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# Issues and Challenges of Optimizing Production Rate uring COVID-19: A Case Study on an Electronic Equipment Manufacturder in Malaysia

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### Abstract

This study helps assess the issues and challenges that affect the rate of production and process and proposes an operational strategy to optimise the production rate at an electronic equipment manufacturer in Malaysia. The study was qualitative research, and the information gathered was analysed using the Ishikawa Diagram to find the most prominent issue affecting their production rate. Two main factors were found to have the most impact on the production rate, namely manpower and material issues. This study suggests the need for manpower reallocation and alternative suppliers to mitigate the problems faced by the company.

Keywords: Operations; Supply Chain; Ishikawa Diagram; COVID-19;

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## **1.0 Introduction**

The disruption of production during the COVID-19 pandemic, according to Ivanov (2020), had an adverse effect on the return of sales and profit, brand image, buyer safety, and overall supply chain performance. Shortages of raw materials and manpower during the pandemic may affect production (Luo & Cai,2020), and if it is not mitigated quickly, it may lead to company shutdowns (Alexander, 2020; Omar et al., 2020). The Department of Statistics Malaysia (2021) has stated that during the pandemic, semiconductor production in Malaysia decreased by 7.16% from 2019 to 2020. Malaysia, as a major player in the worldwide semiconductor supply chain, accounted for 39.4 per cent of Malaysia's total exports in 2020 (Nur Hanani Azman, 2021). The company, an Electronic Equipment Manufacturer in Malaysia (EEM), manufactures internationally accredited electrical distribution equipment that is an integral part of electrical distributors for residential, commercial, and industrial buildings, public transport, and amenities. Whilst businesses are usually affected negatively owing to the pandemic, EEM experienced a positive surge in its sales. However, production rates are unable to match the demand because of the Malaysia COVID-19 Standard Operating Procedure in terms of manpower allowed for manufacturing besides the disruption in the supply chain, particularly the shortage of semiconductor raw material supply in early 2021. The company experienced a production rate decrease of 17.52% in April 2021 and a further decrease of 0.75% in May of the same year. In order to

eISSN: 2398-4287 © 2024. The Authors. Published for AMER and cE-Bs by e-International Publishing House, Ltd., UK. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/). Peer-review under responsibility of AMER (Association of Malaysian Environment-Behaviour Researchers), and cE-Bs (Centre for Environment-Behaviour Studies), College of Built Environment, Universiti Teknologi MARA, Malaysia. DOI: ttps://doi.org/10.21834/e-bpj.v9iS119.5772 mitigate this problem, this investigation is to identify and examine the issues and challenges that affect the production rate for future action in times of global crisis.

#### 2.0 Literature Review

Production rate, in terms of manufacturing, can be described as the number of goods that can be produced in a given time. The issues and challenges faced by the manufacturing sector during the COVID-19 pandemic have affected the production rate and caused delays in the industry's supply chain as a whole (Elsafty & Osman, 2021). Production rate can be measured by dividing the batch size of an order by the total time taken to complete one process. This, in turn, will give the production rate of each of the processes. If the staff are not adequately trained or there are not enough qualified workers to complete the manufacturing task, the production rate will most certainly decrease. Outside variables might also have an impact on the output rate of any process (Kenton, 2021). During COVID-19, limited operating capabilities and low demand have decreased the production volume (Murugiah, 2020). The short-term COVID-19 impacts have overridden all the previous outbreaks, such as SARS and Ebola, and it's also predicted to be very severe for medium to long-term impacts (Paul & Chowdhury, 2020). The loss of working hours is one example of affecting supply, while unemployment related to the lockdown affects the demand side during COVID-19 (Padhan & Prabheesh, 2021). Organisations need to minimize risks in the workplace, such as having preventive methods to prevent overcrowding in the workplace and ensuring worker comfort and safety (Agrawal et. al., 2020; Zhi et. al., 2021). Currently, industries face several problems, including the need to protect their workers while simultaneously ensuring their operational sustainability. Most industries are currently working on a mobilization idea in order to build up a crisis management system for the short term (Agrawal et al., 2020). Besides that, many other problems have been observed across the world, such as a lack of expertise in dealing with these situations, worker education levels on the ground, and customer education levels to grasp the circumstances, to name a few (S. Kumar et al., 2020).

#### 2.1 Manpower

According to the Oxford Dictionary, manpower can be defined as the number of people available for a certain work or service. In the context of production rate, disturbance in manpower allocation is one of the causes that affect production outcomes (Saravanan & Thakkar, 2018). Insufficient manpower is one of the factors affecting the manufacturing outcome of production. Due to the COVID-19 pandemic, the amount of manpower in a manufacturing setting has to be reduced in order to allow proper social distancing in accordance with the pandemic standard operating procedures (MITI, 2021). This restriction has caused several industries to be unable to work at full capacity, thus limiting their output (You, Sonne, and OK, 2020). The number of manpower available and, thus, the performance of the company. Furthermore, a lack of manpower will also affect a company's production rate. According to a study done by Sulaiman and Ismail (2019), this is due to insufficient manpower, which will cause bottlenecks in the production processes, thus affecting their overall production rate. Without adequate manpower, the company would not be able to plan its manufacturing routine efficiently to produce at an optimum level.

#### 2.2 Material

According to a study by Liliana (2017), material is defined as the components that are used in order to produce the final product. The use of raw materials is a must in production, and there is always the possibility of defects, supply chain disruption, and problematic equipment. The current COVID-19 pandemic has created a supply chain complexity since 2019 (Lopes de Sousa Jabbour et al., 2020). This pandemic has caused a major supply chain disruption by imposing restrictions on transportation facilities, shutting down manufacturing activities, and closing borders, which in turn causes severe unavailability of raw materials (Chowdhury et al., 2020). The raw material shortage is one of the elements caused by supply chain disruption. Without adequate raw material, the company will be unable to produce more products, thus increasing the volume of stockouts and backorders. Not only that, but a study done by Budiman et al. (2021) has also shown that the lack of raw materials has caused a significant decrease in productivity and performance. Due to a shortage of raw materials, manufacturing companies would then be forced to find alternative components that may be incompatible with the current product design, thus increasing their reject rate (Paul & Chowdhury, 2020). Without raw materials, a company would not be able to produce any of its products (El-Kassar et al, 2020). Thus, a continuous supply of raw materials is paramount in the production of products.

#### 2.3 Machine

The machine is defined as each task or purpose done using tools such as machinery, computers, tools, instruments, and technology (Aires & Gicaglia, 2017). Machine factors that will affect work performance and production outcome are both reliability and any disturbance caused to machinery (Soliman, 2020; Ben et al., 2021). The machine's reliability can be due to several elements, such as

outdated machinery, breakdown time, and maintenance time. An outdated machine tends to be prone to breakdown due to wear and tear. This, in turn, will cause the machine to be offline, stopping any work-in-progress. This breakdown time and maintenance time will increase the manufacturing production outcome (Soliman, 2020). Disturbance to the machinery will also increase the manufacturing production outcome. The disturbance in question comes in the form of power outages. Power outages are a major constraint in the operation of manufacturing sectors. Access to a reliable supply of electricity is important, as frequent power disturbances will make it difficult for a manufacturing firm to plan and undertake manufacturing activities (Carlsson et al., 2020). According to Carlson et al. (2020), while this problem can be mitigated by installing backup generators, the option might be limited due to their high cost. 2.4 Method

A method is defined as how the procedure is carried out, as well as the exact needs for doing so, such as any procedures, policies, laws, rules, and regulations (Liliana, 2017). In the context of this study, the methods can be broken down into three components, which are procedures, testing, and troubleshooting. Unclear working instructions and ineffective communication are obstacles to manufacturing procedures. According to De Lara (2018), effective communication is a system for receiving feedback on conveyed information. Clear work instructions are needed to ensure an efficient assembly process. Knowing the obstacles to effective communication is essential in improving the company's communication method (Ejohwomu et al., 2017). Other than that, a complicated assembly process also plays a part in performance. According to Long (2021), a complicated process will add a significant amount of time to the completion of a procedure. In the context of manufacturing, complicated processes will add up more time, causing the company to be unable to catch up to its current market demand.

#### 2.5 Money

To make items or deliver services, a company needs finance. Capital is crucial for acquiring raw materials, hiring employees, buying machinery, and covering various other business expenses. Having sufficient capital ensures the smooth operation of a firm. A company's operating capital and fixed capital must be sufficient (Achrekar, 2021). The statement was supported by Omoregie (2015), who said that without money, no endeavor or business could encourage employees, obtain high-quality and adequate supplies, acquire and maintain the appropriate machinery, or even ensure that time is correctly handled. Money management has been the most well-known element in the failure of businesses throughout history when it is not properly structured. The amount and quality of money invested in an enterprise have a direct impact on its long-term success. Man has transformed the accounts department over the years to enable maximum operations of surviving company organizations. When money is scarce, good personnel, materials, and machinery cannot be hired, purchased, or obtained. In other words, such a business will be losing its time by even existing (Omoregie, 2015).

#### 3.0 Methodology

This study employed qualitative research that used non-probability purposive sampling. Since the research is about production rate, interviews were done with those involved in production. Five individuals were interviewed using a semi-structured interview. The five interviewees are a line manager, a lead technician, a supervisor, a production manager, and an engineer. Owing to the pandemic, the interviews were done online. The information received from the interview is analyzed using Ishikawa Diagram. Questions were asked on the 5Ms, which are Man, Money, Material, Method, and Manpower.

#### 4.0 Findings and Discussion

In this study, the Ishikawa Diagram is used to identify the issues and challenges affecting the company's production rate. The Ishikawa Diagram is a qualitative tool used in Total Quality Management (TQM). This graphic can help to discover the sources and consequences that determine production rate. Researchers can use this tool to see the relationships between causes and consequences. These causes are the 5Ms, which are Manpower, Material, Machine, Method, and Money. Figure 1.1 was created based on the information received from the interviewee on major causes and sub-reasons.

#### 4.1 Manpower

Manpower is the first factor in the Ishikawa Diagram. Based on the Ishikawa Diagram, insufficient manpower [A1] is one of the main factors affecting the production rate. All the respondents agreed that due to the pandemic restrictions [A1.1], the company had to adhere to the social distancing rule. This causes certain stations in the production process to have inadequate manpower because they had to reallocate some of their staff to other tasks so as to not crowd some of the stations, compared to when they can station manpower closely together. Not only that, Respondent 1 added that due to the pandemic, the turnover rate had also increased [A1.2] because some of the operators decided to resign and return to their respective hometowns.

The next factor under Manpower is employees' skills [A2]. Due to the increase in turnover rate, new hires tend to lack the necessary skills [A2.1] to complete their tasks faster and more efficiently compared to other experienced staff. Respondents 2 and 3 further elaborated that talented and experienced employees are important to increase the production rate. While talents and skills can be cultivated, the current new hires lack training [A2.2]. According to Respondents 4 and 5, this was due to the pandemic. The company was unable to invite a professional trainer to teach the new hires how to use the machine or equipment.

The last factor under Manpower is morale [A3]. The feeling of job dissatisfaction [A3.1] among employees was there. However, according to Respondent 3, only some employees were burned out. Even with fewer men, they had to find a way to pursue the target. Furthermore, all the respondents agreed that salary reduction [A3.2] also affected morale. The employees burnt out with salary reductions to pursue the company targets. That was an unhealthy environment because doing the job with lower morale would cause more mistakes and higher product rejections.

#### 4.2 Material

The second element in the Ishikawa Diagram is material. According to the Ishikawa Diagram, the supply chain [B1] is one of the external elements influencing the production rate. Global supply chain interruptions, such as a lack of raw materials [B1.1], had a severe impact on the company. This means that the R&D team will have to rethink the entire product in order to use various MCUs, which may take some time. While the company may continue to source from other sources, its buffer time has increased. All the respondents agreed that supply chain disruptions are the main cause of insufficient raw materials for the production process. Not only that, the sourcing of materials from unfamiliar suppliers and the quality of the raw materials [B2] were also questionable. According to the interview, some of the suppliers' material qualities were not up to the company's standard [B2.2]. These two factors affect the overall production process due to increased buffer time due to the need to wait for replacements from said suppliers.

#### 4.3 Method

During the MCO, they were required to adhere to the 60% capacity guideline [D1]. As a result, they had downsized their workforce. According to Respondents 1 and 2, they also had to devise a rotational shift system for the personnel, such as the machine and assembly teams and testing and packaging teams, who would work four days per week (alternating days) [D1.2]. During that period, their production rate was substantially reduced to approximately 8 units per hour. However, due to the company's prompt vaccination of their employees, they were able to operate at full capacity during the later stages of the MCO. Hence, their production staff will be able to completely operate on-site, while executives and management will be able to work from home.

Respondent 4 stated that during that time, they changed their production plan so that they could comply with social distancing when they were fully operational [D1.1]. Therefore, even if they were operating at full capacity, the social distancing SOPs are still in effect. Not only that, all the respondents stated that a mandatory weekly RTK test is also performed, as well as a daily temperature check and sanitization [D1.3]. The company also had to modify its business model. Unlike during the MCO, they ceased rotating shifts. To prevent overcrowding in the canteen, break times were split into two sessions per break. Given that staff typically open their masks to eat, the two-session break period was essential. Thus, the machine and assembly teams worked together in one session, followed by the testing and packaging teams.

According to Respondents 1, 3, and 5, the testing phase [D2] started with calibrating the product before doing the functional test to ensure it was working as intended. The product was left in the burn-in room for a day. The test process was also known as anaerobic tests. In the last stage, the testing team does the final testing to make sure the product still works after the burn-in test. Respondents 1, 4, and 5 also added that the testing part took a long testing time [D2.1]. It runs in two stages. In the first stage, the team needs to calibrate the product before running the anaerobic test, and then it is handed over to the testing team to do the final testing to make sure everything is working well after the burn-in test. So, this stage was a complicated process [D2.2] before the product could be handed over to customers.

#### 4.3 Money

The money or wealth required to generate goods and services was referred to as capital [E1]. All businesses require capital to purchase assets and run their operations.

According to Respondent 1, since the company could not produce as much as it used to, its revenue decreased a little [E1.1]. However, they were operating because they still made a profit, but not as much as previously. Respondents 1, 3, and 4 also agreed that due to their limited raw materials and manpower, they must keep their reject rate to a bare minimum. Greater reject rates would necessitate the purchase of more raw materials in order to replace the parts properly, thus costing the company [E1.2]. As a result, their R&D team is developing a low-cost variant using an alternative MCU.

Based on the respondents' answers, it can be concluded that according to the study's RQ1, the issues and challenges that affect production rate the most are Manpower [A] and Material [B]. This is because insufficient manpower would cause the production team to be understaffed and unable to produce efficiently. Material shortages also caused issues in the production rate, as delays from their suppliers would leave them unable to produce their products. However, it needs to be stated here that this finding is only confined to the production rate for this product. For other products, the company needs to construct a new Ishikawa Diagram to find out what causes the problem with that product.



Figure 1.1: Ishikawa Diagram for Low Production Rate

#### 5.0 Conclusion and Recommendation

Manpower is the main factor that was obtained from the Ishikawa Diagram. An insufficient number of employees to handle the production task is one of the main factors that causes production rate decreases. The lack of manpower caused by the reduction was due to the pandemic situation, which required staff to apply social distancing. This causes certain stations in the production process to have inadequate manpower because they had to reallocate some of their staff to other tasks to not crowd some of the stations, compared to when they can station manpower closely together. At the same time, the material shortage has also impacted the production rate. Owing to the pandemic, one of the limitations is the inability to observe how the production was done. It is recommended for future research to examine the strategy undertaken to overcome what the company encountered during the pandemic so that in times of this crisis, 'plan B' can be executed particularly in sourcing.

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