

Cost Reduction as Applied by Furukawa Automotive System in Lima Technology Center

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Abstract: The study determined the assessment on the cost reduction as applied by Furukawa Automotive System in LIMA Technology Center, Philippines. It aimed to meet the following objectives: determine the profile of the respondents and the profile of management; to assess the extent in the cost reduction scheme applied by the company in relation with the following; defect, overproduction, waiting, non-utilized resources, transportation, inventory, motion and excess processing. The study made use of descriptive- survey method. The researchers considered 60 members of the management of Furukawa Company as the respondents. There was no sampling design used in this research because the researchers choose the total population. The researchers used of a self-constructed questionnaire and used the following tools to treat the data statistically: frequency and percentage, weighted mean and analysis of variance and T- test. The study revealed that the company had average monthly income, five years in the operation, below and average monthly savings percentage. And majority of the respondents were 28-43 years of age, most were female, had a position of senior supervisor and three years in a business service. The study also revealed that the cost reduction was highly applied. However, the respondents profile had no significant difference with the extent of cost reduction scheme used. The study also found out that the length of service has significant difference with the extent of cost reduction scheme used. The researchers recommended that the management should continue using the techniques of Toyota's DOWNTIME or eight hidden wastes to successfully achieve the company's goals.

Keywords: Cost reduction, automotive system, DOWNTIME, eight hidden wastes.

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Introduction

Business is the life blood of every economy. It is important in every individual because one of its purposes is to help and give sustainable value for stakeholders. Through the presence of manufacturing company, it can help the economy to explore new product and new technology. The development of manufacturing industry to this day still depends on research into manufacturing processes and the development of new products and materials. This ability to manufacture products has a huge bearing on the wealth and the prosperity of a country. Through this business, it can help the country finance programs and public expenses.

However, companies often place more emphasis on cutting cost. Usually the major problem is cutting cost because it can quickly decrease returns plus it has a complete and total limit of reducing manufacturing cost.

It gives attention to the company to apply cost reduction which is used by reducing expenses to increase profit such as energy conservation, manpower, raw materials, and even the water conservation. The company must know how to handle or control their capital and manage their resources. They need to eliminate too much cost to ensure profit. Cost reduction assumes that the product and services will retain their essential characteristics and quality. Thus it must be genuine and permanent saving in costs of production, distribution and selling by the elimination of wasteful and non-essential activities and by applying methods and techniques.

In Toyota Production System (TPS) there are eight hidden or sources of waste coming from Lean Manufacturing which are the defects, overproduction, waiting, non-utilized resources, transportation, inventory, motion, and extra processing which are commonly known as DOWNTIME. Elimination of this waste is difficult process because it requires effort and determination and even the transition is hard but it will earn reward. The reward of this is to make the transition worth the effort to change. It is used by manufacturing company to know the possible problems encountered. By checking this hidden waste, it can help the company to detect or identify what they need to reduce and to avoid overstocking of products. DOWNTIME has many uses to the manufacturing company. Although there are many types of lean methodology on the market, each with its own particular slant about how to go about the process, they all incorporate the tools and technique founded in the Toyota Production System. Thus the issue clearly understands how the company can reduce cost.

Theoretical Framework

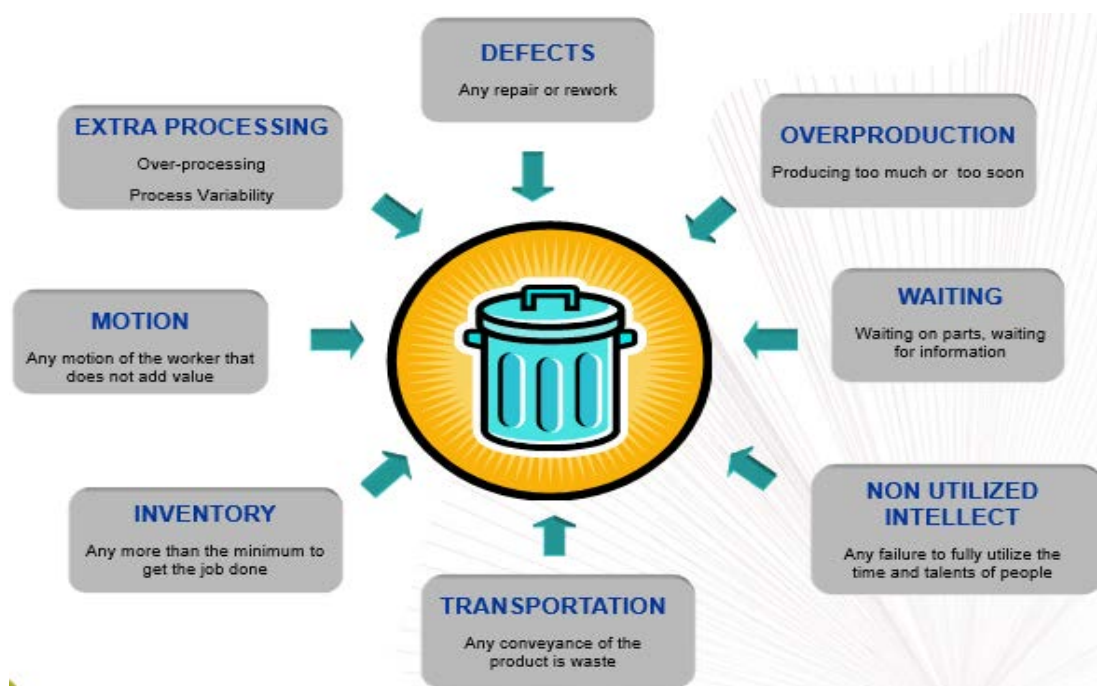


Figure 1. Toyota Production System

Conceptual Framework

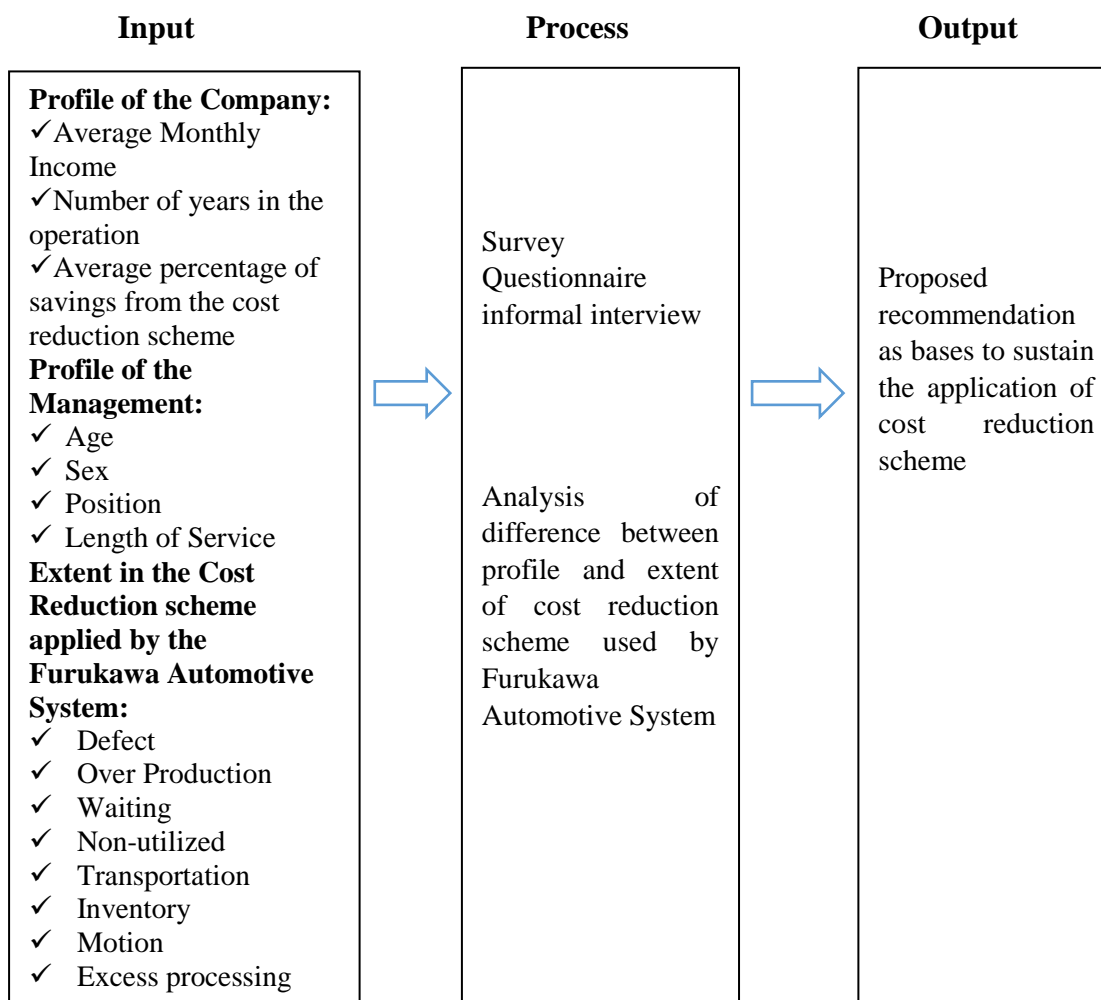


Figure 2. Research Paradigm

Materials and Methods

The researchers of this study used the descriptive type of research in order to determine the cost reduction as applied by Furukawa Automotive System. The survey questionnaire was used by the researchers as their data gathering instrument to secure the needed information. Descriptive research describes current events and that the research questions or problems raised are based on the appreciation of present phenomena, events or states of affairs. The purpose of the descriptive method is to describe “what is”. It deals with the prevailing conditions of object, people, and events. He also stated that the descriptive method is usually used by graduate and undergraduate student in attempt to analyze, interpret and report the present status of their subject matter or problem (Ariola, 2006).

This research method used by the researchers because the researchers believed that it was the most appropriate method to use and helpful tool in gathering data with realistic result in order to determine or describe the cost reduction as applied by Furukawa Automotive System in LIMA, Technology Center. As to respondents of the study, sixty (60) members of top management of Furukawa Automotive System in LIMA, Technology Center, Philippines were chosen. The top management was chosen because they had enough knowledge about the cost reduction as applied by their company. The researchers used the survey questionnaire as

a chief gathering tool to determine and analyze the practices that were used by the Furukawa Automotive System in maintaining their production. There was no sampling design used in this research because the researchers chose the total population of the top management of Furukawa Automotive System in LIMA, Technology Center.

For the instrumentation and measurement, in conducting of the study, the researcher used of a self-constructed questionnaire to determine and as guide of the study. A questionnaire is an instrument or tool used in research for obtaining necessary data needed in the study by the researcher. In constructing questionnaire, the researcher made their own statements of questions and also the comment of the expert and thesis adviser were considered in making the questionnaires.

The researchers made a self-constructed questionnaire which composed of two parts. First part contains of profile of the company such as average monthly income, number of years in the operation, and average percentage of savings from the cost reduction scheme, and profile of the Top Management such as age, sex, position and length of service. And the second parts include the cost reduction scheme applied by the company in relation with defect, over production, waiting, non- utilized, transportation, inventory, motion, and excess processing. Not only questionnaire was used by the researcher as tool to gathered data, also were consider the interview and survey to gathered more necessary data and information to the respondents.

The respondents were asked to rate each item in the self- constructed questionnaire with four Likert's (4) point rating scale which provided a verbal interpretation as presented below. Furthermore, to determine the cost reduction as applied by Furukawa Automotive system in LIMA, Technology Center, the following mean range and their verbal interpretation were used to interpret the weighted mean and composite mean result:

Numerical Rating Value	Mean Range	Verbal Interpretation
4	3.25- 4.00	Strongly Agree / Highly Applied
3	2.50- 3.24	Agree / Applied
2	1.75- 2.49	Disagree /Unapplied
1	1.00- 1.74	Strongly Disagree / Highly Unapplied

In order to conduct the study, the researchers constructed the needed questionnaire based on the data and information they had gathered from various sources. The self-constructed questionnaire was checked and validated by respective authorities, research experts, statistician, and experts in the field. The researchers created necessary request letter to secure necessary data needed from the Furukawa Automotive System in LIMA Technology Center.

The data and information gathered from the questionnaire, interview and survey were presented in a tabulated form. The statistical treatments were used to measure the gathered data quantitatively: Frequency and Percentage. The frequency and percentage was used in this method to find out the distribution of respondents according to their profile; Weighted Mean. It was used to measure the Cost Reduction as applied by Furukawa Automotive System in LIMA, Technology Center; and Analysis of variance (ANOVA) and T-test these were used to determine the significant difference between the assessments of the respondents on the extent of cost reduction when grouped according to their profile. A t-test's statistical significance indicates whether or not the difference between two groups' averages most likely reflects a "real" difference in the population from which the groups were sampled.

Results and Discussion

This section presents data that had been gathered from the respondents through the use of survey questionnaire. The tables presented below are the data collected by the researchers from their respondents.

Profile of the Respondents

The succeeding tables present the profile of the Furukawa Automotive System in Lima, Technology Center that was grouped according to their average monthly income, number of years in the operation and average percentage of savings from the cost reduction scheme.

Average Monthly Income: The profile of the Furukawa Automotive System in terms of average monthly income was determined and interpreted using the frequency and percentage. Table 1 presents the frequency distribution of the Furukawa Automotive System according to average monthly income.

Table 1. Profile of the Furukawa in terms of Average Monthly Income

Average Monthly Income	Frequency	Percentage
Below Php 70,000,000	0	0%
Php 70,000,001-140,000,000	0	0%
Php 140,000,001- Php210,000,000	0	0%
Php 210,000,001- Php 280,000,000	0	0%
Php 280,000,001 - Php 350,000,00	60	100%
Php 350,000,001 and above	0	0%
Total	60	100%

Based on the result of the survey the average monthly income distribution of Furukawa Automotive System is ranges from Php 280, 000,001- Php 350,000,000 with the percentage of 100 and frequency of 60. This means that the Furukawa Company have a high average monthly income maybe because the respondents applied the cost reduction techniques to generate higher income and most specially to minimize expenses. The results were based on the actual year 2014 given by the Furukawa Automotive System.

Number of years in the operation: It refers to how many years that the business has operated. The profile of the Furukawa Automotive System in terms of number of years in the operation was determined and interpreted using the frequency and percentage. Table 2 presents the frequency distribution of the Furukawa Automotive System according to number of years in the operation.

Table 2. Profile of the Furukawa in terms of Number of years in the operation

Number of years in the operation	Frequency	Percentage
5 years and below	60	100%
6-10 years	0	0%
11-15 years	0	0%
15 years and above	0	0%
Total	60	100%

Based on the result of survey the number of years in the operation of Furukawa Automotive System was five (5) years and below with the percentage of 100 and frequency of 60. Through this, the researchers stated that the Furukawa Automotive System which is located

in Lima Technology Center was newly established. According to Galvin *et al.*, (2004), the number of years of operating business should be largely considered in determining the degree of stability. Length of time of operations is just an implication of the effectiveness of management and application strategies of the business. However, short years in operations denote newly engaged establishment in the field of business.

Average percentage of savings from the cost reduction scheme: The profile of the Furukawa Automotive System in terms of average percentage of savings from the cost reduction scheme was determined and interpreted using the frequency and percentage. Table 3 presents the frequency distribution of the Furukawa Automotive System according to average percentage of savings from the cost reduction scheme.

Table 3. Profile of the Furukawa in terms of Average percentage of savings from the cost reduction scheme

Average Monthly Savings	Frequency	Percentage
below Php 10,000	0	0%
Php 10,001 -Php 50,000	0	0%
Php 50,001 - Php 100,000	0	0%
Php 100,001- Php 150,000	60	100%
Php 150,001 - Php 200,000	0	0%
Php 200,001 and above	0	0%
Total	60	100%

Based on the result of survey, with regards to average percentage of savings from the cost reduction scheme distribution, result shows that Furukawa Automotive System averages monthly savings ranges from PhP150,000 and below or 1,800,000 on a yearly basis with percentage of 100 and having a frequency of 60. The result implies that the Furukawa Company has a good practice in cost reduction, due to the fact that the Furukawa Company had save their cost and they control their expenses. By this the researchers said that the cost reduction is so important in managing the business because it helps to have a continuous flow of the business. As cited by Chakraborty *et al.*, (2004) that cost reduction results in more profit for a company. It makes the company more stable, increases its share value, improves investment opportunities, and facilitates collection of capital.

Top Management

The succeeding tables present the profile of the top management that was grouped according to their age, sex, position and length of service.

Age: The profile of the respondents in terms of age was determined and interpreted using the frequency and percentage. Table 4 presents the frequency distribution of respondents according to age.

Table 4. Profile of the Respondents in terms of Age

Age	Frequency	Percentage
18-27	17	28%
28-43	38	63%
44-61	5	8%
61 and above	0	0%
Total	60	100%

As shown in the table, majority of the respondents belonged to the age bracket of 28-43, having a percentage of 63 and frequency of 38. The second highest number of respondents belonged to the age bracket of 18-27, having a percentage of 28 and frequency of 17. Lastly, the least number of respondents belonged to the age bracket of 44-61, having a percentage of 8 and frequency of 5.

By the result, it can be deduced that majority of the respondents in Furukawa Automotive System were in 28-43 years old which belong to generation X. Due to the fact that the respondents are having a good physical strength, patience, and willingness to perform their task and also by achieving their desires and they interested on what they are doing.

Sex: It is also frequently asserted that individual differences may be attributed in sex. The profile of the respondents in terms of sex was determined and interpreted using the frequency and percentage. Table 5 shows the frequency and distribution of the respondents according to sex.

Table 5. Profile of the Respondents in terms of Sex

Sex	Frequency	Percentage
Male	17	28%
Female	43	72%
Total	255	100%

As shown in the table the profile of respondents in terms of sex, majority of them are females having a percentage of 72 and frequency of 43. While males have the least number, having a percentage of 28 and frequency of 17.

It was due to the fact that majority of top management in Furukawa Automotive System were female. It maybe because more industries tend to give the opportunity of work and job to the female employees since they are more capable of doing their very best in every job that they make and they have the charm in every organization needs.

It could be associated in the concept of Chira *et al.*, (2008) stating that females tended to be more confident in their ability to perform better in work. As cited by Conner (2010), women tend to be intuitive global thinkers than men. Female are also more likely to believe that they have to try harder to prove themselves in the organization.

Position: The profile of the respondents in terms of position was determined and interpreted using the frequency and percentage. Table 6 presents the frequency distribution of the respondents according to position.

Table 6. Profile of the Respondents in terms of Position

Position	Frequency	Percentage
Supervisor	13	22%
Senior Supervisor	25	42%
Assistance Group Manager	7	12%
Group Manager	10	17%
Sr. Group Manager	2	3%
Sr. Deputy Department Manager	3	5%
Total	60	100%

As shown in the table, majority of the respondents belonged to the senior supervisor having a percentage of 42 and frequency of 25. The second highest number of respondents is supervisor having a percentage of 22 and frequency of 13. The third highest number of respondents is group manager having a percentage of 17 and frequency of 10. The fourth highest number of respondents is assistance group manager having a percentage of 12 and frequency of 7. The fifth highest number of respondents is senior deputy department manager having a percentage of 5 and frequency of 3. The lastly the least number of respondents is sr. group manager having a percentage of 3 and frequency of 2.

It was due to the fact that the majority in the position were senior supervisor with frequency of 25 and percentage of 42, this implies that the respondents who are senior supervisor are having more capabilities in monitoring the low level of employee regarding to their works.

Senior supervisor often works closely with employees to maintain production standard and improve the productivity of the company. Senior supervisors in businesses and industries are responsible for making important company decisions and overseeing other workers. They are highly skilled and driven professionals who ensure the productivity of employees. A person who wants to become a senior supervisor is usually required to gain several years of experience in entry level or management positions. <http://www.wisegeek.com>.

Length of Service: The profile of the respondents in terms of length of service was determined and interpreted using the frequency and percentage. Table 7 presents the frequency distribution of the respondents according to length of service.

Table 7. Profile of the Respondents in terms of Length of Service

Length of Service	Frequency	Percentage
1 year and below	2	3%
2 years	23	38%
3 years	35	58%
4 years	0	0%
Total	60	100%

As presented in the table, majority of the respondents belonged to the group of 3 years, having a percentage of 58 and frequency of 35. The second highest number of respondents belonged to the group of 2 years, having a percentage of 38 and frequency of 23. Lastly, the least number of respondents belonged to the group of 1 year and above, having a percentage of 3 and frequency of 2. Since the Furukawa Automotive System in Lima Technology Centre is a newly established, majority of the respondents in length of service falls on 3 years.

The length of service, according to Faller *et al.*, (2012), refers to the duration of working experience of the employee. Also, it refers to the duration of service or employment. Often used to indicate how long an employee has worked at the company or an individual has belonged to the organization. It refers to the period of service rendered by the employees to the organization.

Cost Reduction as applied by Furukawa Automotive System

The succeeding tables present the data gathered through the questionnaire accomplished by the respondents. The data presented herein concern on the cost reduction as applied by Furukawa Automotive System according to defect, overproduction, waiting, non-utilized resources, transportation, inventory, motion and excess processing.

Defect: Require rework cost and possible lost sales due to customer dissatisfaction. Table 8 presents the cost reduction as applied by Furukawa Automotive System according to defect.

Table 8. Cost Reduction as applied by Furukawa Automotive System According to Defect

To reduce cost by eliminating/minimizing DEFECTS, employees:	Weighted Mean	Interpretation
1. ensure that my output adhere to the quality standard set by the company	3.67	Strongly Agree
2. check if there is defective material during the production.	3.35	Strongly Agree
3. provide a checklist in every process of production.	3.45	Strongly Agree
4. check if there is a missing process in the production area.	3.55	Strongly Agree
5. ensure that the finish product undergo to the quality control.	3.58	Strongly Agree
Composite Mean	3.52	Highly Applied

It can be gleaned from the table that when it comes to defect the statement “ensure that my output adhere to the quality standard set by the company” had the highest weighted mean of 3.67 and interpretation of strongly agree. This implies that the respondents do the quality standard so that they can avoid defect waste and avoid customer’s complaint. Due to the fact that defects can be made as an additional cost.

As cited by Meredith (2013), a defect is a parts that must be reworked, or in more extreme cases scrapped, represents the final category of waste. Having to perform rework requires repeating steps that were already performed while scrapping parts results in extra materials and process charges with no corresponding output to offset these charges. It was followed by the statement of “ensure that the finish product undergo to the quality control” that obtained a weighted mean of 5.58 with interpretation of strongly agree. This implies that the respondents ensure that the finished product undergo to the quality control to immediately detect the defect and also to avoid the customer complaint that incurred an additional cost. According to Finch (2008), product defect waste results from products that do not meet customer specifications for quality. Defective products create costs by wasting inventory, labor and capacity on product that cannot be sold.

However, the statement “check if there is defective material during production” has a lowest weighted mean of 3.35 and interpretation of strongly agree. It maybe because during the production, sometimes they cannot fully check the defective material, they need to check it to avoid higher cost, also when there is a defective products it cause double process of products which incur additional cost. According to Finch (2008), rework of defective part increases the processing time associated with their production, lengthening lead time and increasing the level of inventory in the system, all contributing to higher cost and lower profitability. Generally, assessment of respondents with regard to defect has a composite mean of 3.52 with a verbal interpretation of highly applied. This means that they control or minimize the defect on their production.

Overproduction: Any production exceeding specific customer orders is a waste, because it uses materials and other resources, which then incur storage costs and are subject to

obsolescence. Table 9 presents the cost reduction as applied by Furukawa Automotive System according to overproduction.

Table 9. Cost Reduction as applied by Furukawa Automotive System According to Overproduction

To reduce cost brought by OVERPRODUCTION, employees:	Weighted Mean	Interpretation
1. provide high volume of products with purchase order to lessen the time in producing another product.	3.50	Strongly Agree
2. check if there are buffer stocks that can be used in case of shortage.	3.47	Strongly Agree
3. ensure that materials purchased are required and needed	3.50	Strongly Agree
4. closely monitor and tally the actual output vs. plan or target quantity	3.53	Strongly Agree
5. always check the inventory report and production output regularly	3..62	Strongly Agree
Composite Mean	3.52	Highly Applied

It can be gleaned from the table that when it comes to overproduction the statement “always check the inventory report and production output regularly” has a highest weighted mean of 3.62 and interpretation of strongly agree. This implies that the respondents check the inventory report so that they know what materials are more needed for the production.

According to Hunt (2011) in manufacturing, overproduction waste is about making more product than is needed or making more than is needed in a particular timeframe. It was followed by statement of “closely monitor and tally the actual output vs. plan or target quantity” with weighted mean of 3.53 and interpretation of strongly agree. This implies that the respondents ensure the monitoring and tallying to have a good result founded to the actual output that the company should meet the customer needs and also in the plan and target quantity the company should enhance the company management.

Overproduction means creating more of an output than is needed at a particular point in time. Producing more than needed creates the need for additional space to store the surplus requires purchasing more raw materials than were needed, and often has a detrimental effects on profit margins as the surplus may need to be disposed of at distressed prices (Meredith, 2013).

However, the statement “check if there are buffer stocks that can be used in case of shortage” has a lowest weighted mean of 3.47 and verbal interpretation of strongly agree. This implies that the respondents merely check the buffer stock to be used in case of shortage because they stick that their stocks are enough to comply it on the times when it is needed. According to Wilson (2010), buffer stock is the incremental volume of inventory above the cycle stocks, inventory volume, which is held to external causes. Generally, assessment of respondents with regard to overproduction has a composite mean of 3.52 with a verbal interpretation of highly applied.

Waiting: It is any movement of machine that does not add value to the products or service. Table 10 presents the cost reduction as applied by Furukawa Automotive System according to waiting.

Table 10. Cost Reduction as applied by Furukawa Automotive System According to Waiting

To reduce cost and minimize the WAITING, employees:	Weighted Mean	Interpretation
1. balance workload during the production.	3.77	Strongly Agree
2. follow the facility layout carefully.	3.52	Strongly Agree
3. check the machine set-up time to produce good quality	3.57	Strongly Agree
4. ensure that the machine to be used is in good condition to avoid downtime.	3.58	Strongly Agree
5. check the machine if it is in good condition to avoid waiting.	3.65	Strongly Agree
Composite Mean	3.62	Highly Applied

It can be gleaned from the table that when it comes to waiting the statement “balance workload during the production” has a highest weighted mean of 3.77 and interpretation of strongly agree. It means that the respondents should implement their operation and would balance to minimize the waiting of other product that they produce to the customers. According to Bragg, (2010) any time when a machine or its operator is waiting is considered a waste of that resource. Waiting can be caused by unbalanced workloads, overstaffing, materials shortages, and so forth. And it was followed by statement of “check the machine if it is in good condition to avoid waiting” has a weighted mean of 3.65 and interpretation of strongly agree. Another analysis made by the respondent, this conclude that before the operation of the worker in the production area, they check or verify if the equipment or machine are properly working that they used in providing the customers need. And the operation will continue on time. Analyze this type of waste with care; throughput analysis holds that only waiting at the bottleneck operation is truly a form of waste (Bragg, 2010).

However, the statement “following the facility layout carefully” has a lowest weighted mean of 3.52 and interpretation of strongly agree. This implies that the respondents merely know their facility layout in the production because they are only focus on the one area. Because according to Bragg, (2010) waiting can be caused by unbalanced workloads, overstaffing, materials shortages, and so forth. They should become aware on the facility to avoid waste of time. Generally, assessment of respondents with regard to waiting has a composite mean of 3.62 with a verbal interpretation of highly applied.

Non-Utilized Resources: It is the effort that adds no value to product or service from the customer viewpoint. Table 11 presents the cost reduction as applied by Furukawa Automotive System according to Non-utilized resources.

Table 11. Cost Reduction as applied by Furukawa Automotive System According to Non-Utilized Resources

To reduce cost and minimize the NON-UTILIZED RESOURCES, employees:	Weighted Mean	Interpretation
1. conduct training and orientation during idle time in the production process	3.60	Strongly Agree
2. ensure that the approvals of the customer needs are already understood.	3.48	Strongly Agree
3. check if the process to be used are	3.55	Strongly Agree

controlled		
4. ensure that the suggestions of the employees are done to improve profitability of the company	3.55	Strongly Agree
5. personally seek for approvals in company's production process.	3.67	Strongly Agree
Composite Mean	3.57	Highly Applied

It can be gleaned from the table that when it comes to non-utilized resources the statement “personally seek for approvals in company's production process” has the highest weighted mean of 3.67 and interpretation of strongly agree. Based on the analysis, the respondents need an approval to their company before they operate their production. Because of this, they can avoid possible problems that they can encounter during the operation. And it is followed by statement of “conduct training and orientation during idle time in the production process” has a weighted mean of 3.60 and interpretation of strongly agree. In this analysis, the respondents should have a proper training and orientation before they performing the actual work in the production it can gained them a better knowledge for their worked. According to Hunt (2011) this particular form of waste is sometimes referred to as an additional waste but its potential to drain value from processes is incredible. Waste from non-utilized resources typically refers to a failure to utilize the full potential of people in a team or organization, but it can also refer to the failure to use any sort of resource effectively—whether the resource is tangible or intangible, human or non-human.

However, the statement “ensure that the approvals of the customer needs are already understood” has a lowest weighted mean of 3.48 and verbal interpretation of strongly agree. It means that the respondent slightly does not meet the customer need which is their basic principle to provide products and services. Also, it is possible that the customer and respondents are having misunderstanding that becomes the reason why they can compel it. (Hunt, 2011) stated that waste from non-utilized resources typically refers to a failure to utilize the full potential of people in a team or organization.

Generally, assessment of respondents with regard to non-utilized resources are all strongly agreed with a composite mean of 3.57 and has a verbal interpretation of highly applied. This means that the company is utilized their resources well and resources are in good way of how it used.

Transportation: This is the waste of moving parts around. Table 12 presents the cost reduction as applied by Furukawa Automotive System according to transportation.

Table 12. Cost Reduction as applied by Furukawa Automotive System According to Transportation

To reduce cost and minimize the TRANSPORTATION, employees:	Weighted Mean	Interpretation
1. ensure that the products are delivered on time.	3.62	Strongly Agree
2. select the suppliers that are near to our company.	3.60	Strongly Agree
3. ensure the completeness of materials moved between another company.	3.58	Strongly Agree

4. stored materials short distances from where they are to be used.	3.65	Strongly Agree
5. ensure that there are multiple temporary storage area	3.60	Strongly Agree
Composite Mean	3.61	Highly Applied

It can be gleaned from the table that when it comes to transportation the statement “stored materials short distances from where they are to be used.” has a highest weighted mean of 3.65 and interpretation of strongly agree. This implies that the respondents should store their materials in a near distance from the place where they will use it. It also helps to reduce time and easy to get the materials needed for the production.

According to Hunt (2011) in the supply chain, transportation waste results when routes are not optimized and cargo must travel further, travel over a longer period of time, or otherwise must be handled excessively. This type of waste might result from poorly designed processes but it can also result from ineffectively located warehouses, suppliers or other stopping points in the supply chain. And it was followed by statement of “select the suppliers that are near to our company.” This means that respondents choose or select the suppliers that are closer to the company location also, for them to get the materials that used in the production as early as possible and eliminate too much cost. According to Finch (2008), transportation waste can also results from decision leading to ineffective location of suppliers or warehouse. Long distance transportation can add a tremendous amount of time to cash to cash cycle and create high levels of inventory in the system by adding a substantial and continuous pipeline inventory. And the statement “ensure that there is multiple temporary storage area” has a weighted mean of 3.60 and interpretation of strongly agree. This implies that the respondents provide or create more storage area for their products to become easy and ready to deliver in their customer. It was supported by Hunt (2011), which states that any additional miles added to shipping routes result in additional costs, which quickly add up, especially when wasteful solutions are utilized over a longer term. Less obvious costs have the potential to leach value from shipping solutions as well because transportation waste can lead to a need for greater levels of safety stock and pipeline inventories especially as the distance between the product’s source and destination increases.

However, the statement “completeness of materials when being moved from one location to another” has a lowest weighted mean of 3.58 and interpretation of strongly agree. This means that the respondents merely check the materials that they need to deliver and become the reason why they are returning again to their location and adds to the cost incurred by the company. According to Hunt (2011) it can also result from ineffectively located warehouses, suppliers or other stopping points in the supply chain. The negative effects of transportation waste clearly include increased costs. Any additional miles added to shipping routes result in additional costs, which quickly add up, especially when wasteful solutions are utilized over a longer term, especially as the distance between the product’s source and destination increases.

Generally, the assessments of the respondents in terms of transportation are all strongly agreed and it has a composite mean of 3.61 with a verbal interpretation of highly applied.

Inventory: It is any supply that is in excess, any form of batch processing producing more than customer demand. Table 13 presents the cost reduction as applied by Furukawa Automotive System according to inventory.

Table 13. Cost Reduction as applied by Furukawa Automotive System According to Inventory

To reduce cost and minimize the INVENTORY, employees:	Weighted Mean	Interpretation
1. provide buffer stock of products with high demand.	3.65	Strongly Agree
2. eliminate too much stocks of products that are not always needed.	3.42	Strongly Agree
3. minimize the number of days of inventory.	3.62	Strongly Agree
4. ensure on-time recording and updating of records	3.67	Strongly Agree
5. assure that the result of our inventories are reliable and recorded.	3.70	Strongly Agree
Composite Mean	3.61	Highly Applied

It can be gleaned from the table that when it comes to inventory, the statement “assure that the results of our inventories are reliable and recorded” has a highest weighted mean of 3.70 and interpretation of strongly agree. This implies that respondents properly manage the inventory they do, so that they can easy know whether their inventories will decrease or earn profit. According to Meredith (2013) the inventory must be insured, handled, financed and tracked. Further in increasing the cost of holding it. And followed by statement of “ensure on-time recording and updating of records” has a weighted mean of 3.67 and interpretation of strongly agree. This implies that the respondents regularly check and update the record on time. It also helped the company to less the work of the employee and it can be easier to find instantly the needs of the company. According to Hunt (2011) in manufacturing, inventory waste is about finished goods sitting as waste in inventory. In the supply chain, inventory can become buffer stock, which happens when trying to ensure products are available when they are not regularly transported in a timely way.

However, the statement “elimination of too much stocking especially on products that are not always needed” has a lowest weighted mean of 3.42 and interpretation of strongly agree. It may be because the respondents think that the stock that they produce are always needed so that they incurred additional cost to their inventory. According to Wilson (2010), the company uses a variety of methods for inventory management and it attempts to minimize the amount of inventory. Generally, the assessments of the respondents in terms of inventory are all strongly agreed and it has a composite mean of 3.61 with a verbal interpretation of highly applied.

Motion: It is the people, information or equipment making unnecessary motion due to workspace layout, ergonomic issues or searching for misplaced items. Table 14 presents the cost reduction as applied by Furukawa Automotive System according to motion.

Table 14. Cost Reduction as applied by Furukawa Automotive System According to Motion

To reduce cost and minimize the MOTION, employees:	Weighted Mean	Interpretation
1. observe the continuity of data or materials between departments and processes	3.52	Strongly Agree
2. ensure that tools are in good working order	3.50	Strongly Agree

before using.		
3.ensure that the materials are in correct specification.	3.60	Strongly Agree
4. ensure that everything about the work area are organized.	3.65	Strongly Agree
5. ensure that work is performed efficiently through organized planning, optimized material support and coordinated work executions.	3.73	Strongly Agree
Composite Mean	3.60	Highly Applied

It can be gleaned from the table that when it comes to motion, the statement “ensures that work is performed efficiently through organized planning, optimized material support and coordinated work executions” has a highest weighted mean of 3.73 and interpretation of strongly agree. This is maybe because company skill was used and performed well without wasting materials, time and energy. This can be happen because of the coordination of the employee that worked together. Meredith, (2013) stated that time and motion studies as well as ergonomic studies are used to help design work environment that increase the efficiency, safety and effectiveness of workers. It was followed by the statement “ensure that everything about the work area is organized” and has a weighted mean of 3.65 and interpretation of strongly agree. The respondents make sure that operation or works are properly organized so it is easy for them working in a place in an organized and presentable. It gives them a comfortable doing their task in an energetic manner. According to Meredith (2013) the unnecessary human motion using the human body efficiently and effectively is vital not only to the health of the workers, but also to the productivity of the organization.

However, the statement “good working conditions of tools prior to usage” has the lowest weighted mean of 3.50 and verbal interpretation of strongly agree. This implies that the respondents analyze the tools that is need to used was in a good condition, because sometimes it leads to excessive reaching or bending, tools missing and leads to poor managerial control. According to Myerson (2012), in terms of motion, you do not just want to consider efficiency, but safety as well.

Generally, the assessments of the respondents with regard to motion are all strongly agreed and it has a composite mean of 3.60 with a verbal interpretation of highly applied. This means that in terms of motion the Furukawa Automotive System organized the material based on their importance and value.

Excess Processing: Poor design or inadequate maintenance of processes, requiring additional labor or machine time. Table 15 presents the cost reduction as applied by Furukawa Automotive System according to excess processing.

Table 15. Cost Reduction as applied by Furukawa Automotive System According to Excess Processing

To reduce cost and minimize the EXCESS PROCESSING, employees:	Weighted Mean	Interpretation
1. measure the amount of rework every day	3.55	Strongly Agree
2. compare the production output vs. actual target	3.53	Strongly Agree

3. strictly follow the steps and procedures	3.70	Strongly Agree
4. follow carefully the procedures to avoid ineffective products	3.70	Strongly Agree
5. ensure that the design of the equipment is precise and accurate before actual production	3.68	Strongly Agree
Composite Mean	3.65	Highly Applied

It can be gleaned from the table that when it comes to excess processing, the statement “strictly follows the steps and procedures” has a highest weighted mean of 3.70 and interpretation of strongly agree. This implies that the workers follows strictly the steps or procedures to the task they perform for better results of product and can eliminate defects. As cited by Meredith (2013) it relates to the extra steps in a process, examples of unnecessary processing include removing burrs from machines parts, reworking defective parts and entering the same information into multiple databases. Also from the lean perspective, inspections are generally considered unnecessary processing. It was followed by the statement “follow carefully the procedures to avoid ineffective products” has a weighted means of 3.70 and interpretation of strongly agree. This implies that the respondents take all the procedure to reduce the wasted products and carefully understand the sequence and flow of doing products. Hines and Rich, (2007) stated that it occurs in situations where overly complex solutions are found to be simple procedures, such as using a large inflexible machine instead of several small flexible ones. The over-complexity discourages ownership and encourages employees to overproduce to recover the large investment in the complex machines.

However, the statement “compare production output versus actual target” has the lowest weighted mean of 3.53 and verbal interpretation of strongly agree. This may be due to the fact that the respondents do not compare their output to the actual target because they consider that their actual target is for their customers’ needs while the production output is for their day to day operation. As cited by Meredith (2013), it means of creating more of an output than is needed at a particular point in time. Producing more than is needed creates the need for additional space to store the surplus requires purchasing more raw materials than were needed, and often has a detrimental effects on profit margins as the surplus may need to be disposed of at distressed prices. Generally, the assessments of the respondents with regard to excess processing are all strongly agreed with a composite mean of 3.65 and a verbal interpretation of highly applied. This means that excess processing in Furukawa Automotive System was eliminated to make the goods easy to deliver to their customers. This implies that respondents can less their time to repeat it.

Summary of the Composite Mean

Table 16 presents the summary table of the composite mean of defect, overproduction, waiting, non-utilized, transportation, inventory, motion and excess processing as applied by Furukawa Automotive System.

Table 16. Summary of the Composite Mean

Cost reduction as applied by the Furukawa Automotive System	Composite Mean	Interpretation
Defect	3.52	Highly Applied
Overproduction	3.52	Highly Applied
Waiting	3.62	Highly Applied

Non- utilized Resources	3.57	Highly Applied
Transportation	3.61	Highly Applied
Inventory	3.61	Highly Applied
Motion	3.60	Highly Applied
Excess Processing	3.65	Highly Applied
Grand Composite Mean	3.59	Highly Applied

As presented, it can be observed that the cost reduction as applied by Furukawa Automotive System is highly applied in terms of defect with a composite mean of 3.52, overproduction with a composite mean of 3.52, waiting with composite mean of 3.62, non-utilized resources with composite mean of 3.57, transportation with composite mean of 3.61, inventory with a composite mean of 3.61, motion with composite mean of 3.60 and lastly the excess processing with a composite mean of 3.65 with a grand composite mean of 3.59.

Difference between profile and extent of cost reduction scheme use by Furukawa Automotive System

Table 17 presents a significant difference between profile and extent of cost reduction scheme use by Furukawa Automotive System. Specifically, it deals with the comparison between the respondent's age, sex, position and length of service. The statistical treatment used was t-Test and ANOVA to determine significant difference between profile and extent of cost reduction scheme use by Furukawa Automotive System.

Table 17. Difference between profile and extent of cost reduction scheme use by Furukawa Automotive System

Variables	Computed Value	Tabular Value	Decision Ho	Verbal Interpretation
Age	0.2299	1.21	Accept	No Significant
Sex	0.2254	1.53	Accept	No Significant
Position	0.154	1.69	Accept	No Significant
Length of Service	0.0012	7.60	Reject	With Significant

It is shown from the table that when the profile and extent of cost reduction scheme use by Furukawa Automotive System was compared when they were grouped according to their age, the computed value is 0.2299. This value is less than the tabular value of 1.21 with the decision of accepts and interpreted as no significant difference. This means age of individual does not affect in connection with applying the cost reduction through the use of DOWNTIME.

It is shown from the table that when the profile and extent of cost reduction scheme use by Furukawa Automotive System was compared when they were grouped according to their sex, the computed value is 0.2254. This value is less than the tabular value of 1.53 with the decision of accepts and interpreted as no significant difference. Thus, there exists no significant difference between the profile and extent of cost reduction scheme use by Furukawa Automotive System.

It is shown from the table that when the profile and extent of cost reduction scheme use by Furukawa Automotive System was compared when they were grouped according to their position, the computed value is 0.154. This value is less than the tabular value of 1.69 with

the decision of accepts and interpreted as no significant difference. This means that positions of the employees are not directly affect the cost reduction because all the employee are obliged to comply with the procedures practiced by the company in applying the cost reduction scheme.

It is shown from the table that when the profile and extent of cost reduction scheme use by Furukawa Automotive System was compared when they were grouped according to their length of service, the computed value is 0.0012. This value is less than the tabular value of 7.60 with the decision of rejects and interpreted as having significant difference. By this, we can state that the tenure of employee affects their assessment on the extent of application of cost reduction in Furukawa Corporation. This means that the respondent who has long term employment has a knowledgeable and has the capacity to apply cost reduction techniques and the respondents fulfilled with their job that is the reason why they tent to stay longer in the company.

Proposed recommendation to the management to strengthen or enforce as applied the cost reduction program

After the results of the study have been analyzed and interpreted, proposed to the management to strengthen or enforce as applied the cost reduction program. This is to encourage the manufacturing manager to continue using the techniques of Toyota Production System in eliminating waste the DOWNTIME or 8 hidden wastes to successfully achieve their goals. Also, it is so necessary for them to implement these techniques which lead to huge improvement in their production.

Conclusions and Recommendations

This study aimed to determine the cost reduction as applied by Furukawa Automotive System in LIMA Technology Center. The study used 60 members of Top Management as respondents. Specifically, it aimed to determine the demographic profile of the company in terms of average monthly income, number of years in operation and average percentage of savings in cost reduction scheme and also, it aimed to determine the demographic profile of top management in terms of age, sex, positions, and length of service. It also aimed to determine whether the Furukawa Automotive System was applying the cost reduction in terms of defects, overproduction, waiting, non-utilized resources, transportation, inventory, motion and excess processing. This study also intended to determine if there is a significant difference between profile and extent of cost reduction scheme use by Furukawa Automotive System. To support the study, the researchers used descriptive method of research with the self-made questionnaire as instrument to gather primary data. Finally, the data collected from the respondents were tallied, analyzed and interpreted through the use of frequency and percentage to determine the distribution of respondents according to their profile, and weighted mean to measure the Cost Reduction as applied by Furukawa Automotive System and analysis of variance and T- test to determine the significant difference between the assessments of the respondents on the extent of cost reduction when grouped according to their profile.

On the basis of the above mentioned summary and findings, some conclusions were drawn: The Furukawa Automotive System in terms of average monthly income were PhP 280,000,001–PhP 350,000,000, number of years in the operation was 5 years and below, and lastly the average percentage of savings in cost reduction scheme was PhP 100, 001 – PhP 150, 000. While in the profile of top management majority belonged to 28-43 age grouped, female, position was in senior supervisor and length of service for 3 years; The respondents

had shown a highly applied level of cost reduction in Furukawa Automotive System; The profile of the top management such as age, sex and position has no significant difference between the profile and extent of cost reduction scheme as use by Furukawa automotive System. In contrast, length of service has significant difference between the profile and extent of cost reduction scheme as use by Furukawa automotive System; and Cost reduction technique was proposed by the researchers to the management to strengthen or enforce the continuous flow of the business and to eliminate such waste in the area of production.

In the light of the findings and conclusions, the researchers hereby recommend the following: The researchers encourage the manufacturing industry to continue using the techniques of cost reduction as well as Toyota Production System in eliminating waste the DOWNTIME or 8 hidden wastes to successfully achieve their goals; the researchers encourage to continue using the cost reduction technique to strengthen and maintain a good flow in the operation; to other manufacturing industries, the researchers suggested to use the technique or strategies of cost reduction to eliminate or bring down cost; the researchers encourage the Furukawa Automotive System to range the result of the questionnaire for better operation of their production. There are some areas that they need to improve like in defects, check if there is defective material during the production. Overproduction, check if there are buffer stocks that can be used in case of shortage. Waiting, follow the facility layout carefully. Non- utilized resources, ensure that the approvals of the customer needs are already understood. Transportation, select the suppliers that are near to our company and ensure that there are temporary storage areas. Inventory, eliminate too much stocks of products that are not always needed. Motion, ensure that tools are in good working order before using. And excess processing, measure the amount of rework every day; to the future researchers in the same field may use this as a reference material when they conduct study similar with the present study. They may also conduct this kind of study on other localities and to determine whether the same finding exists; and the researchers recommend to the Batangas State University to apply cost reduction techniques to reduce the cost incurred to the university.

Proposed recommendation to the management to strengthen or enforce as applied the cost reduction program

Cost Reduction Scheme	Findings	Recommendation	In Charge	Time Frame
Defect	Check if there is defective material during the production	May always check the raw materials before start of every production.	QA/QC Department	Daily
Overproduction	Check if there are buffer stocks that can be used in case of shortage.	May have a daily comparison of actual versus target production.	Production Control Department	Weekly
Waiting	Follow the facility layout carefully	May always provide a signage in the area that directs the employee	Training Center Department	Daily

Non-utilized Resources	Ensure that the approvals of the customer needs are already understood	May verify all the desire of the customer needs and make sure that all the request of the customer is clearly understood	Production Department	Daily
Transportation	Completeness of materials before it moving to another company	May ensure that the materials to be delivered are completed before it proceed to other location	Production Improvement Department	Daily
Inventory	Eliminate too much stock of products that are not always needed.	May conduct regular inventory taking to ensure the correctness of the inventories	Production Control Department	Daily
Motion	Ensure that tools are in good working order before using	May always ensure that tools to be used is in good condition through a regular preventive maintenance	Material Management Department	Daily
Excess Processing	Comparison of production output versus actual target	May ensure that worker always compare their production output to actual target if the workers meet them both.	Production Control Department	Daily

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