

# CASE STUDY ANALYSIS REPORT

The case of Fabritek Manufacturing Corporation

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## 1. Introduction

This report presents the findings of analysis conducted for Fabritek company.

During the analysis, the double Diamond Design Thinking tool was utilized to explore and define the existing problems, as well as to generate potential solutions that can be implemented to address the problems under consideration.

Though, the analysis covers the various sections of the company, due attention has been given to identify the specific problem related with the protagonist Arthur Moreno, a highly productive worker who could not be able to make a substantial bonus. He was the subject and responsible for producing low quality, below standard milling products rejected by the quality inspection expert, as the result of this, delay in time delivery of the products as per the contract agreement with the new customer (Pilgrim auto manufacturing firm) was created.

The report, through its detail analysis of the problem, generated potential solutions and tested them using desirability, feasibility and viability criteria.

Finally, a realistic and implementable recommendations were drawn out with some specific plan of actions

## 2. Aim of the Report

The aim of the report is to:

- critically assess and identify and define the problems that can negatively impact and hinder the performance efficiency of the Fabritek company.
- generate potential solutions that can effectively address the identified target problems
- propose and recommend a realistic and implementable actions that can be achieved and hence significantly improve the performance efficiency of the Fabritek company.

## 3. Assessment Method

In order to further explore, identify and define the key problems and successfully implement and realize the above stated objectives, the double diamond design technique was used as a tool (Design Council UK ,2007).

## 4. Situation Analysis

Fabritek corporation was established in 1938 which specialized in the manufacturing and supply of machine castings for machinery industry working on packings.

The company operated efficiently to achieve its objectives such as, rapid, on time delivery and charging competitive prices for its quality machine products.

In 19968, the company supplied various machine parts Worthing \$15 million to 130 machinery producers located in different areas.

It employs 250 workers of 200 of them engaged in production and maintenance activities.

Although the company had some general strategies, there were no clearly defined generic strategies both at company, operational and implementation levels. As the result of this, it can obviously be observed that the company lacks coordinating operational activities particularly in the human resource (HR) section where there was no cooperation lacking strong team spirit between employees engaged in the milling operation and those working in the drilling and grinding operations area.

Moreover, executives of Fabritek company were also much concerned on how to avoid machine interference from limiting the productivity and effectiveness of an operator capable of exceeding the standard of work.

Hence, to avoid this hurdle, Fabritek introduced a policy of allocating adequate machine to each operators so as to prevent machine interference from impeding operators' performance.

In order to better understand and gain deeper insights a thorough analysis of the internal and external factors affecting the performance of the Fabritek company were investigated using strength, weakness, opportunities and threats (SWOT) analysis which are expected to provide highlights regarding the underlying problem context and the risks (Kotler, 1988 and Wheelen and Hunger, 1995). Results of the SWOT analysis also helps to create overview of the goals, strategies, and the general understanding of the key factors influencing the company's performance, future planning, product evaluation, brainstorming meetings and workshop sessions.

Results of the key insights drawn from the SWOT analysis are shown in Table 1 below: From the analysis, the weakness and threat of the company would help to understand the problem context and identify the risks the company facing at the time.

**Table 1** Summary of the SWOT analysis conducted at the beginning of the case analysis

Strength	Weakness
<ul style="list-style-type: none"> <li>• Strong competitor supplying machine castings to 130 manufacturers</li> <li>• Well-developed organization in Columbus Indiana</li> <li>• Generate high revenue (\$15 Million)</li> <li>• Provide quality machine products</li> <li>• Offer competitive price to many of its products</li> <li>• Good financial position as most operators paid over the average 133 of standards</li> <li>• Specialized in manufacturing &amp; supply of machine castings</li> <li>• Strong emphasis on inspection &amp; quality control</li> <li>• Focusing on imaginative approach to solve machine problems at low cost</li> </ul>	<ul style="list-style-type: none"> <li>• No clear generic strategies at organizational, operational and execution level</li> <li>• Lack of risk &amp; emergency planning</li> <li>• Disorganized &amp; non-uniform incentivized payments</li> <li>• Employees paid based on total output, not based on total good outputs</li> <li>• Lack of provision of training to employees</li> <li>• Weak integration &amp; cooperation among departments</li> <li>• Lack of HR &amp; time management skills to handle employees during machine interference</li> <li>• Lack of team spirits &amp; synergies</li> <li>• Less emphasis to R &amp; D section</li> <li>• Using obsolete general purpose machine</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Strong connection with many customers</li> <li>• Promising future markets such as Pilgrim's promise to offer large &amp; permanent contracts</li> <li>• Good opportunities to expand market share</li> </ul>	<ul style="list-style-type: none"> <li>• May lose contract supply, if fail to deliver quality products on time</li> <li>• Many competitors in the industry</li> </ul>

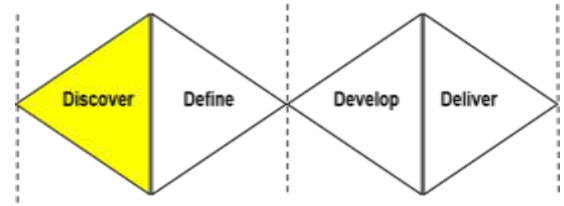
## 5. Assumptions and limitations

It is assumed that Arthur Moreno accepts to be transferred to drilling and grinding operations and be willing to work as a team in the new position.

Reasonable estimates recording on-job training and recruitment costs were taken into account and a rough estimate cost for purchasing new high speed machine in the long term.

The limitations of the analysis include, details information regarding the financial positions, status of R & D of the company were absent in the case study, as well as to generate more information and effectively proceed applying the double diamond design thinking tool, contact personas and stakeholders are absent.

## 6. Problem Identification/Definition



In general, the *discovery* section of the design thinking tool was used to identify and list down the various problems expected to negatively impact the success of Fabritek company. During the analysis, particular emphasis was given for human resource management, product delivery, provision of incentives, degree of cooperation and coordination among operating department, strength of team spirit and synergy among employees engaged in the various business units and the consideration given to R & D section of the company.

In line with this, the various problems identified with their associated root causes were described in Table 2 below. Attempt was also made to critically analyze the problems existing in the different operation sections of the company and a divergent navigation approach exploring and identifying the general problem and then converging to the specific subject and cause of the problem.





<b>HR Section</b> <ul style="list-style-type: none"> <li>Specialized Training</li> <li>Recruiting</li> </ul>	<ul style="list-style-type: none"> <li>Lack of quality on job-training for most of the employees engaged in managing machineries</li> <li>Not recruiting high caliber professional</li> </ul>	<ul style="list-style-type: none"> <li>Though, Arthur Moreno was hard working employee, he had less experience of handling the machine at the beginning while working on Pilgrim's contract</li> <li>Employees in machine operating areas are not highly skilled, as well as <b>not enough employees</b></li> </ul>
<b>Finance payments</b> <ul style="list-style-type: none"> <li>Incentives</li> <li>Salary payment</li> </ul>	<ul style="list-style-type: none"> <li>Non-uniform temporary incentive payments</li> <li>Salary payment was not based on quality output</li> </ul>	<ul style="list-style-type: none"> <li>Arthur Moreno used to receive different incentive based piece rate payments which compromised with the quality of the product.</li> <li>Employees get paid based on total output, but not on total good quality output.</li> </ul>
<b>Marketing Section (Supply Management)</b>	<ul style="list-style-type: none"> <li>Delay of the truck for the February 28 shipment of Pilgrim's contracts</li> </ul>	<ul style="list-style-type: none"> <li>Re-processing of the 38 low quality products rejected by quality inspector took considerable time.</li> <li>Moreno was the cause for such rejections as he was working at 167% of standard producing high number unfinished casting machine which were piled in the grinding areas &amp; interfered with the performance of Paul Clarke.</li> </ul>
<b>R &amp; D section</b> <ul style="list-style-type: none"> <li>Machine</li> <li>Innovations</li> </ul>	<ul style="list-style-type: none"> <li>The use of general purpose obsolete milling machines</li> <li>Lack of business operation research</li> <li>Lack of innovation and continuous improvements</li> </ul>	<ul style="list-style-type: none"> <li>This is evidenced by the feed &amp; speed rates of the machine are set by moving to point to readings on indicator dials, but in reality the lenses are missing &amp; adjustments are made with a wrench</li> <li>Use of one type of machines</li> <li>Poorly organized business operation activities, lacking coordination &amp; integration.</li> <li>Use of similar business operation techniques</li> </ul>

As shown in Table 2 above, Fabritek operation of casting machines had several problems with various interrelated root causes and evidences for such problems.

The scope of the identified problems included from Fabritek company's business operation strategic level to the more detailed & specific problems observed in the various operating imperatives particularly the Production section, HR, R & D and Marketing (supply distribution areas) particularly milling machine operating area where Arthur Moreno started working on Pilgrim's contract.

Fabritek company primarily focuses on producing high quality machined parts for manufactures in many different industries. The company continued its reputation for rapid, on-time delivery and viable prices for high quality machine work. But when Fabritek manufactured engine parts for Pilgrim, there were some problems that might led to a delay in delivery of the products. Thus, the manager and the foreman had to dealing with the troubles.

Quality and delivery problems appeared after a hardworking and productive machine operator, Arthur Moreno, was transferred to a new job position to operate a new machine and successfully handle Fabritek's contract with Pilgrim machine manufacturer firm.

The root causes of the high rejection rates of the milling casting products was Arthur Moreno, as he was not happy to accept the new payment rate after being transferred to work on Pilgrim's contract.

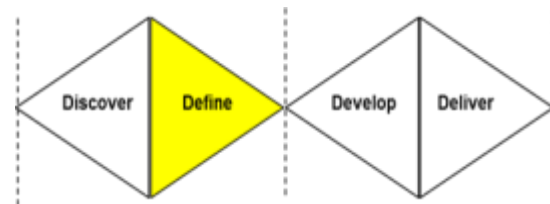
Arthur Moreno used to receive \$215 per week of which \$ 85 was premium bonus pay, however, after being transferred to work on Pilgrim's contract, he intentionally wanted to work faster at a rate of 167% of standard, just intending to receive a higher bonus. But, Moreno received his first week full pay \$174.14 per week, and he was very upset and talked to Deere with anger. He replied to Deere "**I just can't go fast enough to make out on this job**"

From Moreno's previous dialogue with the foreman Deere, later on it became clear that, Moreno inherently did not want his work to be checked by quality inspectors and continued to work at high rate (167% of standard) creating piles of machine products in the grinding operation areas. Moreno did this just to get high bonus payments.

As the result of this, employee working in the grinding section were forced to slow down the machine to produce standard quality products and this unfortunately interfered with employee's operational efficiency producing poor quality products.

There were high (38) rejection rates by the product inspector which had to re-processed again to rectify the problem, and this created significant delay to deliver the products to customer (Pilgrim contract).

### 6.1. Prioritization and Defining the Problem



All the identified problems in the discovery (divergence) phase of the design thinking process were further prioritized following the define (convergence) phase of the design thinking process becoming more specific and targeting the particular problem associated with the its root causes.

Here, the various problem which were identified and analyzed were further prioritized based on their importance and the expected magnitude of the impacts they would have, as well as the urgency required to correct the problems before damaging the reputation of Fabritek company.

It has been attempted to prioritize and condense the list of the various problems into a more clearly defined problem based on which problem matters first, what is feasible and which matters most.

Hence, the problems were clearly defined and categorized into two sections based on their importance as indicated in Table 3 below. And the next section provides detail analysis of the specific problem with the associated cause.

**Table 3** Prioritizing the identified problems based on their significance and impacts on Fabritek company

Priority 1	Priority 2
<ul style="list-style-type: none"> <li>• Piling up of milling machines in the drilling &amp; grinding operation areas created by Moreno <b>to get excess bonus</b> resulting delay in product delivery.</li> <li>• No clearly defined uniform incentivized payments across the various operating sections of the company.</li> <li>• Lack of working in team spirit, weak cooperation and trust between Moreno and employees operating in the grinding section as well as with the foreman Deere too.</li> <li>• Lack of business operation research</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of effective plan for managing human resource and coordinating the various operating activities.</li> <li>• Less attention given to innovation and the use of general purpose obsolete milling machines.</li> <li>• Lack of on-job quality training to build the capability of employees operating machines.</li> <li>• Absence of articulated generic operational strategy aligned with operational activities.</li> </ul>

### The specific Problem and its Cause

In the milling section of Fabritek company, where Moreno has been working in his new position, a high machine scrap rate would definitely be the main problem, it was clear that before Moreno was transferred to the milling Machine section, the average performance was 135% of standard, however, after Moreno came to this new section, he wanted to get more bonuses and started producing at 167 units per day, but, there were 38 defective products rejected by the quality inspector and Paul Clarke was assigned to work overtime for three hours to correct the problem.

Hence, because of high scrap rate, it would be challenging for Fabritek company to deliver the 38 rejected milling casting products, indeed Fabritek had to rectify this problem and guarantee the quality of its products to keep its strong competitive positions.

As shown in Exhibit 2 of the Case study, the total cycle time for the four milling cutting steps were 11.584 minutes, 8.358 minutes and 3.226 minutes for total cycle time, total machine time and total external time respectively, See Exhibit 2 calculations and Table 4 below:

Table 4 indicates the estimated cycle time computed during the analysis			
Outputs	Actual Total cycle time (minutes)	Discount Factor 100/Estimated output	Estimated total Cycle Time
100	11.584	1	11.584
133	-	0.752	8.711
135	-	0.741	8.583
167	-	0.599	6.939

It has been given that total cycle time equals to machine time plus external time.

Indeed, it would be hard for Fabritek to change the machine time unless the company purchases a new machine. Hence, based on the 100 units of production per day, a skilled machine operator can increase output by reducing the external time, thus as the total cycle time for milling cut steps was at least 8.358 minutes. If the total output was 33% greater than the standard, the total cycle time would be  $11.584/1.33 = 8.71$ ,

and this could be possible as milling machine operators would be able to decrease external time and achieve this results. But, Moreno had achieved an average of 167 productions units outputs per day, in doing so he was able to reduce the total time to  $11.584/1.67 = 6.937$ , thus this provides us an insight that Moreno could not be able to finish all the four steps. Moreno's only option would be to skip one or more steps during the milling cuts, for instance skipping Milling cut 2 or only do milling cut 1 and 2 and this work may lead to the production of below standard low quality products compromising quality issues, that was why during his dialogue with Deere, he was not interested for quality inspectors to inspect his work.

## 6.2. Hypotheses

Based on the identified and prioritized problems observed in Fabritek company, the following multiple hypotheses were formulated:

**Hypothesis 1.** The adoption of non-uniform temporary incentivized payment can discourage employees and negatively impact the performance efficiency of Fabritek company.

**Hypothesis 2.** Lack of team work and trust among employees operating together discourages working initiative and hinder the performance of the company.

**Hypothesis 3.** The use of obsolete and general purpose machines can reduce the product quality and performance efficiency of Fabritek company.

## 7. Evidence/proof of hypothesis

**Hypothesis 1.** The adoption of non-uniform temporary incentivized payment can discourage employees and negatively impact the performance efficiency of Fabritek company.

**Proof/Evidence:** From analysis of the case study, it is clear that Fabritek company follows non- uniform payment mainly focusing on total produced, not based on total quality output produced and this has even led to quality and delivery problem.

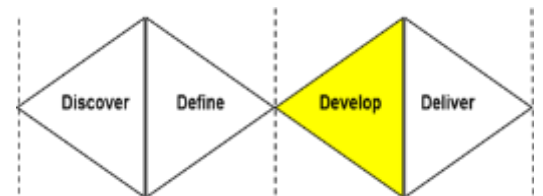
**Hypothesis 2.** Lack of team work and trust among employees operating together discourages working initiative and hinder the performance of the company.

**Proof/Evidence:** It has been clear that after Moreno was transferred to his new position, he was not in good team work spirit with employees and with Deere, and this also created inefficiencies

**Hypothesis 3.** The use of obsolete and general purpose machines can reduce the product quality and performance efficiency of Fabritek company.

**Proof/Evidence:** This is evidenced by the feed & speed rates of the general purpose machine are set by moving to point to readings on indicator dials, but in reality the lenses are missing & adjustments are made with a wrench. This machine is obsolete and less efficient compared with high speed machine.

## 8. Developing Potential Solutions



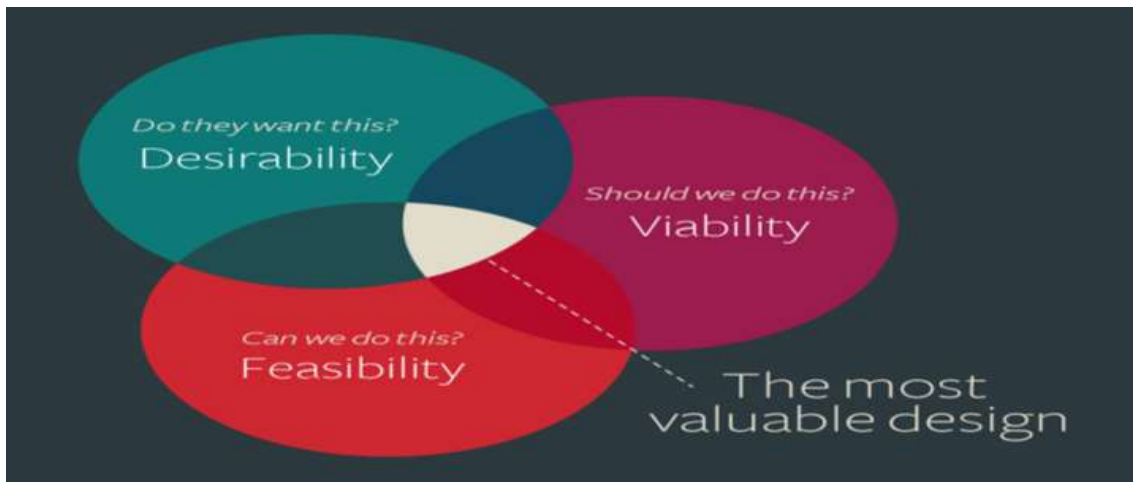
In the ideation phase of the analysis, various potential solutions were generated and checked whether these solutions were relevant enough to address the problems Fabritek company had been facing.

The potential solutions were listed down into two categories as shown in Table 5 below:

<b>Table 5</b> List of potential solutions generated during the ideation phase of problem-solution analysis	
<b>Solution category 1</b>	<b>Solution category 2</b>
<ul style="list-style-type: none"> <li>Recruit additional experienced &amp; skilled machine operators &amp; enter agreement to work overtime &amp; peacefully complete Pilgrim's contract with in time delivery.</li> <li>Provide compensation to Moreno &amp; replace him with productive machine operators.</li> <li>Introduce and adopt a fair, reasonable &amp; permanent incentive and salary payments based on efficiency of employees and quality output across the various business units.</li> <li>Provide on-job quality training &amp; build the capacity of employees working in machine operating areas</li> </ul>	<ul style="list-style-type: none"> <li>Fabritek company should create &amp; implement relevant &amp; appropriate strategies at organizational, operational and execution level</li> </ul>
<ul style="list-style-type: none"> <li>Formulate new HR management policy that can encourage &amp; motivate productive employees &amp; staffs and discourage unproductive &amp; badly behaving individual workers</li> </ul>	<ul style="list-style-type: none"> <li>The company need to re-align &amp; coordinate its production, marketing, HR &amp; financial resource to optimize &amp; increase efficiencies</li> </ul>
<ul style="list-style-type: none"> <li>The company should encourage &amp; foster the importance of team work, synergy, trust &amp; sense of belongingness to the company</li> </ul>	<ul style="list-style-type: none"> <li>The company should develop and adopt a cost effective and efficient product supply distribution systems to deliver products quickly</li> </ul>
<ul style="list-style-type: none"> <li>The company should conduct training gap analysis &amp; provide on-job training focusing on improving &amp; building the capacity of employees operating various machines</li> </ul>	<ul style="list-style-type: none"> <li>It should also introduce high speed specialized machines and provide due attention on continuous improvement &amp; technology management</li> </ul>
<ul style="list-style-type: none"> <li>Developing vertical &amp; horizontal integrations among the different sections of the company as well as encourage a culture of cooperation</li> </ul>	<ul style="list-style-type: none"> <li>Compensations to be need to be offered to for employees</li> </ul>

## 9. Prioritization of the potential Solutions

The potential solutions generated were further prioritized desirability (importance & acceptance by Fabritek management bodies), Feasibility (Fabritek company's manpower & resource capability to implement) and Viability (impact of solutions on company's profitability). Figure 1 and Table 6 below shows how potential solutions were prioritizes based on the above mentioned criteria.



**Figure 1.** Indicates how the most valuable solution package chosen based on the desirability, feasibility and viability criteria. Source: <http://www.forbes.com/sites/darden/2015/08/28/is-design-thinking-the-new-tqm/>

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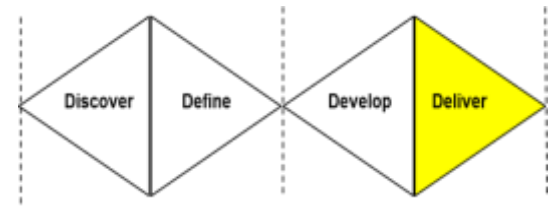


**Table 6** Prioritizing the potential solutions based on Desirability, Feasibility and viability criteria

Potential Solutions	Desirability	Feasibility	Viability
<b>HR Section</b>			
<ul style="list-style-type: none"> <li>Transfer Arthur Moreno to drilling &amp; grinding section &amp; bring Paul Clarke to Milling operation</li> </ul>	High	High	High
<ul style="list-style-type: none"> <li>Letting Moreno to work in Pilgrim Team in the short term until Pilgrim contract completes</li> </ul>	High	High	Medium
<ul style="list-style-type: none"> <li>The company should encourage &amp; foster the importance of team work, synergy, trust &amp; sense of belongingness to the company</li> </ul>	High	High	High
<ul style="list-style-type: none"> <li>The introduction and adoption of a fair &amp; reasonable and permanent incentive and salary payments based on efficiency of employees and quality output</li> </ul>	High	High	High
<ul style="list-style-type: none"> <li>Formulate new HR management policy that can encourage &amp; motivate productive employees &amp; staffs and discourage unproductive &amp; badly behaving individual workers</li> </ul>	High	Medium	Low
<ul style="list-style-type: none"> <li>The company should conduct training gap analysis &amp; provide on-job training focusing on improving &amp; building the capacity of employees operating various machines.</li> </ul>	High	Medium	Medium
<b>Business Operation Management</b>			
<ul style="list-style-type: none"> <li>Developing vertical &amp; horizontal integrations among the different sections of the company as well as encourage a culture of cooperation.</li> </ul>	Medium	Medium	Medium
<b>Operation Strategy</b>			
<ul style="list-style-type: none"> <li>Fabritek company should create &amp; implement relevant &amp; appropriate strategies at organizational, operational and execution level</li> </ul>	Medium	Medium	Medium
<ul style="list-style-type: none"> <li>The company need to re-align &amp; coordinate its production, marketing, HR &amp; financial resource to optimize &amp; increase efficiencies</li> </ul>	High	Medium	Medium
<ul style="list-style-type: none"> <li>The company should develop and adopt a cost effective and efficient product supply distribution systems to deliver products quickly.</li> </ul>	High	High	High
<b>R &amp; D section</b>			
<ul style="list-style-type: none"> <li>It should also introduce high speed specialized machines and hence provide due attention on continuous improvement &amp; managing technologies</li> </ul>	Medium	Low	Low

## 10. Recommendations and actions

### The Delivery Phase



#### 10.1. Specific Recommendations

- Letting Moreno to work in Pilgrim Team- In the short term, it would be hard to replace Arthur Moreno as he has substantial machine operation experience. In addition to this, new employees take time to familiarize themselves with the Milling machine, new employees may also need some training which incur additional cost. Moreover, a few time is left to finalize the 17,000 units for Pilgrim contract in six months, thus, even if his incentive payment was not correct, one option would be to give strong advice to Moreno and keep working at 135 units/day and complete Pilgrim's contract by using more shifts a day.
- The second option would be to transfer Moreno to Drilling and Grinding operation area and bring Paul Clarke to milling operation area. Transfer Moreno to grind and drill operation seems to be a good idea for Deere. Based on the operation process, operators at drill and grind position needs to keep the same speed of operation with the milling operator. Therefore, once Moreno placed in the drilling and grinding operation areas, he will not be able to increase his speed as he has to wait for Paul Clarke to complete the previous steps. This placement may also have a good impact to reduce the ethical issues between Moreno and Deere and the other employees.
- Improve the premium pay Policy- The premium policy governs premium pay based on total output, but not based on total goog output hence, this may help some employees like Moreno to focus on what is the maximum output that he can produce so as to get higher payment/day. As the result of this, aggressive employees provide less care and neglect product quality issue. Therefore, due attention need to be given to balance each of the operating sections to check and revise output premium based on good output quality.

Besides, if low quality product is produced, employees from both sections should work overtime to re-grind and re-mill and rectify the problem, and if any scrap produced, it would be the responsibility the team, not individual employee.

It is also possible to compute the maximum good output, and make a bench mark and manage the production process.

## 10.2. General Recommendations

### In the short term

- Provide on-job quality training & build the capacity of employees working in machine operating areas.
- The introduction and adoption of a fair & reasonable and permanent incentive and salary payments based on efficiency of employees and quality output
- The company should encourage & foster the importance of team work, synergy, trust & sense of belongingness to the company
- Developing vertical & horizontal integrations among the different sections of the company as well as encourage a culture of cooperation
- The company need to re-align & coordinate its production, marketing, HR & financial resource to optimize & increase efficiencies (Iansiti and Serels, 2013).

### In the Long term

- Recruit additional experienced & skilled machine operators & enter agreement to work overtime & peacefully complete Pilgrim's contract through in time delivery
- The company should create & implement relevant & appropriate strategies at organizational, operational and execution level
- The company should develop and adopt a cost effective and efficient product supply distribution systems to deliver products quickly
- It should also introduce high speed specialized machines to increase automation level
- provide due attention on continuous improvement & technology management

## 11. Conclusion

From the results of the analysis, it can be concluded that the increase in the scrap rate was because of an over processing subject to its current capacity of the machine. It has been shown in the analysis that the cycle time of processing 167 units was 6.939 minutes which was slower than the machine running time of 8.358, minutes, Table. Thus, for Arthur Moreno to achieve 167 units of outputs, he had to skip part of the milling operation process, thereby producing below standard poor quality milling casting bearing surface.

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