

# SYNERGY AND COMPETENCY OF LABOR AND MANAGEMENT IN HANDLING DANGEROUS GOODS WITH GAME THEORY APPROACH

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## ABSTRACT

*This study aims to explain the phenomenon of synergy and competency between management and workers in the process of handling explosive goods in the Dahana Marunda Explosives Warehouse at North Jakarta, Indonesia. Game theory is used to explain the differences in competencies between workers and warehouse management who must work hand in hand in handling dangerous goods. Using qualitative research methods, primary data are collected through observation and interview instruments, while secondary data were obtained from documents related to handling explosives which are then analyzed inductively.*

*The results of this study expose: First, handling dangerous goods includes warehouse functions, types of explosives, sending and receiving explosives, as well as the loading, licensing and storage of explosives. Second, labor synergy and warehouse management shows a pattern of group collaboration in which problem solving, decision making, differences in values blend into one cohesiveness. Third, the competency of the labor team and the warehouse management is seen based on the competency criteria and factors that affect competencies that are different but synergize with each other. Fourth, based on the analysis from the perspective of game theory, differences in competencies do not necessarily result in disputes between workers and warehouse management in handling explosives, on the contrary the labor and warehouse teams maintain mutual synergy by prioritizing teamwork, common vision-mission and standard procedures for handling explosives.*

**Keywords:** Competency, Dangerous Goods, Game Theory, Labor, Synergy, Warehouse.

## INTRODUCTION

Competency-based synergy between workers and company management is a phenomenon that continues to experience dynamic developments in major cities such as Jakarta, Bogor, Depok, Tangerang and Bekasi. In the Bekasi area, especially in several Bonded Zone areas, researchers found an indication of a poor synergy or cohesiveness between workers and

companies. This is marked by the many cases of disputes between workers and companies, such as disputes over the disparity between workers' welfare and the orientation of companies that lead to demonstrations and several other cases that need legal settlement in court.

The lack of synergy and cooperation between workers and companies is often indicated by the workers' strike action to demand an increase in welfare. This certainly has the potential to hinder the production process or distribution of goods from warehouses or factories to other storage locations in the supply chain management system. Conflicts like this are of course very detrimental to companies because production targets and quotas for distribution of goods are hampered so that they cost a lot of money. In the end, the company must bear the losses due to the workers' strike who demand to increase their income, such as wages, guarantees and allowances, or work facilities.

Indeed, companies need labor in the production process or distribution of goods in factories or warehouses, but to increase the cost of labor wages, when the performance and motivation are very low, of course it will burden the company. In addition, there are demands to increase health insurance, old age benefits, and various other demands which are of course very burdensome for the company. The first burden will be experienced by the company in the form of a decrease in production capacity as a result of a strike that has the potential to hinder activities for about 1-2 days, while the second burden is an increase in wage costs that the company must pay in the next several months or even years. This phenomenon reflects the lack of synergy between workers and company management due to differences in perceptions.

Research of Sihombing & Firera (2014) by using the Analysis Hierarchy Process (AHP) method, studies the warehouse selection for finished goods that is processed from qualitative and quantitative data to provide options and determine storage costs. The results of study by Barai et al. (2017); Huo et al. (2016); Rifni et al. (2018) indicate that lithium batteries that meet the requirements of the IATA DGR, operator requirements and state regulations can be upgraded to aircraft. Samarina (2016) which aims to suggest what is needed to have a safe warehousing process of dangerous goods, especially explosives. Several other dangerous good studies have previously been carried out by Rizaldy et al. (2020, 2018, 2017) those who discuss Handling Lithium Battery as Passenger or Crew Baggage, also dangerous goods handling management between air and railway transportation. In relation to warehouse management, research by Al Amin et al. (2018) on game theory at Jakarta International Container Terminals (JICT) and Koja container terminals at Tanjung Priok Port, Jakarta; find that with a larger capacity we can aggressively lower rates to attract more demand because it tends to have spare capacity.

Similar studies, regarding the relationship between synergy models with logistics and warehouse, were also carried out by several researchers (Xuan, 2019). The results of the study by Haryadi (2010) conclude that the workforce must have specialization and competency in a specific and certified area. Aigbokhaevbolo (2011), with his research in Nigeria, argues that the game theory model if applied, is beyond doubt; improve problem solving of business decisions in business from developing countries. A game theory approach to cooperative play has been used, adopting the Pareto optimum foundation (Hadi et al., 2015). In the context of warehousing, Sohrabi & Azgomi (2019) developed three strategies for each player and on each game iteration; players try to choose the best strategy for themselves. At the end of the game, the final solution is calculated according to the strategy chosen by the players. As to the Inventory Management in warehousing, Fiestras-Janeiro et al. (2011) provide a review of the applications of cooperative game theory in the management of centralized inventory systems. Besides, we will be

introducing and studying a new model of centralized inventory: a multi-client distribution network.

In the case of warehouse management at the Dahana Explosives Warehouse in the Marunda area, Bekasi, West Java, researchers are trying to explore the phenomenon of synergy and competence between management and workers, whether the handling of explosives, which is special cargo with high safety risks, has been carried out properly, or vice versa, the work situation forces the synergy between workers and employers to run poorly, which can cause losses for many parties.

Some of the objectives in this study are; (1) To know and explain the dangerous goods handling process, (2) To find out and explain the synergy of workers and warehouse management in the dangerous goods handling process, (3) To know and explain the competency of workers and warehouse management in the dangerous goods handling process and (4) To find out and explain the dynamics of synergy and competency in handling Dangerous Goods between workers and management at the Dahana Marunda warehouse with the Game Theory approach.

From the background above, there may be several main problems arising as the objectives of the research in handling dangerous goods between workers and management at Dahana Marunda Warehouse, they are; (1) The process of handling dangerous goods, (2) Synergy between Workers and Warehouse Management in handling dangerous goods, (3) the difference of Competency between Workers and Warehouse Management in handling dangerous goods, and (4) Dynamics of Synergy and Competence between Workers and Warehouse Management in handling Dangerous goods with Game Theory Approach.

## METHODOLOGY

This research uses qualitative methods which are practically used to analyze or interpret a phenomenon by focusing on the point of view of the subject being studied (intersubjective meaning) through direct interaction (John, 2010). Data were collected primarily through observation and in-depth interviews, and secondary through documentation and collection of audio-visual material (John, 2010). The data that have been collected were analyzed using the inductive analysis method, which is the data processing by building concepts and descriptions that are combined and interpreted into themes, categorizations or typologies according to the phenomena that occur and theoretical explanations (Merriam, 2009).

The population that became the unit of analysis (research subjects) in this study consisted of two categories, namely: (1) daily labor, and (2) Dahana Marunda warehouse management. First, the Labor in the Dahana Warehouse consists of a group of 12 workers. Based on the results of observations and short interviews with workers, the majority of workers live in the vicinity of the warehouse area, which generally consists of migrants from Java who immigrated to Jakarta. The sample is divided into two categories, namely the labor and the management groups. The labor sample were the labors who had worked as laborers for more than five years at the Dahana warehouse, either as foremen or group members. Meanwhile, the management members who become samples were those who have more than five years work experience, have roles as stake holders or stock holders, and have positions related to warehousing activities, operations and distribution of goods at the Dahana Marunda Warehouse.

## RESULTS AND DISCUSSION

### Game Theory Analysis Against Synergy and Competency Between Labor and Warehouse Management in Handling Dangerous Goods

Game theory as an analysis tool is an explanation of decision making in both a cooperative (conductive) and non-cooperative (conflict) atmosphere. This theory is used to find resources that can increase cooperation and reduce conflict in decision making for the common interest. In handling explosives, this theory explains the phenomenon of competency-based synergy between the labor and warehouse teams at the Dahana Marunda warehouse. Game Theory elements include: (1) Number of decision makers; (2) Payoff (gains and losses between players); and (3) The strategy used between players. Skills-based decision making from the leader as the decision maker must have an explosives training certification.

The payoff between players is related to the concept of competence, namely motivation. The advantage for the labor and warehouse teams is that they will get high wages and bonuses if the handling of explosives is completed properly. On the other hand, if the handling gets into a trouble or problem, it can result in delays in the loading/unloading process at the warehouse so that it is detrimental to many parties, such as labor and warehouse teams, freight forwarding parties, trucking parties, shipping parties, and all related parties. The strategy used is a practical application of the concept of competence, namely motivation in handling explosives, that is how to earn more wages as a family income, even though the job has a level of risk. Therefore, their strategy is to maintain the safety, security and quality of explosives during the handling process in accordance with standard handling procedures.

Game theory analysis explains the difference in competency between workers and warehouse management in handling explosives, the synergy of labor and warehouse management in handling explosives does not reduce group synergy, but on the contrary, differences in competence between each group complement each other's shortcomings so that the effectiveness of group collaboration becomes better. In synergy, labor and warehouse management differ in terms of knowledge, work position and income based on competence. These differences in competence are minimized to keep in synergy through: (1) self-handling of conflicts; (2) method of deliberation in deciding cases; (3) work briefings in order to maintain a common understanding of work instructions and evaluation and maintain cohesiveness between members.

Apart from that, the labor and warehouse teams also have limited options because they are limited by: (1) the operational system of the Dahana Warehouse; (2) Indonesian Police Headquarters regulations regarding explosives; and (3) technical regulations for warehouse heads and workers at the Dahana Marunda warehouse. From the perspective of game theory, differences in competence do not necessarily result in disputes between workers and warehouse management, but on the contrary, teams maintain synergy by prioritizing teamwork, common vision and mission and standard procedures for handling explosives.

Based on the explanation of the synergy and competence of workers and warehouse management in handling explosives, game theory analysis can be understood using a pure strategy model (pure strategy game) can be seen in the following matrix (Table 1).

**Table 1**  
**GAME THEORY ANALYSIS OF PURE STRATEGY MODEL OF SYNERGY AND COMPETENCE BETWEEN LABOR AND WAREHOUSE MANAGEMENT**

		Warehouse Management (Player B)		
		Synergy Strategy and Low Competence (S1)	Medium Synergy and Competency Strategy (S2)	Synergy Strategy and High Competence (S3)
Laborer (Player A)	Synergy Strategy and Low Competence (S1)	1	9	2
	Synergy Strategy and High Competence (S2)	8	5	4

In pure strategy, the optimal strategy for each player, namely labor and warehouse management, is to use a single strategy. Through the application of the maximin criterion and the minimax criterion the value achieved must be the maximum of the row minimum and the minimum of the column minimax, which is known as the saddle point. From this matrix, it can be understood that workers and warehouse management have the same product, namely handling dangerous goods. Both of them try to get benefits, namely high wages as work motivation in handling activities in the warehouse. To maximize these results, workers use 2 strategies and warehouse management uses 3 different strategies. From this explanation, the maximin and minimax rules are applied that for new players (laborers), the smallest value for each row is the value 1 for the smallest row one and the value 4 for the smallest row two. Of the two values, the best or greatest value is 4 (Table 2).

**Table 2**  
**ANALYSIS OF GAME THEORY MAXIMIN PURE STRATEGY MODEL OF SYNERGY AND COMPETENCE BETWEEN LABOR AND WAREHOUSE MANAGEMENT**

		Warehouse Management (Player B)			
		Synergy Strategy and Low Competence (S1)	Medium Synergy and Competency Strategy (S2)	Synergy Strategy and High Competence (S3)	Maximum
Laborer (Player A)	Synergy Strategy and Low Competence (S1)	1	9	2	→1
	Synergy Strategy and High Competence (S2)	8	5	4	→4

For column players (warehouse management), the largest value is chosen for each column so that column one has the largest value is 8, while column two has the largest value is 9, and column three has the largest value is 4. Of the three values, the smallest value for warehouse management is 4 (least loss) (Table 2).

From this explanation, it can be seen that the choices of line-laborers and column-management-warehouse players find common ground, namely each choosing a value of 4. In other words, synergy and competence in handling dangerous goods can be said to be optimal and effective because value has been found. the same saddle point (Table 3). The effective result, where each player chooses a value of 4 means that workers want a large profit, but will only get a maximum profit of 4 when using a synergy and strong competency strategy (S2). Meanwhile, warehouse management (player B), although it wants big profits and small losses, the best loss is 4 too, and can be obtained by responding to the strategies used by workers by also implementing

synergy and Strong Competency Strategies (S3). Thus, game theory is used to explain the process of conflict between labor and management in the Dahana Marunda warehouse, in the social domain of logistics management, specifically to explain: (1) Players or decision makers, consisting of labor groups and management groups, (2) Game strategy, which is a strategy used in competitive situations involving two or more interests, and (3) Payoff or payment that must be paid by opponents to other opponents for every decision taken.

<b>Table 3</b>					
<b>ANALYSIS OF GAME THEORY MAXIMIN-MINIMAX PURE STRATEGY MODEL OF SYNERGY AND COMPETENCE BETWEEN LABOR AND WAREHOUSE MANAGEMENT</b>					
		<b>Warehouse Management (Player B)</b>			
		<b>Synergy Strategy and Low Competence (S1)</b>	<b>Medium Synergy and Competency Strategy (S2)</b>	<b>Synergy Strategy and High Competence (S3)</b>	<b>Maximum</b>
<b>Laborer (Player A)</b>	Synergy Strategy and Low Competence (S1)	1	9	2	→1
	Synergy Strategy and High Competence (S2)	8	5	4	→4
Minimum	→	8	9	4	

This research is in line with previous research by Muhardi (2011) that in game theory there are several basic elements including: (1) The number of competitive decision makers, (2) Another element in game classification is pay off, (3) Strategy used by players in games. There are several literature reviews from previous research that are related and relevant to the problems studied in this study regarding industrial relations between labor and management. Based on the results of the payoff matrix in game theory, which is in line with this research, optimal strategies are found for industry and the environment in directing energy policies (Aplak & Sogut, 2013). This research also supports another previous study by Kalinsky et al. (2018), that in order to ensure a stable position in the market, companies need to improve their approach related to strategic management, in particular to develop a strategy for providing resources using economic mechanisms that are made in a sustainable manner. This study is in accordance with the results of previous research conducted by Yang et al. (2019 & 2021) which uses a cooperative game theory approach known as the Cournot Game. In particular regarding the handling of dangerous goods in warehouse management, Jiang's research has provided clues on how to reduce the number of accidents in handling these goods by implementing strict rules (Jiang, 2020). Through game theory, management can reduce the amount of inspection fees, and for employees who are caught violating the rules, management can provide fines according to the prevailing rules.

## CONCLUSION

In handling explosives, synergy amid differences in competency is very important to maintain the timeliness of loading and unloading explosives in the warehouse, creating a conducive atmosphere that supports prudence and accuracy in handling, and maintaining safety, work safety, and good condition of goods and ready for use in accordance with the handling procedures for handling explosives. The results of this study explain that the effectiveness of handling explosives between workers and warehouse management can be assessed as effective as seen from the synergy in the form of group cooperation, work cohesiveness, and the same vision

and mission even though there are contrasting competencies between labor and warehouse management.

Thus, the phenomenon of synergy and competency from the perspective of game theory explains that the differences in complex competencies and the risks of handling explosives do not result in disputes (conflicts) between labor and warehouse management, but they have high synergy seen from teamwork, vision and understanding mission, as well as putting aside personal egos for one motivation, namely earning a living by handling explosives in a procedural, professional and effective manner, while still paying attention to work safety and security, as well as maintaining the quantity and quality. From the analysis using the maximin and minimax matrices it can be seen that synergy and competence in handling dangerous goods can be said to be optimal and effective because the same saddle point has been found.

Based on research results and research conclusions, suggestions that can be given to related parties are as follows: (1) It is recommended to PT. Dahana to maintain synergy (cooperation and cohesiveness) of the warehouse team and Dahana Marunda workers by providing training on explosives not only to staff and warehouse heads, but also to workers and head of labor. (2) It is recommended that Freight Forwarding be better and more timely in managing customs, police, shipping, and port permit documents. (3) It is recommended that the Trucking Company (expedition) be on time during the arrival hours of the car, improve the safety of drivers and equipment, and not rush in transporting/delivering explosives from the loading process until arriving at the destination.

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