The factor analysis of obstacles in energy consumption reduction using reverse logistics of Tier 1 auto-parts industry in Thailand

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Abstract

The purpose of this study was to analyze the factors that became obstacles in using reverse logistics to reduce energy consumption of Tier 1 auto-parts industry in Thailand. Purposive random sampling was used to select the 335 samples from workers of Tier 1 auto-parts industry. The research instrument was a 5-point rating scale questionnaire. The data were analyzed by a statistical analysis software program for percentage, mean, standard deviation, and factor analysis. The results showed that the most important obstacle was the relationship between workers and their organization, the second was the organization structure, and the third was the organization's atmosphere. From factor analysis, it was found that there were seven factors or obstacles that obstructed the use of reverse logistics to reduce energy reduction of Tier 1 auto-parts industry in Thailand. Those obstacles included; 1) organizational climate and relationship in organizations; 2) organizational structure and management; 3) workers' efficiency; 4) organizational culture; 5) workers' devotion; 6) technology and data communication for operation; and 7) employee attachment.

Keywords: *Reverse logistics, Tier 1, auto-part industry, energy consumption, factor analysis, Thailand*

1. Introduction

One expected change that would happen to Thailand after joining the ASEAN Economic Community (AEC) in 2015 is that Thailand being located in the center will become an ASEAN hub for various activities such as tourism and airline. Thus, Thailand has opportunities to become a distribution center and a center of medical and public health management further supporting the growth in tourism industry. Thailand also has a strength point on transportation, especially land transportation because roads are provided all over the country. The other strength point is the industries that mainly rely on labor force, especially the industries owned by Japanese such as auto-parts industry and electronic industry [1]. That means, now and in the future, Thailand still needs to consume large amount of energy. Table 1 demonstrates the information of energy consumption of economic sectors.

Table 1: Share of Energy Saving by of Economics Sectors in 2030

Economic Sectors	Technical Potential			Specified Target (ktoe)	Share (%)
	Heat (ktoe)	Electricity (GWh)	Total (ktoe)		
Transportation	16,250	-	16,250	13,400	44.7
Industry	10,950	33,500	13,790	11,300	37.7
Commercial building and residential					
- Large commercial building	410	27,420	2,740	2,300	7.6
- Small commercial building and residential	1,690	23,220	3,670	3,000	10.0
Total	29,300	84,140	36,450	30,000	100.0

As shown in Table 1 [2], Ministry of Energy identified that industrial sectors were the second largest energy consumers while transportation sectors were the first. Thus, the Ministry of Energy has determined the target for industrial sectors to take measures for effective use of energy, especially for the automotive industry as they have a large number of connecting production lines and are one of the large industries in Thailand. Figure 1 below demonstrates the graph of Thailand automotive sales in the past along with the future forecasts.

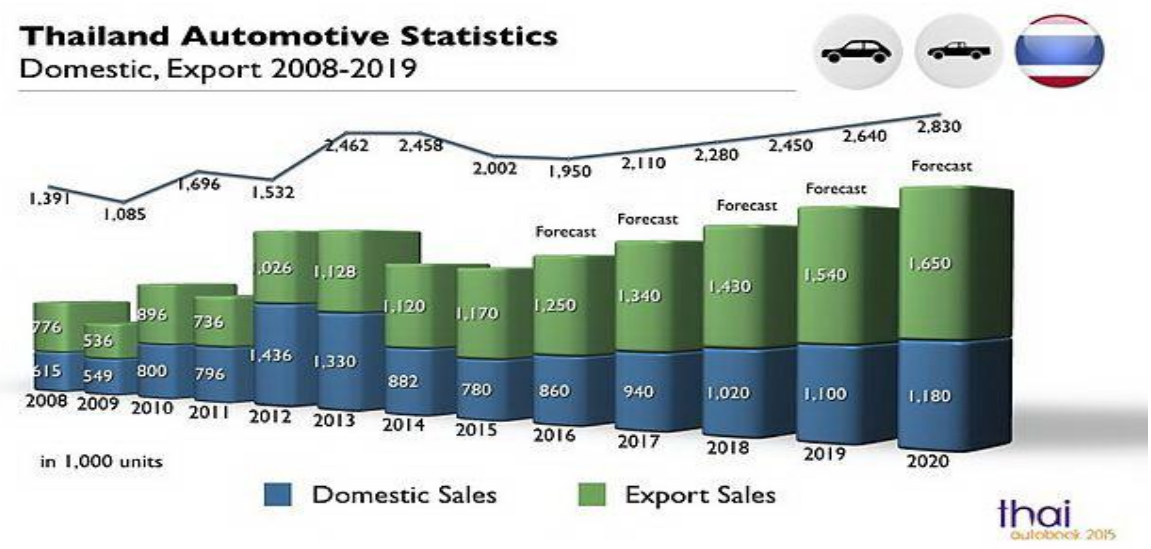

Figure 1 Thailand Automotive Sales 2008-2020 [3]

From the graph it can be seen that, the automotive industry has grown continuously in both domestic sales and export sales. For the future from 2016 to 2020, it has been expected that the sales would be higher. Some private automotive enterprises such as Toyota expected that

in 2017, the total automotive production of Thailand would increase up to 50% or to 3,000,000 units as they had planned for production expansion. Since 2015, three automotive manufacturers had been built and increased production power up to 500,000 units per year including Ford, Suzuki, and Mitsubishi. Ford mainly produced sedan cars while Suzuki and Mitsubishi aimed to produce economy cars. Table 2 [4] demonstrates the numbers of auto-parts enterprises in Thailand.

Table 2: Numbers of auto-parts enterprises in Thailand

	Numbers of Enterprises			**Numbers of Employees**
Enterprises	Motorcycle enterprises -7 companies -7 manufacturers		Sedan and truck enterprises -19 companies -19 manufacturers	Automotive enterprises -50,000 Dealers and Service centers - 2000,000
Tier 1 auto-parts manufacturers	Auto-parts manufacturers -396 companies	Motorcycle parts and Auto-parts Manufacturers -122 companies	Motorcycle parts manufacturers -201 companies	Auto-parts manufactures -350,000 Support industries
Tier 2 & 3 auto-parts manufacturers	Small and medium auto-parts manufacturers -1,100 companies			-100,000

In Table 2, manufacturers were divided into two groups including Tier 1 and Tier 2 & 3 according to the size of the companies. The size of Tier 1 manufacturers was larger than Tier 2 & 3 and generally had higher production potential than Tier 2 & 3 due to their tools, office supplies, and high technology machines. With the large number of production, the large amount of energy would be consumed. That means they would spent high cost for the energy consumption. Therefore, it would be better for them if they could have effective management in energy consumption which would help them to reduce the use of energy as well as reduce the production cost. Consequently, in this study, the researchers had decided to study the energy consumption of Tier 1 manufacturers, especially auto-parts manufacturers since they were one of the main enterprises of Thailand.

In order to control the production cost of an enterprise or an organization, the energy consumption control would be one important key as mentioned. One way to control the energy consumption is to have effective management on logistics activities. In fact, logistics management is an effective tool for organization management because it purposes to reduce cost and satisfy customers. One of logistics management activities that is important to current business management is reverse logistics. A process does not always end at completely delivering products to customers' hands. Reverse logistics is the next process that supply chains have begun to pay more and more attention as some products may be returned to their stores, manufacturers, or suppliers. Those products may not be sold or less popular in one place, but suitable for other places. Some of them may be damaged or wrongly delivered. It could also involve environment and consumers' safety issues that causes the return of a product.

If the auto-parts enterprises intend to reduce the energy consumption, they would need to begin with the management of reverse logistics. To make effective management of reverse logistics, the first step they need to do is to figure out factors that affect the work of reverse logistics. Therefore, the researchers decided to investigate those factors affecting reverse logistics and mainly focusing on factors that were obstacles to reduce the energy consumption of Tier 1 auto-parts enterprises. The objective of this research is to study the factors that were obstacles to reverse logistics on reducing of energy consumption of Tier 1 auto-parts industry in Thailand.

2. Literature review

Dowlatshahi [5] determined that reverse logistics had two main purposes that were to maintain environment and to increase profits. From Smith's study [6], it was found that the convenience of product return, in case of product being unsatisfactory or of size improper, was one of primary factors affecting consumers' decision making to order more products. Moreover, reverse logistics also helped building companies' reputation on environment concern that conformed to Corporate Social Responsibility (CSR). Rogers and Tibben-Lembke [7] stated that the cost of reverse logistics was 4% of the cost of logistics. In 2013, GDP of Thailand was 11,898,710 million baht [8]. The cost of logistics was 2,260.754.9 million baht including 90,430.196 million baht of the cost of reverse logistics. If a company could decrease the cost from this part, it would increase profits and reduce the amount of energy import as well as reduce the release of carbon dioxide from manufacturers and delivery vehicles.

Hawks [9] explained that reverse logistics was the process that moved goods from the final destination to capture the goods' values or put them in the proper disposal including remanufacturing and refurbishing activities. The process was started when the goods were returned due to damage, excess or seasonal inventory, restock, etc. Reverse logistics involved with reusing, recycling, and redesigning containers or packaging materials which could be able to help a company to use less material, reduce energy and pollution emerged from transportation. Reverse logistics could be used to various industries such as software industry, technology industry, or retail industry.

Moe and Jin [10] did case studies on using the reverse logistics in the automotive industry. The results showed that reverse logistics could help companies to control cost of products, improve return goods circulation, gain customers' trust, reduce amount of material use for containers and packaging, save raw materials as well as contribute to sustainable development and environmental protection. However, the companies mentioned that reverse logistics system still needed improvement. Besides, the companies also needed more human resources who could be able to handle the process effectively; otherwise, it might probably cause some delays leading to customers' dissatisfaction. Another problem was the lack of information about reverse logistics system and networks, thus, some automotive companies did not pay attention to the system. In fact, the benefits of reverse logistics could not be seen in a short-term.

Tepprasit and Yuwanont [11] studied the impacts of logistics management on reverse logistics in electronics industry. Researchers focused on five elements including product design and choice of materials, transportation and movement, manufacturing, packaging, and communication. The results revealed that logistics management had effects on the effectiveness of reverse logistic. It affected on both outcome of revers logistic and each element of reverse logistics.

Ramerez and Morales [12] studied the effect of reverse logistics on flexibility of information distribution and organizational performance. They found that the proactive attitude toward reverse logistics could increase the importance of reverse logistics which could increase the importance of flexibility of information distribution. Then, finally, they could improve organizational performance.

It seems that reverse logistics is a good process that could provide various benefits to a company as mentioned. However, some problems also exist from the use of reverse logistics. Companies need to find out what could cause a problem to the use of reverse logistics in their company. The companies should start with the organization management as a basis that could support the use of revers logistics in their organization so that they could see more clearly for the direction they need to go first. Therefore, in this study, the researcher had decided to use the Steer's organizational effectiveness as the research framework.

From Steer's organizational effectiveness, he [13] indicated that there were six main organizational factors that affected the effective management of an organization. The six factors included organizational structures, technology, organizational culture, organizational climate, employee attachment, and scholar. Many researches were conducted on organizational effectiveness based on Steer's organizational effectiveness model. For example, Robbins [14], Hall [15], and Owens [16] agreed that organizational structure was one important factor for organization management. Scott [17], Hodge and Anthony [18], and Rothwell and Kazanas [19] supported that technology was another factor that affected the organization management. Chung and Megginson [20], Schwartz and Davis [21], and Cherrington [22] confirmed that organizational climate affected the organization management. Therefore, it would be able to consider Steer's organizational effectiveness model as an effective tool for organizational management.

3. Research methodology

A. Participants

The population of this study was workers from Tier 1 auto-parts companies in the industrial estates of Bangkok, Samut Prakarn, and Eastern Thailand areas. To ensure that the samples could be able to represent the Thailand auto-parts industry, the sample size was calculated based on Yamane's Formula [23]. The result came up with 370 workers from the whole workers' population. Purposive random sampling was used to select the samples from workers of Tier 1 auto-parts manufacturers in the three different main areas. 400 sets of questionnaire were distributed in different manufacturers and the total of 335 sets were returned (around 83.75% of all).

B. Research instrument

This research was a survey research using a 5-point Likert scales questionnaire including three parts. The first part focused on general information of participants. The second part, as a main part, aimed at the obstacles of using reverse logistics to reduce energy consumption of Tier 1 auto-parts manufacturers in Thailand. The last part was an open-ended question for participants to comment and give suggestion.

The instrument was validated by three experts and revised before using with the main study. After revision, the main part of the questionnaire consisted of 23 items of organization structure, 9 items of tools, 15 items of organizational culture, 21 items of organization atmosphere, 13 items of employee engagement, and 15 items of specializing.

The instrument was tried out with 30 employees that had similar characteristic with the main sampling group. Then to measure the instrument's reliability, Cronbach's alpha

coefficient was used to calculate the internal consistency. The alpha coefficient for the items of the questions was 0.95 depicting high internal consistency.

C. Data collection and data analysis

The questionnaire was distributed to 400 participants. When the questionnaires were returned, only 335 were completed and usable. Then the data were analyzed using an instant program for descriptive analysis and factor analysis.

4. Research findings

From the data analysis, the results were the following:
In order to gain more insight on obstacles of using reverse logistics to reduce energy consumption of Tier 1 auto-parts manufacturers, the basic information of participants was needed to analyze first.

Table 3: General information of participants

Participants' Characteristic		Total No. of Participants	%
Genders	Males	163	48.7
	Females	172	51.3
Education	Lower than Bachelor's Degree	165	49.3
	Bachelor's Degree	145	43.3
	Higher than Bachelor's Degree	25	7.5
Years of Experiences	Less than 5-10 years	108	32.2
	5 – 10 years	134	40.0
	11 years and above	93	27.8
Position	Executives	33	9.9
	Operators	233	69.9
	Supporters	69	20.6
Numbers of Employees	Not more than 50	7	2.1
	51-200	54	16.1
	201 or more	275	81.8
Investors	Thai only	44	13.1
	Thai and Foreigners	292	86.9

Table 3 demonstrates the general information of all participants as well as their companies' basic information. The data shows that most participants have education lower than bachelor's degree. Most of them are the main operators and have worked for 5-10 years. The participants are working in organizations that have at least 200 employees and most of them are Thai - Japanese joint ventures.

Table 4 demonstrates the descriptive analysis of obstacles of reducing energy consumption by using reverse logistics for Tier 1 auto-parts manufacturers in Thailand.

Table 4: Mean and standard deviation of obstacles of using reverse logistics to reduce energy consumption

Obstacles	N	Mean	Std. Deviation
Organizational Structure	336	3.9139	.60962
Technology	336	3.8095	.60793
Organizational Culture	336	3.7827	.64447
Organizational Climate	336	3.8601	.67454
Employee Attachment	336	4.1845	.62160
Scholar	336	3.8304	.61651

The results in Table 4 show that the three most important obstacles are employee attachment (4.1845), organizational structure (3.9139), and organizational climate (3.8601) respectively.

The data were also analyzed with factor analysis for obstacles of using reverse logistic to reduce energy consumption. First, Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were used to analyze the appropriateness of data for factor analysis. The result showed that KMO of data valued 0.955 which was greater than 0.5. Also, Bartlett's test of sphericity showed that the result from the data rejected H_0. It meant that all variables were from population with equal variances. Therefore, the data were appropriated with factor analysis.

Furthermore, the relationships among participants' general information and obstacles were analyzed. The result showed that the values of correlation coefficient were between 0.0032 – 0.072. It could be interpreted that the associations between participants' general information and obstacles were very low.

Principal component analysis was used for factor extraction and to find Eigen values, variance, and the sum of cumulative variance. The result revealed 7 obstacles that contained the Eigen values higher than 1.00 and the sum of cumulative variance was 52.091%. The result is presented in Table 5.

Table 5: Numbers of factors, eigen values, variance, and cumulative variance

Obstacles	**Eigen Value**	**% of Variance**	**% of Cumulative Variance**
1	13.491	14.201	14.201
2	9.857	10.376	24.578
3	7.217	7.597	32.174
4	5.941	6.254	38.428
5	5.823	6.130	44.558
6	4.494	4.731	49.288
7	2.663	2.803	52.091

Moreover, to make the interpretation more reliable, the orthogonal rotation was used with Varimax method to find an association between obstacles and variables. Kline [24] stated that when conducting the factor analysis, one main concern was factor loadings of variables. He explained that the factor loadings of greater than 0.60 were considered as high while the loading of greater than 0.30 were considered as moderately high. Then other loadings that were lower than 0.30 could be ignored which meant they did not have any effects on the factors. Therefore, from the analysis, the result of this study revealed seven obstacles consisted of variables with factor loadings of more than 0.30. It could be interpreted that variables with factor loading of greater than 0.30 would affect the use of reverse logistics in energy consumption reduction. Table 6 – Table 12 demonstrate each obstacle and its variables.

Table 6: Obstacle 1: Organizational climate and relationship in organization

Item No.	Variables	Factor Loading
4.10	The relationship between personnel in all levels is good.	.705
4.19	Executives give an opportunity to all employees to be involved with decision making based on accurate information	.684
4.20	Executives create stimulated atmosphere to challenge employees.	.682
4.13	Work environment promotes good atmosphere for employees who have different personality.	.681
4.15	Organizations show an employee's works or best works to other employees.	.673
4.9	Executives accept employees' decision making on their own works.	.666
4.11	Work environment promotes a good atmosphere in working.	.660
4.8	Organizations create an atmosphere that stimulates employees to be aware of their own responsibility.	.651
4.12	Work environment promotes an atmosphere that is appropriated with employees' different needs.	.651
4.14	Organizations give honor or reward employees who have well perform.	.646
4.4	Employees have freedom to be creative in work pre-forming, not only stick with the traditional ways.	.644
4.16	All employees give respect to each other.	.634
4.2	Rules and regulations are associated with present situations and be able to follow.	.624
4.5	The top-down communication is used in the organization.	.622
3.15	Organizations provide knowledge transfer to employees in order to shape up a new paradigm to be ready for upcoming changes.	.620
4.3	Employees perform well with full potential in order to complete their work.	.611
4.18	Executives accept their employees' potential.	.601
4.6	The bottom-up communication is used in the organization.	.599
3.14	Regulations can respond to important changes such as budgets or humans resource.	.592
4.7	Employees have confidence in their executives.	.579
4.1	Working is flow because organizations are flexible and reasonable with the use of rules and regulations.	.553
3.13	Organizations provides activities that allow employees to present their ideas and the ways to perform their work that can go along with organizations' strategies	.487
3.11	Action plans are unofficially announced to employees in order to reach the organizations' goals.	.453
5.1	Employees are unity.	.439
	Eigen value =13.491, % of Variance =14.201	

Table 6 presents obstacle 1, organizational climate and relationship in organization. It includes 24 variables. The factor loading is between .439 - .705 with the Eigen value at 13.491. The highest factor loading is item no. 4.10, "The relationship between personnel in all levels is good" (.705).

Table 7: Obstacle 2: Organizational structure and management

Item No.	Variables	Factor Loading
1.3	Departments are divided regarding the numbers of employees.	.669
1.5	The chain of command creates convenient contact in working.	.663
1.6	The chain of command creates flow communication for working.	.641
1.19	Organizations give supports to employees in training.	.636
1.4	Departments or working teams are divided based on the operation in order to complete the mission.	.630
1.20	Organizations give supports to employees to develop different skills.	.608
1.2	Organization structure contributes to work in cross-functional teams.	.590
1.12	Employees are placed in a position that is appropriated to their skills.	.574
1.14	Employees' jobs and responsibilities are clearly specified and written.	.573
1.16	Rules and regulations are seriously followed.	.555
1.18	There is a supporting system that helps with coordinating in the organization.	.550
1.15	Job Description is flexible.	.540
1.17	A job rotation system is implemented.	.533
1.10	There is no overlap in working processes.	.525
1.1	Organizations are flexible and able to adjust themselves to all changes.	.519
1.7	Different departments and working teams can coordinate with each other quickly.	.519
1.8	Organizational structures contribute to flow coordinate between different departments or working teams.	.510
1.13	The management of operators accords with supporters.	.454
1.22	Each project manager has his/her own power to manage the project budget.	.335
	Eigen value =9.857, % of Variance =10.376	

Table 7 demonstrates obstacle 2, organizational structure and management, including 19 variables. The factor loading is between .335 - .669 with the Eigen value at 9.857. The

highest factor loading is the item no. 1.3, “Departments are divided regarding the numbers of employees” (.669).

Table 8: Obstacle 3: Workers’ efficiency

Item No.	Variables	Factor Loading
6.12	You are farsighted and capable of seeing the trends of your organization that can be used to determine working directions of your organization appropriately.	.662
6.6	You always follow the current situations of your country.	.654
6.13	You are farsighted and capable of seeing the trends of your organization that can be used to adjust to working directions of your organization appropriately.	.647
6.11	You have helped support other employees to train and learn new knowledge for working development	.643
6.5	Your usually search in different sources for new information that is useful for your work.	.625
6.10	You are a part of your organization that helps stimulate other employees to create new and different working styles.	.617
6.7	You can solve a problem in any situation.	.612
6.8	You can adopt new management technology such as TQM, BSC, or KM into your own organization continuously.	.600
6.9	You can adopt new management technology such as TQM, BSC, or KM into your own organization effectively.	.599
6.4	You are interested in all kinds of news.	.593
6.1	You are a person who always seeks for new knowledge to improve your own work.	.518
6.3	You solve a problem with integrated methods.	.490
6.15	You can explain your concept better than tell your final decision when your works are criticized.	.440
6.2	You are a moral person.	.416
	Eigen value =7.217, % of Variance =7.597	

Table 8 demonstrates obstacle 3, workers’ efficiency, containing 14variables. The factor loading is between .416 - .662 with the Eigen value at 7.217. The highest factor loading is the item no. 6.12,“You are farsighted and capable of seeing the trends of your organization that can be used to determine working directions of your organization appropriately” (.662).

Table 9: Obstacle 4: Organizational culture

Item No.	Variables	Factor Loading
3.2	Organizations build the atmosphere that allows employees to be involved with the goal setting.	.683
3.4	Organizations give opportunities to employees to be involved with the goal setting.	.651
3.3	Organizations give opportunities to employees to be involved with vision setting.	.643
3.1	Organizations create an atmosphere that allows employees to be involved with vision setting.	.635
3.5	A commitment is created together with employees in order to pursue the organization's goal and vision.	.553
3.11	Action plans are unofficially distributed to the entire organizations in order to complete the goal.	.464
3.8	Organizations promote team working and emphasize on getting employees involved with evaluation.	.462
3.10	Organizations give support in employees' behavior check regularly, especially for morality.	.460
3.6	Organizations promote team working and emphasize on brainstorming.	.416
3.9	Employees' goal is associated with organizations' goal.	.388
	Eigen value =5.941, % of Variance =6.254	

Table 9 demonstrates obstacle 3, organizational culture, which consists of 10 variables. The factor loading is between .388 - .683 with the Eigen value at 5.941. The highest factor loading is the item no.3.2 "Organizations build the atmosphere that allows employees to be involved with the goal setting" (.683).

Table 10: Obstacle 5: Workers' devotion

Item No.	Variables	Factor Loading
5.10	You are willing to devote your intelligence to the organization.	.810
5.9	You are willing to devote our strength to the organization.	.781
5.8	Your work responsibility is important for your organization's goal.	.721
5.11	Personnel work for the success of their organization more than their own success.	.720
5.7	You have devoted yourself to complete the work's goal.	.626
5.13	Personnel accept the limitation of their organizations and do not decrease their intention.	.516
5.6	You accept your organization's vision and goal.	.511
	Eigen value =5.823, % of Variance =6.130	

Table 10 demonstrates obstacle 5, workers' devotion, including 7 variables. The factor loading is between .551 - .810 with the Eigen value at 5.832. The highest factor loading is the item no. 5.10, "You are willing to devote your intelligence to the organization" (.810).

Table 11: Obstacle 6: Technology and data communication for operation

Item No.	Variables	Factor Loading
2.9	Organizations provide enough budgets to improve technology.	.611
2.2	Technology is used to help internal coordination flow.	.606
2.4	Software is used appropriately with work's objectives.	.569
2.3	Technology is used for quick and easy communication in the organizations.	.562
2.1	Different kinds of technology are used to complete the organizations' mission.	.534
2.7	Modern technology is used to design an operation process appropriately.	.520
2.8	Technology is appropriately used to connect information from the outside quickly and conveniently.	.494
2.5	Tools and office supplies are enough for all employees	.469
1.21	Organizations distribute adequate amount of power of decision making in operation in order to reach the goal.	.390
	Eigen value =4.494, % of Variance =4.731	

Table 11 demonstrates obstacle 6, technology and data communication for operation, including 9 variables. The factor loading is between .390 - .661with the Eigen value at 4.494. The highest factor loading is the item no. 2.9, "Organizations provide enough budgets to improve technology" (.66d1).

Table 12: Obstacle 7: Employee attachment

Item No.	Variables	Factor Loading
5.2	You are feeling that you are an important part of your organization.	.638
5.3	You are proud of your organization.	.622
5.4	You are ready to protect your organization's reputation.	.616
	Eigen value =2.663, % of Variance =2.803	

Table 12 demonstrates obstacle 7, employee attachment, containing 3 variables. The factor loading is between.616 - .638 with the Eigen value at 2.663. The highest factor loading is the item no. 5.2, "You are feeling that you are an important part of your organization" (.638).

5. Conclusion

The result of the study revealed that the most important obstacle of using reverse logistics to reduce energy consumption was the relationship between employees and their organizations. The second was organizational structure, and the third important one was organizational atmosphere.

When analyzed with the factor analysis, the obstacles to reduce energy consumption by using reverse logistics turned to be seven obstacles. The obstacle that had highest factor loading was the organizational climate and relationship in the organization. Each variable of the first obstacle was analyzed. It was found that creating a positive relationship between personnel in all levels was the most concerning factor. Moreover, executives should give an opportunity to employees in decision making based on accurate information. Organizational climate should be one key to stimulate challenging work. Working environment should promote a positive atmosphere for team works and daily working. Employees should have freedom in creating their working style by not holding on only a traditional style. Besides, the unity between all personnel was important.

The obstacle 2 was the organizational structure and management. The main factor was the appropriateness of dividing departments or teams based on the numbers of employees. That mean in a department or a team, the organization should place an adequate number of personnel to work in that particular department or team. The next factor was the chain of command that could contribute to employees to be able to coordinate easily. Organizations should support employees' training to develop themselves in different skills. Job description should be clear and in a written form. Moreover, job rotation should be flexible and managed systematically.

Obstacle 3 was workers' efficiency. The main factor was the employees themselves. They needed to be a person who was farsighted and able to predict the trend of their own organization. Then they could be able to determine their working direction that could go along well with the change of the organization. They should be a person who was eager to learn and brought their new knowledge to improve their work as well as took a part to help stimulate others to be creative in their working style. Furthermore, they should be able to deal with all problems and be able to use new management technology effectively with their work. The last important factor was the employee should be a moral person.

The obstacle 4 was the organizational culture. The main factor was culture participation. Employees concerned with if they could be able to participate in some decision making. Therefore, organizations should give them an opportunity to set goals, work in teams, and brainstorm. It would help employees to have their own goal to accomplish their work that was associated with the organizations' goals.

The obstacle 5 was the workers' devotion. The main factors were employees devoted themselves both from brain power and physical strength to take responsibility in their work. Besides, they accepted in limitation and visions or goals of their organizations in all cases.

The obstacle 6 was technology and data communication for operation. The main factor was the sufficient budgets. Budgets were the key to improve technology to be up-to-date all the time as well as to provide enough numbers of technology devices to the employees. Modern and adequate numbers of technology devices could help in coordination and communication both inside and outside organizations. It would help the organizations to easily accomplish in their works. Sharma, Panda, Mahapatra, and Sahu [25] stated that information and technology systems were a key that support reverse logistics in many stages. They were necessary in completing the product life cycle.

The obstacle 7 was employee attachment. The main factor was that employees felt that they were a part of an important organization. They were proud to work with their organization and delighted to protect their organization's reputation.

Finally, this research mainly focused on the workers' view as they were the main operators of the organization. The results would reveal some important information for a policy person or an owner to help with the organizational management. The result would reflect some problems and needs from their own workers and find a right solution, especially when they needed their workers to support them with the energy consumption reductions.

6. Suggestions

In order to use the reverse logistics effectively, organizations could not choose to deal with only one obstacle at a time. They need to handle all obstacles simultaneously because some of them may relate to one another. However, organizations need to pay more attention on the factors and variables that have more effect on operation, and then they could later handle the less ones.

For the future research, to gain more insight on the obstacle of using reverse logistics, a study could examine the relationship between each variable in the same factor if they would be related to each other, especially the ones that have the closed value of factor loading. Moreover, a study could be conducted on different industries or on different sample groups like policy person or owners of the organization.

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