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RISK ANALYSIS ON MSME TATTI CROCHET USING HOUSE OF RISK

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ABSTRACT: Tatti Crochet is an MSME (Micro, Small, and Medium Enterprise) in Malang City engagedin the handicraft industry. The handicrafts produced are knitted goods, with a specialisation in knitting bags.As an MSME producing handicrafts, Tatti Crochet faces problems in human resources, especially knitters. The number of knitters currently available is three people, and this number cannot support the production needs of Tatti Crochet. This is one of the risks that must be faced not only by MSMEs but also by other organisations and companies. Risk management can be carried out by risk identification, evaluation and measurement, and risk management. One method that can be used to manage risk is the House of Risk. From the risk identification process, Tatti Crochet faced 22 risk events triggered by 29 agents. Based on the calculation of HOR Phase 1, 10 risk agents will enter HOR Phase 2 for determining preventive action, namely A11, A10, A18, A13, A14, A3, A12, A5, A28, and A4. Finally, one preventative measure was soondone with the highest ETD number, PA1, with ETD 1620.

Keywords: House of Risk, Risk Identification, Risk Analysis, Risk Prevention, Risk Management

1. Introduction

Tatti Crochet is an MSME (Micro, Small, and Medium Enterprise) in Malang City engaged in the handicraft industry. The handicrafts producedare knitted goods, with a specialisation in knitting bags. This knitting bag from Tatti Crochet is unique because it is handcrafted and combines synthetic leather. The knitted bag produced by Tatti Crochet is quite in demand by the wider community, so Tatti Crochet often gets orders for collective bags from several companies. In addition, to further introduce his products, Tatti Crochet actively participates in handicraft exhibitions and training held by the Ministry of Trade and associations of handicraft craftsmen.

As an MSME producing handicrafts, Tatti Crochet faces problems in human resources, especially knitters. The number of knitters currently available is three people, and this number cannot support the production needs of Tatti Crochet. Through an interview with the owner of Tatti Crochet, the existing knitters could not complete the number of orders that came in. Also, because of the rush of time, the existing knitwear was not up to standard, so it had to be reworked.

This is one of the risks that must be faced not only by MSMEs but also by other organisations and companies. Even though it is small in scale, MSMEs still have to carry out risk management. Risk can be appropriately managed through risk management. Risk management can be carried out by risk identification, evaluation and measurement, and risk management [1].

One method that can be used to manage risk is the House of Risk. House of Risk, abbreviated as HOR, is one of the methods used to identify, analyse, and mitigate the chances of a company or organisation. HOR is based on the need for risk management that focuses on prevention actions to determine which risk causes are the priority, which will then be given risk mitigation or preventive measures [2].

In this paper, HOR will be used to identify what risks Tatti Crochet faces, what ones dominate, and determine what preventive action is to reduce the dominant threat.

2. Research Methods

Risk is events that probably can harm the company [3]. Risks are fundamental to identify and measure. Risks are unavoidable in the

company, for it is necessary to identify and measure these risks to determine the steps that must be taken to prevent or minimise the emergence of these risks.

Risk management is a series of procedures and methodologies used to identify, measure, monitor, and control risks arising from the company's operational business [3]. Risk management is carried out through several process steps: risk identification, risk evaluation and measurement, and risk management. [1]. Risk identification is carried out to identify any risks faced by an organisation. Risk evaluation and measurement are carried out to understand the risk characteristics well. That way, the bet will be easier to control. After analysis and risk assessment, the next step is to manage risk. Risk management can be done in several ways, such as avoidance, detention, diversification, or transfer to other parties [1].

House of Risk is a risk analysis method that develops the FMEA and QFD models [2]. FMEA is a method used to identify potential failures of a product or service and determine actions to eliminate or minimise these risks. FMEA is widely used in the design of manufacturing processes to assess failure modes and reduce the effects of failures [4]. QFD is a process to determine customer desires and how to implementthem. The framework of QFD is expected to be able to control the risk agents that are a priority so that risk management can run effectively.

House of Risk Phase 1 determines which risk sources are the priority for determining preventive actions. In contrast, House of Risk Phase 2 determines preventive measures that will be carried out by considering existing resources effectively [5]. House of Risk Phase 1 focuses on determining the ARP rating, which consists of 3 factors: occurrence, severity, and correlation. House of Risk Phase 2 focuses on determining the most appropriate step by considering the effectiveness of the resources used and the level of performance of the object or project concerned[6].

3. Results and Discussion

3.1. House of Risk Phase 1

The first step to performing calculations using the House of Risk Phase 1 is identifying risks. The components needed are event risk and risk agent. The risk event will be measured by severity value, while the risk agent occurrence value will be calculated on a scale of 1-5, where one is the lowest and five is the highest.

Table 1 Risk Event Identification

Code	Risk Event	S
E1	Error in determining product concept	2
E2	Error in determining production scale	2
E3	Material calculation error	3
E4	Raw material price fluctuation	2
E5	Selection of raw materials that are not suitable	3
E6	Raw materials received are not up to standard/damaged	3
E7	Raw material components are not available	2
E8	The production process takes longer than planned	4
E9	The knitting process is not perfect	4
E10	The sewing process is not perfect	3
E11	Improper installation of accessories	3
E12	Production target not achieved	3
E13	Damage to the tools/machines used	3
E14	Lack of raw materials	3
E15	The packaging is not up to standard	2
E16	Delay in delivery of packaging packaging	1
E17	There is a product defect	3
E18	Delays in delivery	1
E19	Cancellation of delivery	1
E20	Product returns	1
E21	There is a natural disaster	1
E22	Product piled up	4

In Table 1, it can be seen that 22 risk events were identified, and in Table 2, it can be seen that 29 risk agents were identified. Severity and occurrence values are determined using a scale of 1 to 5, where one is the lowest and five is the highest.

Risk agents or risk triggers can trigger the emergence of risk events. One risk agent can start several risk events at once. Therefore, the number of risk agents is more than the risk events.

Suppose the risk event and agent have been identified along with their severity and occurrence values. In that case, the last step before calculating the House of Risk Phase 1 is to determine the correlation value between the risk event and the risk agent using a number scale of 1, 3, and 9, which shows 1 is a weak correlation value, 3 is a moderate correlation value, and 9 is a high correlation value [2]. The following is the calculation table for the House of Risk Phase 1 based on the rating scale.

Table 2 Risk Agent Identification

Code	Risk Agent	O
A1	Insufficient process of market survey and target market analysis	1
A2	Does not match the estimated amount of raw materials in production	2
A3	There is an impromptu order	4
A4	Different supplier locations	5
A5	Lack of raw material inventory by suppliers	4
A6	Purchasing raw materials from different suppliers	5
A7	Purchase in bulk	4
A8	Error in delivery	3
A9	Insufficient inspection of raw materials	2
A10	Differences in knitting skills of each worker	5
A11	Limited number of workers	5
A12	Remote location of workers	5
A13	There are new workers	3
A14	There is a queue at the tailor	4
A15	Transportation limitations	2
A16	Communication is not smooth	1
A17	Old production tools/machines	1
A18	Inadequate production planning	3
A19	The product inspection process is not thorough, so there are defects in the product	3
A20	Error packaging order entry	3
A21	Ordering packaging in bulk	2
A22	Error in product storage	2
A23	Incomplete delivery identity	1
A24	The shipping address is too far	1
A25	Product delivery in bulk	2
A26	An accident occurred during delivery	1
A27	Unpredictable/extreme weather	1
A28	Lack of marketing/promotion strategy	4
A29	Lack of stock of raw material components	3

ARP calculation in House of Risk Phase 1 is calculated using the severity value of the riskevent, the occurrence value of the risk agent, and the correlation between the risk event and the riskagent. The formula used is as follows:

ARPj= Oj∑ Si Rj

ARP : Aggregate Risk Potentials O: Occurrence
S : Severity
R : Correlation Risk Event and Risk Agent

Below is an example of ARP calculation using the formula above:

ARP1 = O1 ((S1xR1)+(S2xR2))
= 1 ((1x2)+(1x2))
= 1 (2+2)
= 4

Risk Event	Risk Agent																												Severity
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	
E1	1																													2
E2	1																													2
E3		1	3																											3
E4				3		3																								2
E5				1		1																								3
E6							1	1	1																					3
E7				3																										2
E8				3					3	3	9		3	3		3		3											3	4
E9									9	9	3	3				3	1													4
E10														3	3	3	3													3
E11									3				3				3													3
E12			3												3	3	3	3	3										1	3
E13																	3													3
E14																		3												3
E15																				1	1									2
E16																					1									1
E17																						3								3
E18																							1	1	1	1				1
E19																										1				1
E20																				1										1
E21																											1			1
E22																		3										3		4
Occurrence	1	2	4	5	3	5	4	3	2	5	5	5	3	4	2	1	1	3	3	3	2	2	1	1	2	1	1	4	3	
ARP	4	6	72	45	54	45	12	9	42	240	360	60	99	84	36	42	40	126	27	9	6	18	1	1	2	2	1	48	45	
Rank	24	22	6	10	8	10	19	20	13	2	1	7	4	5	16	13	15	3	17	20	22	18	27	27	25	25	27	9	10	

Figure 1 House of Risk Phase 1

3.2 House of Risk Phase 2

House of Risk Phase 2 determines the actions that need to be taken to minimise the impact of risk events. Not all risk agents that have been identified have their preventive measures determined. Based on the House of Risk Phase 1 calculation and discussion with Tatti Crochet, tenrisk agents with the highest ARP values were determined to get their preventive action on House of Risk Phase 2. Ten selected risk agents based on the highest to lowest ARP, namely, A11,A10, A18, A13, A14, A3, A12, A5, A28, and A4.
The following is Table 3, which contains preventive actions from selected risk agents.

The degree of difficulty (D) is determined on a scale of 1-5, where one is the lowest and five is the highest[5]. In the House of Risk Phase 2, there are two calculation steps. The first is calculating the effectiveness value (TEk), obtained by multiplying the correlation between the risk agent and preventive action. The correlation value was determined using a scale of 1, 3, and 9, which shows one is weak, 3 is a moderate correlation value, and 9 is a high correlation value. The formula used is as follows:

TEk = ∑ARPj x Ejk

TE : Total Effectiveness
ARP : Aggregate Risk Potentials
E : Correlation Risk Agent and Preventive Action

Below is the example of total effectiveness calculation using the formula above:

TEK1 = ARP1 x E1
= 360 x 9
= 3240

The second is to calculate the total effectiveness to determine the size of the ratio using the formula:

ETDk = Tek/Dk

ETD : Effectiveness to Difficulty ratio
TE : Total effectiveness
D : Difficulty

Below is the example of total effectiveness calculation using the formula above:

ETD1 =TEK1/D1
=3240/2
=1620

Table 3 Preventive Action

Code	Preventive Action	D
PA1	Recruiting new workers	2
PA2	Conducting training for the surrounding community while increasing the number of workers	2
PA3	Conduct training to equalise skills	3
PA4	Determine skill standards to equalise production	3
PA5	Make a more mature production plan to meet the number of orders and prepare safety stock	4
PA6	Setting skill standards in screening new workers	3
PA7	Increase sewing capacity	2
PA8	Prepare additional tailors if there are more orders than usual	2
PA9	Prepare safety stock for finished products and ready to ship	3
PA10	Implement an open order system to minimise the possibility of impromptu orders	3
PA11	Providing facilities to make it easier for workers to go to work	4
PA12	Looking for other suppliers who have the required raw material components with the same quality	2
PA13	Prepare safety stock of raw material components	3
PA14	Maximising online promotion	3
PA15	Participate in exhibitions and trainings to expand the network	2
PA16	Implement a made-to-order system to attract consumers who want to create products with personal designs	3
PA17	Make a purchase schedule so that raw material components can come at the same time	4

Based on the House of Risk Phase 2 calculation in Figure 2, the preventive action that got the first rank was PA1 Recruiting new workers, with ETD 1620 and a difficulty level of 2, which is relatively easy. The preventive action that got the last position was PA11, Providing facilities to make it easier for workers to go to work, with ETD 15 and a difficulty level of 4, which means it is pretty hard. After a discussion session with Tatti Crochet, PA1 was chosen as the preventive action that can be done soon.

PA1 can reduce A11's Limited number of workers with difficulty level 2, which is relatively easy. BY recruiting new workers, Tatti Crochet can increase production capacity.

Risk Agent	Preventive Action																ARP
	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	PA11	PA12	PA13	PA14	PA15	PA16	PA17	
A11	9	3																360
A10			3	3														240
A18					9													126
A13						3												99
A14							1	3										84
A3									9	1			3					72
A12		3									1							60
A5												3	9					54
A28														9	3	1		48
A4													1				3	45
TEk	3240	1260	720	720	1134	297	84	252	648	72	60	162	747	432	144	48	135	
Dk	2	4	3	3	4	3	2	2	3	3	4	2	3	3	2	3	4	
ETD	1620	315	240	240	283,5	99,0	42	126	216	24	15	81	249	144	72	16	33,75	
Priority	1	2	5	5	3	10	13	9	7	15	17	11	4	8	12	16	14	

Figure 5 House of Risk Phase 2

4. Conclusions

The results showed that Tatti Crochet faced 22 risk events triggered by 29 risk agents. Based on the calculation of HOR Phase 1, 10 risk agents will enter HOR Phase 2 for determining preventive action, namely A11, A10, A18, A13, A14, A3, A12, A5, A28, and A4. Finally, one preventative measure was soon done with the highest ETD number, PA1, with ETD 1620.

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