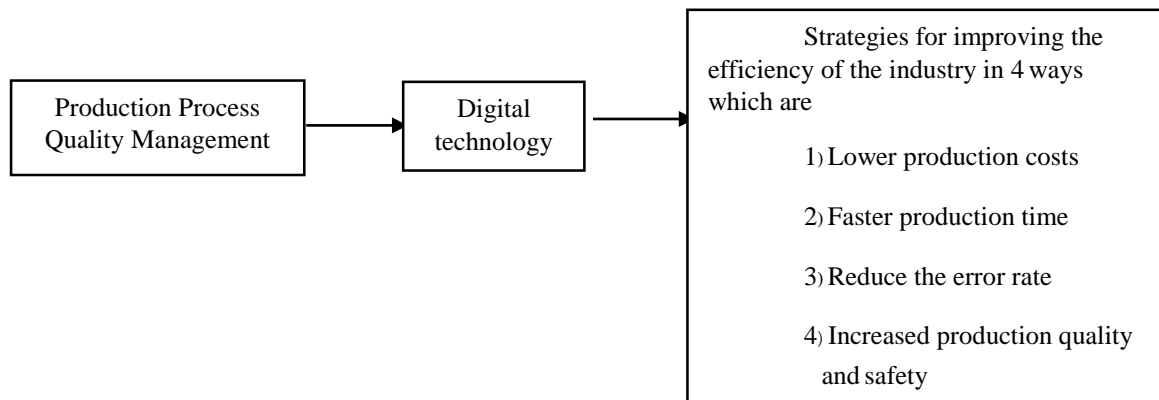
**Figure 2** Research framework

3. Research methodology

Research scope

1. Scope of content

Study the strategy for quality managing the production process using digital technology of the ready-to-eat food industry in Global Emergency Situation, which studies from secondary data, documents from observation Study trip and information from interviewees regarding production processes from in-depth interviews.

2. Scope of data collection

In this research, study the business process which has the scope for data collection only in the production process as follows
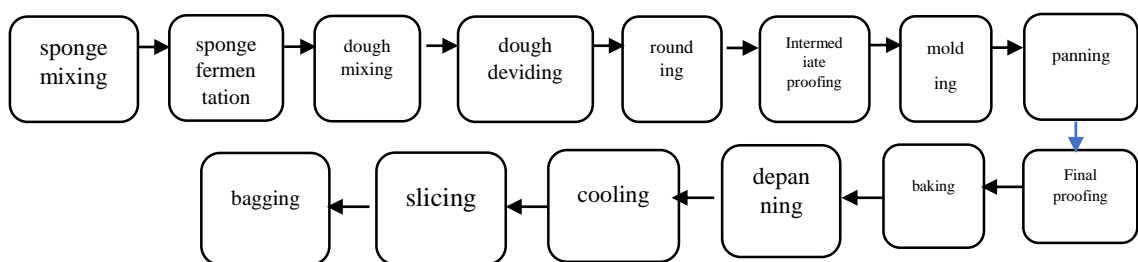
Figure 3 Scope of data collection

Population and samples

A case study of 3 ready-to-eat food production business, ready-to-eat bread type and the beginning of Thailand. By interviewing a total of 3 people

Data collection

1. Document study

The researcher has collected and studied various information from research papers, academic articles and internet information related to production process management strategies to be used in the analysis of the data obtained from in-depth interviews, which will give more accurate and complete information.

2. Observation

The researcher observed without participation from field trips. Able to collect data without having to participate in the activities of the sample is a structured observation to record data. By the researcher observed from activities within the scope of the production process that occurred and recording the data in various formats and analyzing it systematically in order to be able to analyze the results in the future.

3. Interview form

This research uses a semi-structured interview form and recording audio during the interview to gather various information during the interview which is very important to help prevent forgetfulness.

4. The researcher using Nvivo11 program for analyze data from interviews.

4. Analysis results

Analysis of results in case studies of digital technology quality management strategies of ready-to-eat food industry in global emergency situations It operates in line with the objective of monitoring the quality management of production processes of ready-to-eat food production in a global emergency. And to arrive at the strategy for quality management of the production process using digital technology That makes it efficient in cost of production, production time, fault rate and the quality and production safety are improved. Which shows details as follows

Table 1: shows the summary of the study from the documents of the 3 companies.

Company	Type	Quality	Technology Digital
A	Bread, Sandwich	GMP HACCP	Robot Product and material sorting robots
B	Bread, Sandwich	HACCP TQM	Robot Product and material sorting robots
C	Bread, Sandwich	GMP HACCP	Robot Product and material sorting robots

The results of the study from the document found that all 3 companies have a standard system for quality management of production processes, whether GMP, HACCP and TQM, with Product and material sorting robots to help make the production process more efficient in terms of Quality management as well.

Table 2 : shows the comparison of labor costs.

Labor	Cost	Difference [3]=[2]-[1]	% [4]=[3]/[2]*100
Robot (Working 24 hours, 365 days)	200,000,000 [1]		
Employee (4,800 people, daily wages 325 baht, working 24 hours, 365 days)	569,400,000 [2]	369,400,000	65%

From Table 2, it was found that the cost of using the robot was less than the cost of hiring 370 million baht, 65 percent of the labor force.

Table 3 : shows the summary of the interview

Company	Quality and Safety	Interview	Transcribe	Lean
A	GMP HACCP	• Use robots to increase production efficiency faster to help reduce workforce. • To increase the speed in working as fast as it comes with efficiency. • Accurate sales data	• Cost reduction • Reduce mistakes. • Reduce time • Increased quality and safety.	• Cost reduction • Reduce time • Reduce mistakes. • Increased quality and safety.
B	HACCP TQM	• Develop their own technology and innovation To reduce production costs, reduce costs • The time is 6-7 hours shorter than before, reduced to 2-3 hours only. • Develop standard potential	• Cost reduction • Reduce mistakes. • Reduce time • Increased quality and safety.	
C	GMP HACCP	• With the use of robots to help work For speed, accuracy, reduce costs in management.	• Cost reduction • Reduce mistakes. • Reduce time	

Company	Quality and Safety	Interview	Transcribe	Lean
		• Reduced from 12 months to 3-6 months or left 1 month • Strict manufacturing process control standards for every step	• Increased quality and safety.	

From the study of cleaning documents and in-depth work from employees in quality management of the production process, data can be examined through a package for qualitative data analysis. Safe in Manufacturing, with the use of technological robots, allows companies to be managed, reduce time, reduce error rates, and improve quality and safety, in line with lean manufacturing at a competitive advantage in a global emergency situation.

5. Conclusion

By examining the data in the mechanical process management of the ready‑to‑eat food industry in the global emergency situation, it is understood that the company in the case study manages quality in its manufacturing processes with a material robot and that the company is Manage production downgrades, reduce production times, improve quality and safety, resulting in a production error rate, which is consistent with lean manufacturing standards, as well as enabling the company to deliver to manufacturers. In addition, the company builds a trust in cleanliness and safety for businesses to survive this global emergency.

6. References

Black, J. (2008). Lean production: Implementing a world-class system. New York: Industrial Press Inc.

Collins, D. (2016). Lean strategy: Start-ups need both agility and direction. Harvard Business Review, 94(3), 63-68.

Food Institute. (2020). Food Institute reveals Covid-19 transforms food industry trends in Asia. From https://konkao.net/read.php?id=39636

Kasikorn Research Center. (2020). "Ready-to-eat food" year 63, although still growing out of the total market. From https://kasikornresearch.com/th/analysis/k-socialmedia/Pages/FB-ReadytoEat-10-01-20.aspx

Ministry of Industry. (2018). Production standards of the food industry. Bangkok: Ministry of Industry.

Score (2019). How to Establish Quality Control Processes. from https://www.score.org/blog/how-establish-quality-control-processes

Sumipol (2019). 5 innovative robots that are used in industrial plants. From https://www.sumipol.com/knowledge/5-robots-innovation/

Woodruff, J. (2019). Economic Definition of the Four Factors of Production. From https://smallbusiness.chron.com/economic-definition-four-factors-production-3941.html