



# Mitigating business risks in the culinary supply chain: An empirical study in Bangkalan District

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## ABSTRACT

Most Medium, Small, and Micro Enterprises (MSMEs) in the culinary sector are experiencing the fastest growth and increasing trends in demand and income, indicating the potential for business expansion. However, many MSMEs have encountered several problems in their supply chain that could jeopardize business continuity. The objectives of this research are: 1) to identify risk events and risk sources (risk agents) and prioritize them; and 2) to determine the mitigation actions (preventive actions) that MSMEs need to undertake to minimize risks. The identification of risk events is conducted using the SCOR (Supply Chain Operation Reference) approach, while data analysis employs the HOR (House of Risk) method. It is revealed that there are 38 risk events with 24 risk sources. From the three priority risk sources, 8 mitigation actions were developed, with 3 priority mitigation actions identified: determining supplier criteria, establishing minimum order time regulations, and maintaining records related to production raw material stocks.

## 1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are increasingly emerging. MSMEs in the creative economy industry, such as culinary MSMEs, represent a significant portion of the MSME sector, with 241,133 units in 2020 in East Java Province alone, according to data from the Central Statistic Agency 2020. This dominance underscores the important role of culinary MSMEs in the national economy. For example, culinary MSMEs contributed 7.38% to the Gross Domestic Product (GDP), equivalent to Rp. 852.24 trillion and accounted for the largest share (41.69%) of the creative economy industry. This data suggests that culinary MSMEs play a vital role in increasing people's income, improving their living standards, and reducing unemployment rates [1]. Moreover, culinary MSMEs have shown rapid growth trends. Despite the challenges of the COVID-19 era, culinary MSMEs not only survived but also experienced a growth rate of 3.49%. By the third quarter of 2022, this growth percentage had increased to 3.57%, according to an official statement from The Ministry of Industry Republic Indonesia.

MSMEs that produce their own products must be able to manage all business activities, from planning orders for raw materials to selling to consumers [2]. If this is not done, various kinds of risks can occur. Risk is an undesirable event because the impact resulting from risk tends to be negative [3]. Risk has an uncertain nature, as does the impact it will have [4]. Risks that generally occur in culinary MSMEs include increases in raw material prices, irregular operational activities, delays in product delivery to consumers, and inappropriate cost management due to not keeping financial records [5], [6], [7]. Implementing risk management in a business can minimize threats and maximize opportunities for a business and can gain a competitive advantage [8].

According to the results of research conducted by Imam Saf'i, conducting a risk analysis on a business can reveal risks that could threaten the continuity of the business, especially during the COVID-19 pandemic, which is a difficult time. By identifying the biggest threats, strategies can be developed to reduce or prevent these risks, ensuring the business can survive and thrive [9]. Additionally, research conducted by Atmajaya also explored risk management, finding 66 risk events. This information can be used to develop

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strategies for prevention or to minimize the risks, ensuring the business avoids losses or bankruptcy [10]. Supply chain risk management can be interpreted as a series of activities starting from identifying risks, analyzing risks by providing an assessment of each risk, evaluating risks, and providing risk mitigation measures [11], [12].

Dapur Mama Shanum is one of the MSMEs operating in the culinary sector. It produces various processed local foods such as dumplings, sticky rice lupis, seblak, cilok, wontons, and its main product, pempek. This MSME started operating on November 30, 2020, and initially had an outlet, but it became empty of visitors during the COVID-19 pandemic. Subsequently, online marketing was implemented, which proved to be more effective. As a result, the business owner decided to close the outlet and has been actively selling online since then. This effectiveness is evidenced by Dapur Mama Shanum producing and selling 1,080 portions of pempek in 2022 and 1,442 portions in 2023. The product has not only consistently sold out but has also experienced ongoing demand from consumers. The increasing number of sales indicates potential for further business development. Under these conditions, it can absorb labor, albeit within the family scope for now. MSMEs Dapur Mama Shanum often experience several problems in their business activities, such as difficulty in obtaining main raw materials due to dependence on small suppliers, receiving packaging labels late, inadequate production equipment, and issues in the process of distributing products to consumers. All these problems are interconnected within the supply chain. Issues in the supply chain can disrupt business operations, affect production outcomes, and potentially cause losses, even threatening the business with bankruptcy [2].

Thus, the objectives of this research are: 1) to identify risk events and risk sources (risk agents) for Dapur Mama Shanum MSMEs and prioritize them; and 2) to determine the mitigation actions (preventive actions) that Dapur Mama Shanum MSMEs need to undertake to minimize risks.

## 2. Material and method

### 2.1. Research subject

The research was conducted at Dapur Mama Shanum MSME, located in Tunjung Village, Burneh District. The selection of research subjects was carried out purposively. Dapur Mama Shanum MSME was chosen because it is relatively new with potential for further development due to its wide consumer segmentation. Additionally, based on an initial survey, Dapur Mama Shanum MSME often experiences problems, particularly in the supply chain, which can pose a threat to business continuity.

### 2.2. Data processing

The data used in the research consists of primary data, which is obtained directly for analysis. This

primary data includes the supply chain activity process of Dapur Mama Shanum MSMEs and identifying the risk events and sources of risk in Dapur Mama Shanum MSMEs. Data sources are obtained through observation, interviews, and questionnaires. The respondents for the questionnaire are selected purposively, specifically the business owners of Dapur Mama Shanum. The questionnaire is completed after the risks have been identified. The assessment of severity and occurrence uses a scale of 1-10, with scale information provided in Table 1 and Table 2 [14].

Data analysis uses the House of Risk (HOR) analysis technique. HOR is an analytical tool used to analyze risk. The HOR analysis process is divided into two phases. Phase 1 focuses on identifying which sources of risk need to be prioritized [15]. Risk events and sources of risk in the Dapur Mama Shanum MSME supply chain are identified using the SCOR (Supply Chain Operation Reference) approach. The SCOR approach is highly recommended for evaluating supply chain systems because each process and subprocess is oriented towards a series of performance indicators [16].

The SCOR approach consists of five stages:

1. **Planning.** The process of adjusting demand and supply of raw materials to meet needs in the subsequent processes, namely procurement, production, and delivery.
2. **Procurement (Source).** The process of procuring or purchasing goods/services to meet demand.
3. **Manufacture (Make).** The process of processing raw materials into a product.
4. **Delivery.** The process of distributing products/services to consumers.
5. **Return.** The process of returning goods, which occurs when there is a complaint or specific reason from the consumer.

These five stages can be used to identify risk events in a business in more detail [17], [18]. Each stage includes several subprocesses; this research uses subprocesses according to Maria Ulfah as outlined in Table 3 [19]. The return portion will be adjusted to the risks that occur. Each identified risk event will be assigned a code such as E1, E2, E3, and so on. Identify risk sources using different tables. Each source of risk found will be given a code such as A1, A2, A3, and so on.

The next step is to assess the correlation between the risk event and the risk source on a scale of 0, 1, 3, and 9. It is assessed as 0 if there is no correlation, 1 if the correlation is weak, 3 if the correlation is moderate, and 9 if the correlation is strong [20]. The following step is to calculate the Aggregate Risk Potential (ARP) value to determine the priority risks using Eq. (1).

$$ARP_j = O_j \cdot \sum S_i \cdot R_{ij} \quad (1)$$

where  $O_j$  is the risk probability (Occurrence),  $S_i$  is the risk impact (Severity) and  $R_{ij}$  is the result of the correlation between the risk event and the risk source. After knowing the ARP value, a ranking will be carried out starting from the lowest ARP value to the highest.

**Table 1.**  
Impact assessment scale (severity)

Scale	Severity	Description
1	There isn't any	There is no impact on Dapur Mama Shanum MSMEs
2	The least	There is very little impact on the performance of Dapur Mama Shanum MSMEs
3	A little	Little impact on the performance of Dapur Mama Shanum MSMEs
4	Very low	The impact on Dapur Mama Shanum's MSMEs is very low
5	Low	Low influence on the performance of Dapur Mama Shanum MSMEs
6	Currently	Moderate impact on the performance of Dapur Mama Shanum MSMEs
7	Tall	High impact on the performance of Dapur Mama Shanum MSMEs
8	Very high	The impact was very high and Dapur Mama Shanum MSMEs could not operate
9	Are you serious	The serious impact and failure of the MSMEs in Dapur Mama Shanum was preceded by a warning
10	Dangerous	The impact is dangerous and causes failure which are not preceded by warnings

**Table 2.**  
Probability assessment scale (occurrence) MSMEs Dapur Mama Shanum

Scale	Occurrence (Probability)	Description
1	Rarely	It is impossible for this incident to happen at Dapur Mama Shanum UMKM
2	Thin (very small)	Number of rare incidents in Dapur Mama Shanum MSMEs
3	The least	There are very few incidents at Dapur Mama Shanum UMKM
4	A little	Several incidents at Dapur Mama Shanum UMKM
5	Small	The number of occasional incidents at Dapur Mama Shanum UMKM
6	Currently	The number of incidents is moderate at Dapur Mama Shanum MSME
7	High enough	The number of incidents in Dapur Mama Shanum MSMEs is quite high
8	Tall	The number of incidents is high in Dapur Mama Shanum MSMEs
9	Very high	The number of incidents in Dapur Mama Shanum MSMEs is very high
10	Almost certainly	This is almost certain to happen at Dapur Mama Shanum UMKM

**Table 3.**  
Illustration of the MSMEs risk event table for Dapur Mama Shanum

Process	Activity	Risk events	Code
Plans	Planning and controlling inventory of main raw materials and supporting raw materials	...	E1
		...	E2
		...	...
Source	Production planning and production control Raw material delivery schedule	...	...
		...	...
		...	...
Make	Payment for purchased raw materials Procurement Process Production Activities	...	...
		...	...
		...	...
Deliver	Packaging Process Production Control Maintain production facilities Acceptance of consumer orders	...	...
		...	...
		...	...
Return	Delivery of products to consumers Sending bills to consumers	...	...
		...	...
Return	Product returns Product withdrawal	...	...
		...	...

HOR Phase 2 focuses on providing mitigation actions (preventive actions) based on the prioritized risk sources [15]. Correlation was assessed on the same scale –0, 1, 3, and 9–between risk sources ( $A_i$ ) and mitigation or preventive actions (PA). To calculate the total effectiveness value ( $TE_k$ ) of each mitigation action, use Eq. (2)

$$TE_k = \sum(ARP_j \cdot F_{jk}) \quad (2)$$

where  $ARP_j$  is the Aggregate Risk Potential and  $F_{jk}$  is the correlation value between risk sources and mitigation actions. Next, give an assessment of the level

of difficulty ( $D_k$ ) using a scale of 3, 4 and 5, namely with a value of 3 meaning PA is very easy to apply, 4 means PA is quite difficult to apply and 5 means PA is very difficult to implement [20]. Which is then used to calculate the total effectiveness of the difficulty ratio ( $ETD_k$ ) using Eq. (3).

$$ETD_k = \frac{TE_k}{D_k} \quad (3)$$

where  $TE_k$  is the total effectiveness value and  $D_k$  is the degree of difficulty. After that, a ranking is carried out

starting from  $ETD_k$  the highest to the lowest value to determine the priority of mitigation actions.

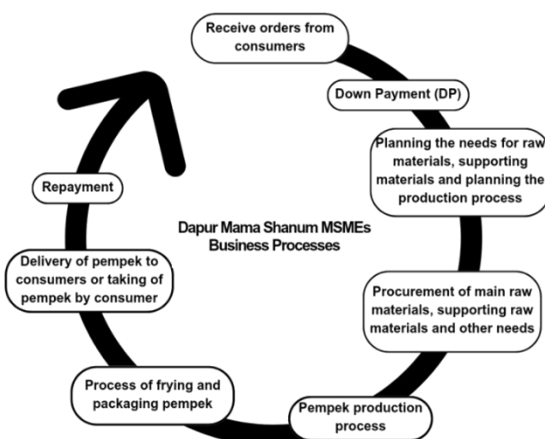
### 3. Results and discussions

#### 3.1. General profile of Dapur Mama Shanum MSMEs

Dapur Mama Shanum is a culinary MSME that has been operating since November 30, 2020, and was founded by Mrs. Suherdah, the business owner. The vision of this business is "To become a processed product business that is liked by the public and can continue to innovate." In 2020, Dapur Mama Shanum opened an outlet on Jalan Raya Perum Tonjung, but it didn't last long due to the impact of COVID-19, resulting in a lack of visitors. After closing the outlet, Dapur Mama Shanum shifted to active online sales. The business has two permanent workers: Mrs. Suherdah, who is the business owner and in charge of production, and Syah Firda Lula Hemada, who assists in the production process and handles online marketing on the GoFood platform and the business's Instagram account. Dapur Mama Shanum offers various kinds of processed products such as dumplings, sticky rice lupis, wontons, seblak, shredded chicken cilok, geprek chicken, yellow rice, and its main product, pempek. The target market for Dapur Mama Shanum MSMEs is people in the Burneh-Bangkalan area, aged 15 to 60 years. The product ordering system is "made by order," which is usually announced via Dapur Mama Shanum's social media platforms when pre-orders (PO) are being opened or when pempek products can be purchased directly on the same day as ordering.

#### 3.2. Business process

Fig. 1 shows the business process of Dapur Mama Shanum MSME to facilitate the identification of risk events. Business processes are designed as a series of activities within a group or business that highlight the potential to achieve a target, starting from input, then adding value to get the desired output in the form of pempek products for consumers [21], [22].



**Figure 1.** Dapur Mama Shanum MSMEs Business Processes

Fig. 1 sufficiently explains the business processes of Dapur Mama Shanum MSME, starting from receiving orders to the payment completion by consumers. Usually, the down payment (DP) stage is skipped if the consumer's request is not too large ( $< 20$  portions) or if the consumer is loyal, as a sense of trust has been established between the two parties.

#### 3.3. House of Risk phase 1

In phase 1, identification analysis is carried out on risk events using the SCOR approach, which is then continued by identifying risk sources. The results of identifying risk sources revealed that there were 38 risk events namely in the plan process there are 5 risk events, in the source process there are 10 risk events, in the make process there are 18 risk events, and in the deliver process there are 5 risk events. Every risk event at Dapur Mama Shanum UMKM is assessed how big the impact (severity) will be if the risk event occurs. All risk events at Dapur Mama Shanum UMKM along with the assessment of the impact (severity) of each risk event can be seen in Table A1 (see Appendices).

The return process is not included in the identification of risk events because Dapur Mama Shanum MSME does not carry out this process. In the planning process, there are two highest risk events, each with a risk event value of 7: E1 and E3. E1 is a high-impact risk event because if the supplier cannot meet the raw material needs, the business owner must resort to shopping directly at the market, which is usually more expensive and can affect business finances. Finances become vulnerable if not managed properly, as indicated by the E3 risk event.

In the source process there are two highest risk events with a severity value of 9, namely E9 and E10. There will be warnings or notifications through news information or word of mouth. If this happens, you must increase the price of the product sold or not carry out the production process.

In the make process there are two highest risk events with a severity value of 9, namely E18 and E31. E18 has an impact on the taste of pempek, if the taste is not good then consumers will be disappointed and will likely not make a repeat purchase. If E31 occurs, of course the production process cannot continue because a stove for a culinary MSME is very important. Even if the raw materials are complete but the stove is damaged, the production process will not take place.

In the deliver process there is one highest risk event with a severity value of 8, namely E38. If consumers are late in paying their bills, it will certainly affect the use of costs for the next production process. The effect could be a delay in production activities.

The risk events E1, E9, E11, E31, E32, E35 and E37 are common risks that are usually experienced by culinary MSMEs [2], [23]. The identified risk events can occur because of a risk source. Risk sources can be identified by referring to risk events. The results obtained from discussions with MSME owners were based on 38 risk events caused by 24 risk sources. Each source of risk is

assessed the level of probability (occurrence) of the occurrence of that risk source. Risk sources and occurrence assessments can be seen in Table A2 (see Appendices).

One risk source can trigger one risk event or even more. The identification results show that two risk sources have an occurrence value of 10, namely A3 and A21 because these risk sources almost certainly occur in Dapur Mama Shanum MSMEs. Next, a correlation is carried out between the risk event and the risk source by providing an assessment. The values given are the result of discussions with business owners using a predetermined scale, namely 0, 1, 3 and 9 to calculate the ARP value. ARP values are used to determine priority risk sources. Three sources of risk will be prioritized from the ARP value. The ranking of ARP values from highest to lowest can be seen in Table A3 (see Appendices).

It is known that the priority risk sources are A5, A12 and A1. The priority source of the first risk is A5 with a probability value of 7, which means the occurrence is quite high. The source of risk A5 can be said to be a speculative risk because if A5 occurs it can provide a profit when the Dapur Mama Shanum UMKM has sufficient stock of raw materials, but it can be a loss when the opposite is true. If this happens to loyal consumers, they will likely switch to competitors. Of course, this is a loss for the MSMEs Dapur Mama Shanum. If the risk source A5 occurs, it can also trigger the risk of events E4, E5, E29 which will have a moderate impact on the performance of Dapur Mama Shanum MSMEs; the E35 risk event which had a high impact on the performance of Dapur Mama Shanum MSMEs; risk events E13, E14, E23, E24 which have a very high impact so that MSMEs Dapur Mama Shanum cannot operate; as well as the E10 risk event which has a serious impact and causes failure on the Dapur Mama Shanum MSMEs which will be preceded by a warning.

The second priority risk source is A12 with a probability value of 7, which means the occurrence is quite high. In accordance with what is experienced by business owners, when they are about to carry out the production process, they run out of supporting materials or other necessities such as cooking oil, LGP, staples, styrofoam, plastic spoons and plastic bags, which is quite a high probability. If the risk source A12 occurs, it can trigger the risk of events E2, E4, E29 which will have a moderate impact on the performance of Dapur Mama Shanum MSMEs. Apart from that, it can also trigger the risk of events E13, E23, E24 which have a very high impact so that the Dapur Mama Shanum MSMEs cannot operate.

Risk source A1, which is the third priority, has a high level of probability. This is because Dapur Mama Shanum only works with small suppliers so the source of risk A1 can trigger the risk of E1 events which have a high impact on the performance of Dapur Mama Shanum MSMEs; risk events E7, E8, E11 which have a very high impact so that MSMEs Dapur Mama Shanum cannot operate; as well as risk events E9, E10 which have a serious impact and cause failure on the Dapur

Mama Shanum MSMEs which will be preceded by a warning.

The results of the priority risk sources of this research are in line with research conducted by Adriant where of the seven priority risk sources in their research there are sources of risk of sudden demand from consumers and limited availability of raw materials from suppliers which is indirectly stated if the party the suppliers, we work with are small suppliers [24]. However, the priority position of risk sources in the research of Adriant and this research is different, namely the risk source of sudden demand from consumers is ranked 7th while in this study it is ranked 1st. For risk sources, the limited availability of raw materials from Suppliers are ranked 3rd as well as in this research. From the three known priority risk sources, appropriate mitigation action (PA) proposals will be provided in HOR phase 2.

#### 3.4. House of Risk phase 2

Mitigation actions for each priority source of risk will be identified and analyzed in HOR phase 2. Identification of mitigation actions is also carried out by discussing with business owners to obtain mitigation actions that are in accordance with the priority sources of risk. It can be seen in Table A4 (see Appendices) that there are eight proposed mitigation actions that can be implemented to address priority risk sources. Each mitigation action is assessed the level of difficulty of its implementation according to a predetermined scale and a value is calculated  $ETD_k$  to determine which mitigation actions need to be prioritized for implementation.

Based on these results, the mitigation actions that can be prioritized for implementation are PA8, PA1 and PA5, respectively. The three priority mitigation actions come from each priority risk source. PA8 is a mitigation action with  $D_k$  a value of 3, which means the mitigation action is easy to implement. By determining appropriate supplier criteria, the raw material needs of Dapur Mama Shanum MSMEs can be met consistently and minimize the risks associated with procuring raw materials [25]. The criteria in question include supplier product capacity, product availability period, supplier service, level of accuracy of order quantity, product price, distance to supplier outlet locations and others.

The second priority is PA1 with  $D_k$  a value of 3, which means mitigation actions are easy to implement. By making minimum order time regulations, the frequency of sudden orders will be minimal or even non-existent. Apart from that, implementing PA1 also has a good impact, namely that business owners can have sufficient time to prepare a complete stock of the required raw materials. Generally, the minimum order time is three days before the event.

The third priority mitigation action is PA5 with  $D_k$  a value of 4, which means that mitigation actions are quite difficult to implement. Implementing PA5 requires personal awareness that recording raw material stock is important for the business. If this awareness has been

formed, it is necessary to be consistent in carrying out PA5. PA5 can be done simply, but if you want to do it using the accounting method for inventory recording, it will take time to learn this. By implementing PA5, you can find out the correct amount of inventory stock so that the business owner will know which inventory is old/new and when is the right time and quantity to purchase raw material inventory. Even though only three mitigation actions are prioritized, this does not mean that other mitigation actions do not need to be implemented. The mitigation actions prepared can be applied to overcome other sources of risk that occur.

PA8 mitigation actions were also proposed in research conducted by Atmajaya's research, however this mitigation action is not a top priority because it is ranked seventh out of 9 proposed mitigation actions [10]. Meanwhile, this research is the priority. Apart from that, PA1 is also a mitigation action proposed in Ulfah's research but is not a priority because it is ranked fifth out of 11 proposed mitigation actions, whereas in this research it is the second priority [26].

#### 4. Conclusions

Based on the results of the research conducted, it can be concluded that there are 38 risk events and 24 risk sources, with 3 priority risk sources: sudden demand from consumers, not regularly checking needs before the production process, and dependence on small suppliers. To address these issues, 8 proposed mitigation actions can be considered by Dapur Mama Shanum MSMEs, with 3 priorities: determining supplier criteria, establishing minimum order regulations for pempek, and maintaining records related to the stock of production raw materials.

The results of this research can serve as a guide for culinary MSMEs, highlighting the importance of implementing risk management to minimize various sources of risk that can cause losses and to ensure business continuity. Suggestions for further research include exploring areas not fully addressed in this study, such as how to effectively implement the recommended mitigation actions. One key area is building awareness among MSME operators about the importance of good risk management.

#### Declaration statement

Syah Firda Lula Hemada: **Conceptualization, Methodology, Project administration, Software , Resources, Formal analysis , Visualization, Investigation , Data curation, Writing - Original Draft , Editing .** Mardiyah Hayati: **Conceptualization, Supervision, Validation, Data curation, Review Funding acquisition.**

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The authors report there are no competing interests to declare.

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#### Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## Appendices

**Table A1.**

Risk event of MSMEs Dapur Mama Shanum

Activity	Risk events	Code	Severity
Planning and controlling inventory of main raw materials and supporting raw materials	Suppliers cannot meet raw material needs	E1	7
	Errors in calculating raw material inventory requirements	E2	6
	The budget planning that will be used is not appropriate	E3	7
Production Planning	There has been a change in plans for the number of products to be produced	E4	6
	Changes to plans during production	E5	6
Payment for purchased raw materials	Error in payment	E6	7
	The availability of raw materials and supporting materials is uncertain	E7	8
	The estimated time for receiving raw materials from suppliers is not on time	E8	8
	There was an increase in the prices of raw materials and supporting materials	E9	9
	Lack of raw materials and supporting materials (out of stock)	E10	9
	The quality of the main raw materials and supporting materials is not good	E11	8
Procurement process	The number of scales for supporting materials is inappropriate/insufficient	E12	8
	Packaging supplies are out of stock	E13	8
	The packaging available in stores is not sufficient for needs	E14	8
	Receiving labels not on time	E15	2
	Fish fillet is not optimal	E16	6
	Injured hand	E17	5
	Mistakes in measuring ingredients	E18	9
	The dough texture is not suitable	E19	7
	The egg filling leaks during the formation of the pempek	E20	5
	The heat of the fire is uneven	E21	5
Production activities	Pempek is charred during the frying process	E22	6
	LPG (Liquified Petroleum Gas) runs out during the frying process	E23	8
	Lack/running out of cooking oil when frying	E24	8
	There are pempek that are missed to be cut	E25	2
	Plastic gravy leaking	E26	3
	There is a condition that has been missed	E27	6
	The packaging (mica) shrinks	E28	3
	Staples are out of stock	E29	6
Production control	The shape of pempek is not uniform	E30	4
	The stove is not functioning properly/damaged	E31	9
Maintain production facilities	Chopper is not working properly/damaged	E32	8
	Digital scales are not accurate	E33	7
Acceptance of orders by Consumers	The number of products does not match demand	E34	7
Delivery of products to consumers	Receiving orders not on time	E35	7
	The plastic gravy broke while traveling	E36	6
Sending bills to consumers	Delivery times change when the pempek is ready to be sent/picked up	E37	5
	Consumers are late paying bills	E38	8

**Table A2.**

Risk agent of MSMEs Dapur Mama Shanum

Risk agent	Code	Occurrence
Depends on small <i>suppliers</i>	A1	7
Don't make a list of shopping needs	A2	6
Have not carried out structured financial records	A3	10
The business owner is sick	A4	3
Sudden demand from consumers	A5	7
Influence of weather/season	A6	7
There is no agreement/contract with the supplier	A7	8
Incorrect payment details	A8	2
Insufficient storage space for materials	A9	6
<i>human error</i>	A10	5
Delay in ordering labels	A11	4
Not regularly checking requirements before carrying out the production process	A12	7
Lack of concentration while working	A13	4
Do not use PPE (Personal Protective Equipment) when working	A14	8
Not careful when weighing	A15	3
Less skilled	A16	3
The plastic packaging material used is not thick enough	A17	4
There was a power outage	A18	2
Lack of maintenance of tools and machines	A19	4
Tools and machines are no longer suitable for use	A20	6
Still using conventional frying pans	A21	10
Too hasty to pack pempek which is still hot	A22	5
There is damage or problems with transportation	A23	4
There is no contract/agreement with consumers	A24	9



**Table A3.**

Rank order and ARP value

Code	Risk agent	Rank	ARP
A1	Depends on small <i>suppliers</i>	3	1,911
A2	Don't make a list of shopping needs	4	1,368
A3	Have not carried out structured financial records	10	870
A4	The business owner is sick	20	201
A5	Sudden demand from consumers	1	2,408
A6	Influence of weather/season	7	1,141
A7	There is no agreement/contract with the supplier	5	1,360
A8	Incorrect payment details	19	206
A9	Insufficient storage space for materials	22	84
A10	<i>human error</i>	11	610
A11	Delay in ordering labels	23	72
A12	Not regularly checking requirements before carrying out the production process	2	2,058
A13	Lack of concentration while working	8	1,132
A14	Do not use PPE (Personal Protective Equipment) when working	17	360
A15	Not careful when weighing	13	498
A16	Less skilled	15	375
A17	The plastic packaging material used is not thick enough	18	356
A18	There was a power outage	24	27
A19	Lack of maintenance of tools and machines	16	369
A20	Tools and machines are no longer suitable for use	9	1,008
A21	Still using conventional frying pan	12	580
A22	Too hasty to pack pempek which is still hot	21	195
A23	There is damage or problems with transportation	14	420
A24	There is no contract/agreement with consumers	6	1,143

**Table A4.**

Preventive Action (PA)

Ai	Mitigation Action	Code	$TE_k$	$D_k$	$ETD_k$	Rank
A5	Create minimum time regulations for ordering pempek	PA1	15,561	3	5,187	2
	Implement appropriate raw material inventory management	PA2	12,805	4	3,201	6
	Forecasting consumer demand	PA3	15,561	5	3,112	7
	Establish good communication with consumers	PA4	5,187	3	1,729	8
A12	Make records related to the stock of production raw materials	PA5	7,499	4	4,759	3
	Schedule time to check inventory regularly	PA6	17,307	4	4,327	4
A1	Search for new <i>suppliers</i>	PA7	16,632	5	3,326	5
	Determine <i>supplier criteria</i>	PA8	16,632	3	5,544	1

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