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Chapter 01 – Introduction

1.1 Outline of the firm and background of the study

Apparel industry of Sri Lanka is the largest contributor to the national economy as well as it is the largest foreign exchange earner for the country. “It is the single largest employer within the manufacturing sector with an annual output of 600 million garments whilst USA and the United Kingdom account for more than 70% of total apparel exports”. Source - <http://www.skyscrapercity.com/showthread.php?t=492042&page=8>

1.1.1 MAS Holdings

MAS Holdings is one of South Asia’s largest apparel manufacturing firms that was established in Sri Lanka in 1986. The firm spans its manufacturing operations across Sri Lanka, India, Bangladesh and Indonesia with 46 world class apparel manufacturing facilities. Currently the product portfolio of the firm includes intimate wear, sportswear, leisure wear and swim wear with a customer portfolio including some of the leading global apparel brands and retailers such as GAP, Victoria Secrets, Marks and Spencer, lulu lemon and Nike. At the on-set of operations MAS signed several joint venture partnerships with some global apparel brands such as Triumphs and Nike that enabled the firm to gain the necessary marketing insight and technical know-how that were necessary in developing as a robust apparel manufacturing firm. Being the single largest vendor to Victoria’s Secret, with a global talent of 67,000 professionals and skilled workers, MAS boasts a turnover of USD 1.2 Billion as of 2013.

1.1.2 Linea Clothing Division

Linea Clothing Division is located in the Hill Capital Kandy, within the Kandy Industrial Park, a BOI Free Trade Zone. The firm is the largest employer within the Central Province, which provides employment opportunities for more than 2000 employees. The Linea Clothing Division specializes in the manufacturing of ladies briefs for Limited Brands under the labels Victoria’s Secret Pink, Signature Cotton and Pout with 50% of the products being enhanced with embellishments. With a capacity of 41 million units per annum and a strong work force, Linea Clothing is driving towards the goal of becoming the model plant for Lean apparel manufacturing in Sri Lanka.

permanent countermeasures to the problem stated the immediate need to build up a pool of skilled technical staff to cater the training requirement.

Manufacturing unit not conducive to be facilitate Team Member multi-skilling.

To facilitate flexible manufacturing capacity, the manufacturing unit should be highly adaptive. In a labor intensive industry, the agility/ flexibility of the manufacturing unit depends on the skill level of Team Members who perform value adding work. In the sewing industry a multi-skilled Team Member is an individual who is competent in several sewing operations across several sewing machine types. The multi-skill level of Team Members is critical in dealing with short run order quantities and high change over frequencies. Unlike a Team Member who only knows to perform a single operation, a multi-skilled Team Member can easily adapt to perform in several operations if required. Thus as the multi-skill level of the team increases, their capacity increases to absorb many number of style changes without significant impact quality or targets. The effort to train Team Members by the technical staff would also be less.

Although this is the case the current manufacturing unit; the Zig Zag sewing machine lay out is not conducive in creating multi-skilled Team Members. The layout works in a sequential progressive flow system. Team members do a specific part of the value adding process and send the work-in-progress (WIP) to the next operation. (See Figure H).

Zig Zag Layout Sewing Module

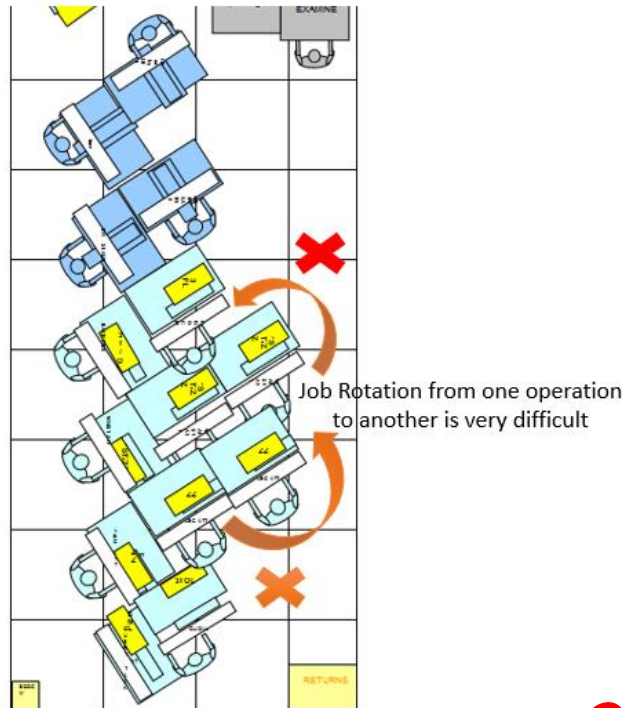


Figure 10: demonstrates the lack of opportunity of the Zig Zag layout for Team Members job rotation

Source: Internal

The operations are laid out in a Zig Zag format. The operations start at the bottom of the layout. Team Members build a WIP (Work in Progress) of components of the garments (roughly around 5- 10 Pieces) and move them to the next work station, to the next Team Member. The issue here is that due to the size of the layout (length 35 Feet from Bottom to Top and Width of 11 Feet) of the work stations and Zig Zag angles the Team Members find it very difficult to move from one operation to another and settle at the seating position to initiate work. Further due to the wide area of the modules it becomes difficult for an individual to assist and support the Team Members.

The current Multi skill level of Team Members
of Zig Zag Manufacturing Lay Out

(Multi skilled – ability to sew Two or more
operations)

38%

TL – GL Structure Journey

Since September 2013



12: TL - GL Journey

Source - internal

The Researcher would explore that whether the problems stated above could be overcome by the elements of the TL – GL structure thus improving the flexibility of the organization.

Although the researcher has signified several problems related to manufacturing flexibility, this research scope would be narrowing down to the manufacturing structure and its implications to manufacturing flexibility with the advent of the TL – GL concept.

The impact would be measured both in the pilot area and non-pilot area of the plant.

1.3 Research Question

The Research question is **“Is there an impact of the Team Leader and Group Leader structure on manufacturing flexibility?”**

Flexible manufacturing strives to be responsive to consumer demand for small orders and short lead times. “Flexible Manufacturing Strategy means the capability to quickly and efficiently produce a variety of styles in small production runs with no defects”.

<http://www.indiantextilejournal.com/articles/FAdetails.asp?id=1988>

2.2.1 Modular Manufacturing units

According to the “The American Apparel Manufacturing Association” several apparel manufacturers in the US have sought to modular manufacturing method to meet the growing demand and diversity in the apparel manufacturing industry. According to the American Apparel Association in a modular manufacturing unit “processes are grouped into a module instead of being divided into their smallest components. As a rule, fewer numbers of multi-functional operators work on the machines which are arranged in a U-line.” (F. Kalaoglu and C. Saricam, 2006).

According to Kalaoglu and Saricam the modular manufacturing systems are effective where product standardization is high. Further productivity is improved due to low levels of work-in-progress (WIP) within the system and due to the multi-functioning of operators.

2.2.2 Management involvement and manufacturing flexibility

According to Pathirage et al, in his research on the “Impact of Management Support for Team Performance within the Sri Lankan apparel Industry” stresses out the criticalness of the management support on success of the manufacturing system. “Gemuneden and Lechler (1997) have defined team performance as the extent to which a team is capable to meet the established quality, cost and time objectives.” (Pathirage et al). Thus for a team to perform well Pathirage illustrates the requirement of a key factor, that is setting the right support structure with clear direction and scope “Management is largely responsible for the determination of organization structure (e.g., information flow, decision-making processes, and job assignments). They must recognize the existing organization culture and learn to work within or change its parameters”. This means that setting clear communication channels, defining levels of support, empowerment to make decisions and clear and standard specification of job roles/ assignments have clear impact of performance.

The TL:TM Ratio is dependent on several factors such as the criticalness of the process, absenteeism and the type of work performed (Repetitive/ non-repetitive)

Defining the Ratio

- **Type of work**
 - Type 01 –Repeatable Standardized work.
 - Type 2 –Predictable variable
 - Type 3 – Work with very little predictability
- **Nature of work**
 - Ergonomics / Monotonous
- **Absenteeism / LTO rate**
- **Geographical Area**

Figure 16: Defining TM: TL Ratio

Source: Tony Chamblin

As said, the each role at the manufacturing is designed to support the role of their subordinates. Thus the nature of processes as well as the manufacturing unit or the shop floor design may determine the TM: TL ratio.

“Standard is the best, safest and easiest way, to achieve and maintain a defined quality level.”

<https://kaizeninstituteindia.wordpress.com/2013/12/>

From these definitions, it is evident that a standard can be defined as a best practice that has been commonly agreed upon.

The Harvard Business Review article, “Decoding the DNA of Toyota Production System” by Stephen Spear and Kent Brown explains the elements of standard work in an example;

“Moving the machinery was broken into 14 separate activities. Each activity was then further subdivided and designed as a series of tasks (**Content**). A specific person was assigned to do each task in a specified sequence (**Sequence and Timing**). As each of the machines was moved, the way the tasks were actually done was compared with what was expected according to the original design, and discrepancies were immediately signaled (**Outcome**).” (S.Spear and K.Brown, 2004)

According to Tony, Standard work contains of four parts

- The content (Content of work)
- The time (Average time taken to complete a single cycle)
- Sequence (The work order performed)
- Outcome (expected result of the work)

“Standard work will set the platform for work to be performed at a particular way so that any abnormalities of the work could be identified and corrected. Also standardized work would also be the platform for improvement” (Tony 2014)

Whilst conducting the same activity of ensuring that the standardized work is performed across several different work cells through standardized work audits the Group Leader also provides feedback to the Team Leaders so that they can better their work processes.

The Team Leader and the Group Leader has a role in setting up standardized work for new products before they are introduced at bulk manufacturing. Along with the Technical staff, the Team Leader and Group Leader would try out the various drafted standard work before it is finalized for mass production.

“ The Team Leader and Group Leader would provide input on design for manufacturability on standardized work before they are introduced to the line. This reduces the variation resulted by modification of work methods after they are introduced at bulk production” (Tony, 2014).

Standardized work is the platform to improve upon and take the organization to the next level. The TL – GL structure would facilitate the roll out and actual performance of work standardization and rigorously improve upon them.

Principle 7- Use Visual control so no problems are hidden

“Visual Control is any communication device used in the work environment that tells us at a glance how work should be done and whether it is deviating from the standard” (Page 152 Liker, 2004).

As the above statement explains, the visual controls are vital to identify abnormalities in the work flow and tools such as kanbans, Min/ Max levels helps value adders identify these issues.

“Having clearly visible indicators of minimum and maximum levels for inventory will help the manager (and everyone else) see if inventory is being managed properly” (Page 152 Liker, 2004).

The Team Leaders and Group Leaders are entrusted with the practice of these visual control so that problems do not escalate to a wider magnitude, transcending their own work area. Tony

Chamblin explains this in the following discussion where he stresses the importance of utilization of visual controls in the work area.

“The Leader and the Group Leader take ownership of the visual displays and visual Controls of their geographical area. Thus, they attend and resolve abnormalities that are recognized by these visuals” (Tony, 2013).

Further the value adders should also practice 5S, a work place organization practice that will also highlight any abnormalities of the process.

“In mass production, without 5S’s, many wastes accumulate over the years, covering up problems, and becoming an accepted dysfunctional way of doing business. The 5S’s together create a continuous process for improving the work environment” (page150 Liker, 2004)

The Team Leader’s and Group Leader’s role would be to sustain also known as “shitsuke” through continuous auditing of 5S conditions and teach the principles of 5S to new Team Members who join the shop floor.

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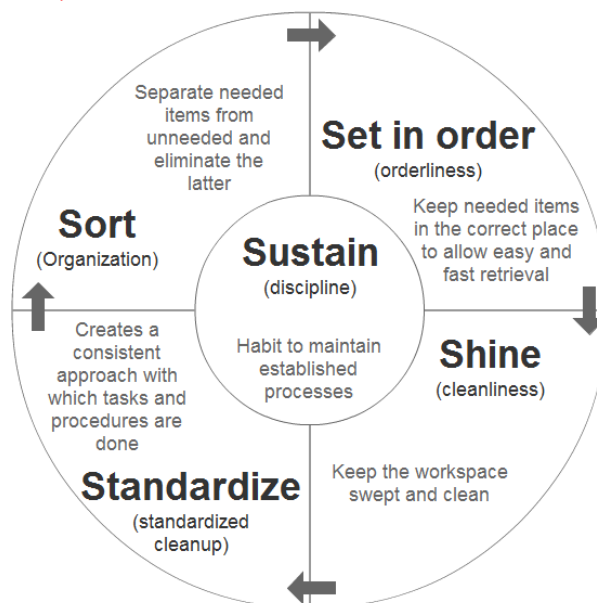


Figure 21: 5S

Member would be exposed to would only be captured by stepping in to the shoes of a Team Member themselves” (Tony, 2013).

Principle 10 – Develop Exceptional people and teams who follow your company’s Philosophy

The Toyota Production System is based on team work. The Team Leader – Group Leader Structure is encompasses the development of robust teams that embraces Toyota way; the Toyota culture. This is explained in the John Shook’s model of the Lean Transformational model.

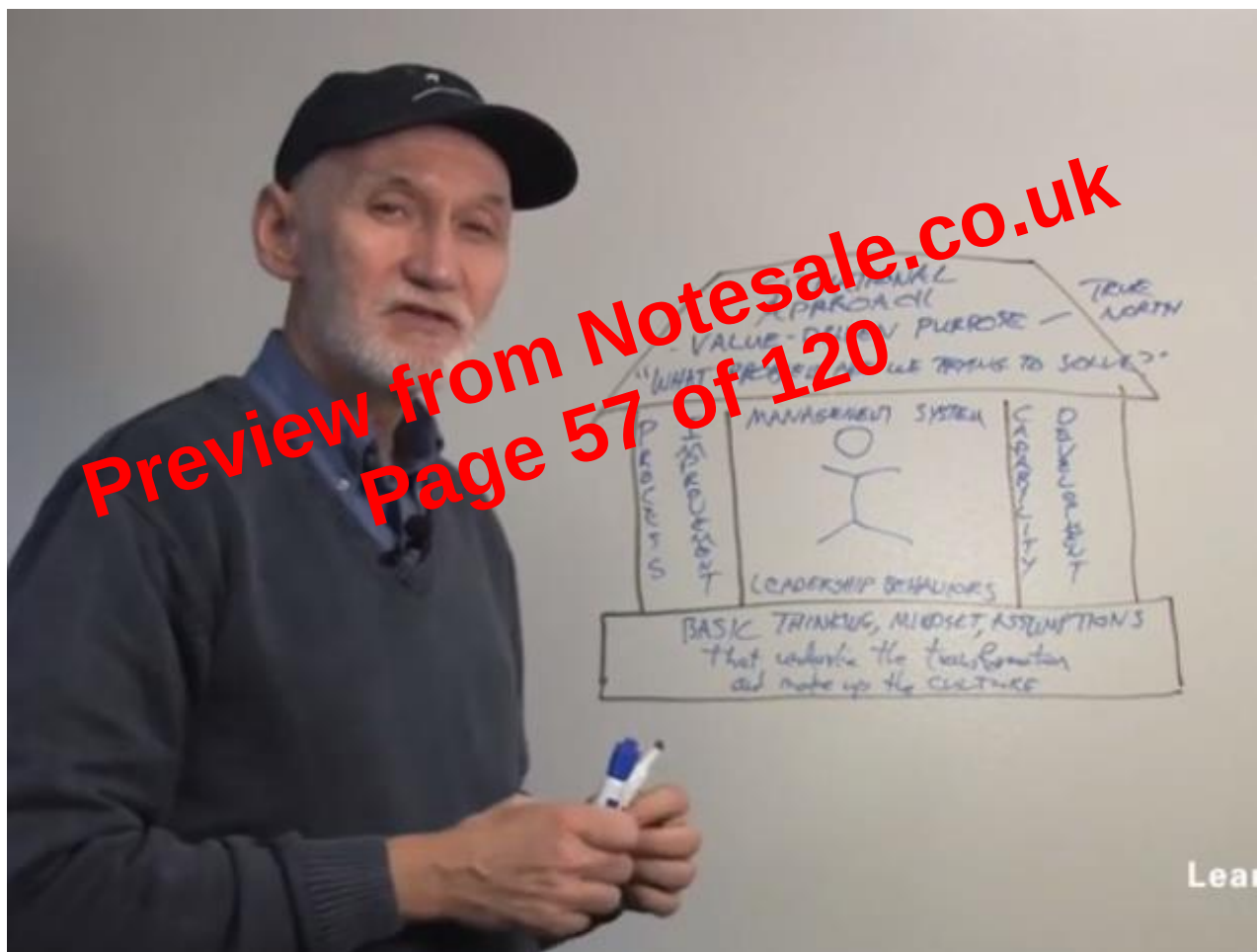


Figure 22: John Shook's Lean Transformational Model

Source – John Shook, www.youtube.com

8-Step Problem Solving Model

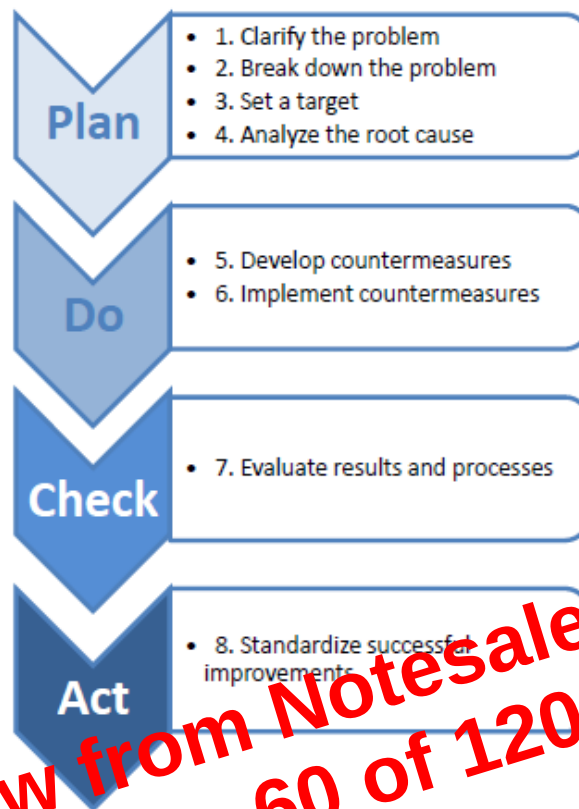


Figure 23: 8 Steps Problem Solving

Source - Internal

Principle 13 Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly.

At Toyota the decisions are made after evaluation of all possible avenues. This is explained in the Harvard Business Review article; Decoding the DNA of the Toyota Production System of Stephen Spear. According to Stephen;

Real time problem solving

The Principle; “Go and see for yourself to thoroughly understand the situation (Genchi genbutsu)” up holds the value of seen the issue as and when it occur at the point of occurrence. The Team Leaders and Group Leaders are entrusted to solve problems real time so that manufacturing flow is uninterrupted as quality of product not being undermined. As explained the Team Leaders and Group Leaders use various problem solving tools such as eight steps problem solving, asking of 5 Whys, Fishbone root cause analysis and Pareto Charts for their day-to-day problem solving initiatives. A similar approach is seen at Boeing where Superintendent who acts as a Team Leader assist the Self-Directed Work Teams on problem solving to overcome their issues. The superintendent also has role to play on coaching and guiding Team Members to develop their problem solving abilities.

Succession Planning

Secession planning is also seen as a vital contribution to the performance of the organization (especially at Toyota). Thus this aspect would also be inquired in the research.

Out of Scope – Veridical Integration between supplier partners (Best practice seen at Apple Inc.)

3.2 Research Conceptual Frame work

The conceptual frame work of the research would be as of following;

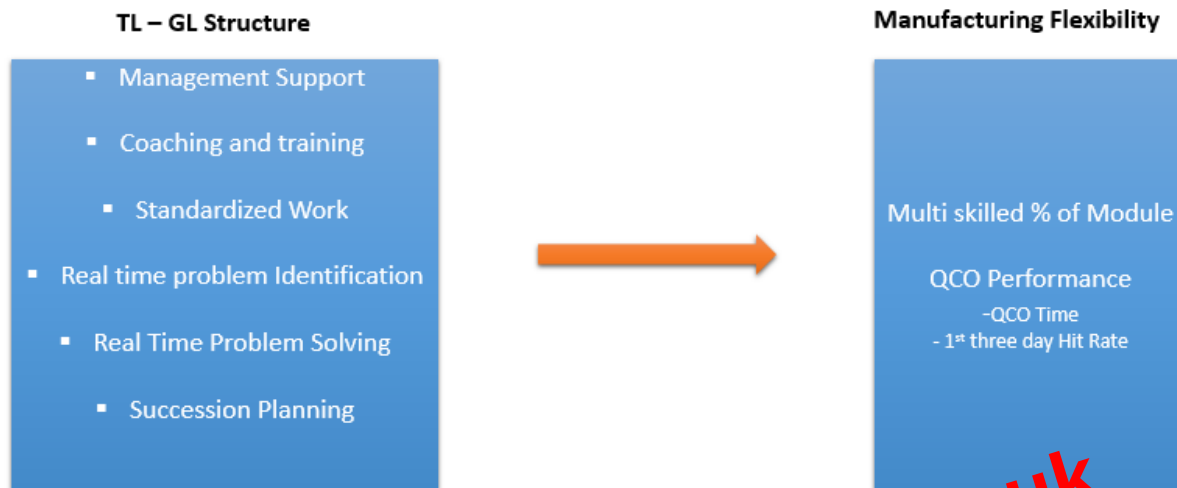


Figure 25: Conceptual Frame Work

Source – Author

The research would inquire how the elements of the Team Leader structure would impact will influence the flexibility of the manufacturing unit. The flexibility of the manufacturing unit could be measured by the multi – skilled percentage of the module (how many Team Members could multi-task/ several operations at the module). Another measure would be the QCO performance (Quick Change Over Performance) that could be measured by the QCO time (Time Taken to change from one style to another style) and 1st three day Hit Rate (efficiency of the module measured against a target efficiency ladder).

The Dependent variable are Multi-skill percentage and QCO Performance

The Independent Variables are the elements of the TL-GL Structure

3.3 Hypothesis Development

In order to measure the impact and the validity of the elements of the TL-GL structure on Manufacturing Flexibility, the following hypothesizes will be tested. For the hypothesis testing quantitative measurements will be utilized. Thus the hypothesizes would be as following;

	Likert scale used for quantitative measurement	Negative correlation coefficient
	Key informant interview	-0 – -1 = the Hypothesis would be null

Table 0-1: Research Operationalization

Source - Author

3.5 Data collection and Measurement

The researcher will try to obtain a variety of qualitative data as the topic deals with human relations and behavioral practices. Furthermore the collection of qualitative data will also give a deeper understanding and rich insight on the functionality of the Team Leader – Group Leader Structure.

Two questionnaires would be prepared – these would be;

1. For value adders (TLs and JTs / GLs) to obtain the value adder perception on the concept.
2. For Management – Inquire about the management involvement and support on the TL-GL structure.

The questionnaires would contain open ended questions and semi-structured questions which has qualitative options. These questions are intended to capture qualitative information on the topic area. To create measurability, several question of each element of the TL-GL structure contain rating scales (Likert Scales). The rating would start from 1. Strongly disagree to 5. Strongly agree, quantifying the answers of the respondents.

Further to this, several key informant interviews would be held in order to obtain depth information on topic areas.

Data analysis would be done with the feedback that are received from the respondents using the IBM SPSS Statistical package and data would be visually presented in meaningful formats accordingly.

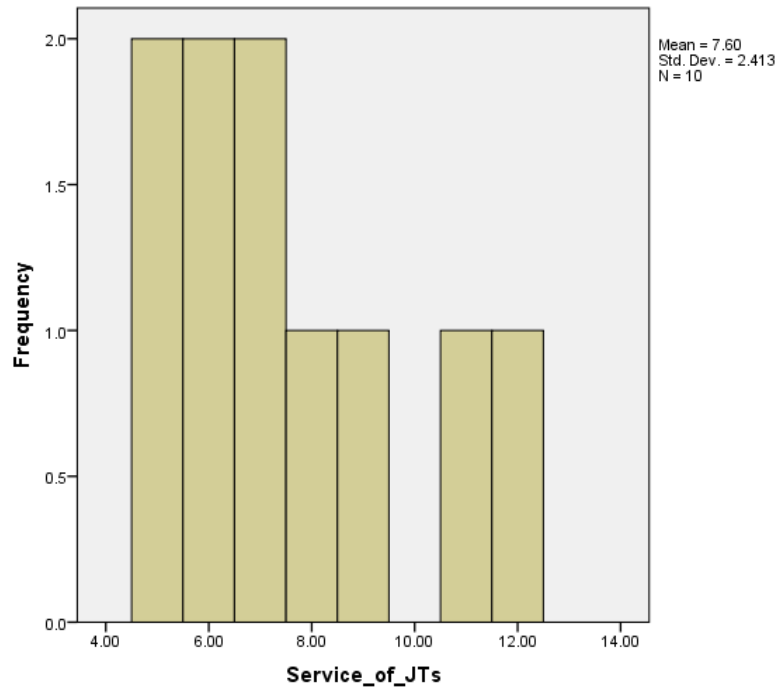


Figure 28: The Service period of Job trainers of the non-pilot area

Source: Author

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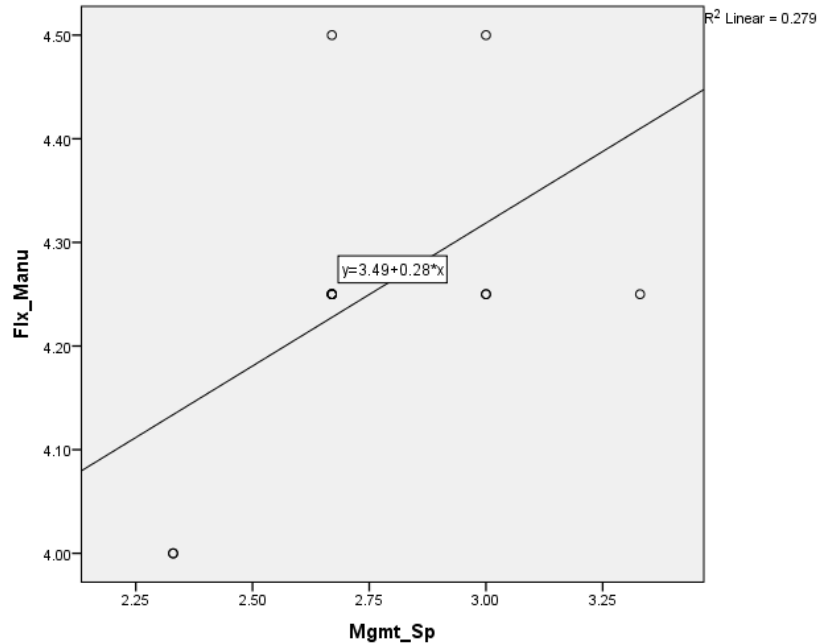


Figure 32: Scatter Plot, Correlation Analysis, Management Support on Manufacturing Flexibility (Pilot area)

4.2 Training and Coaching on Manufacturing Flexibility

The first questionnaire focused on data capturing of the Team Leaders and Group Leaders. The questionnaire intended on capturing the value adder's perspective on the Team Leader – Group Leader structure in the piloted modules and the non-pilot shop floor, thereby trying to obtain a 360 degree view on the concept.

The first question (**Q1**) inquired on the time dedication if Team Leaders and Group Leaders/ job trainers (a role equivalent to the Group Leader) on on-the-job training through job instruction training method for New Team Member training. The semi-structured question contained qualitative output measuring the daily involvement of the **TLs and GLs on teaching and coaching commitment** towards their value adding core **at their advent to the shop floor**. The answers were;

- more than one hour per day
- less than one hour per day

In the pilot area, according to the Pearson's correlation, the **R value of 0.704** demonstrates yet again a **Very strong significant positive correlation** between real time problem solving and the current state of manufacturing flexibility of this area.

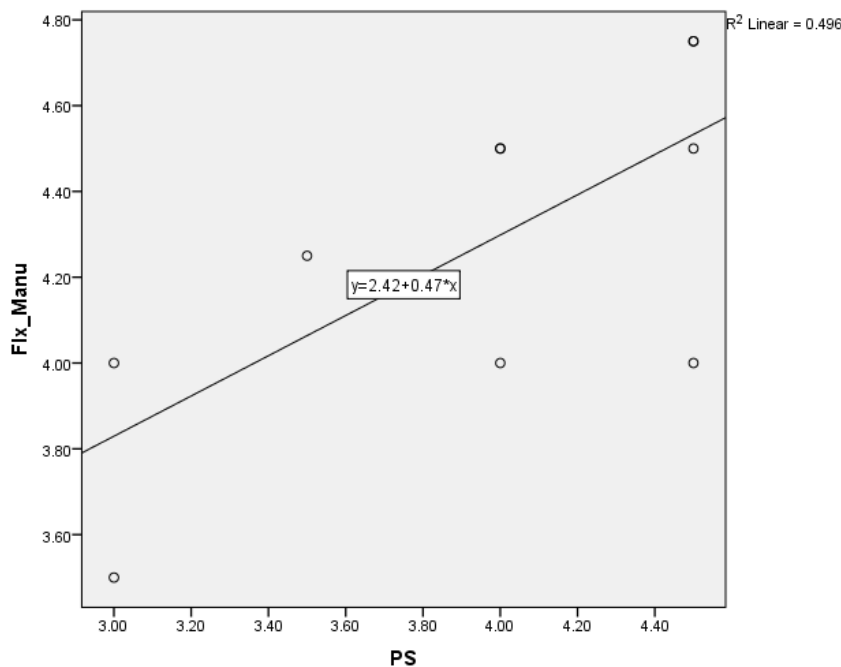
➔ Correlations - Problem Solving and Manufacturing Flexibility (Pilot Area)

Correlations			
		Flx_Manu	PS
Flx_Manu	Pearson Correlation	1	.704 [*]
	Sig. (2-tailed)		.023
	N	10	10
PS	Pearson Correlation	.704 [*]	1
	Sig. (2-tailed)	.023	
	N	10	10

*. Correlation is significant at the 0.05 level (2-tailed).

The TLs and GLs are content on the level of problem solving done at the pilot area and its frequency. Further they are positive on the input derived from problem solving initiatives that are included in the standards. The answers on the TLs and GLs are polarized in 3 and 5 (see chart Q)

➔ Graph - Problem Solving and Manufacturing Flexibility (Pilot Area)



Graph - Highlighting Abnormalities and Manufacturing Flexibility (Non - Pilot Area)

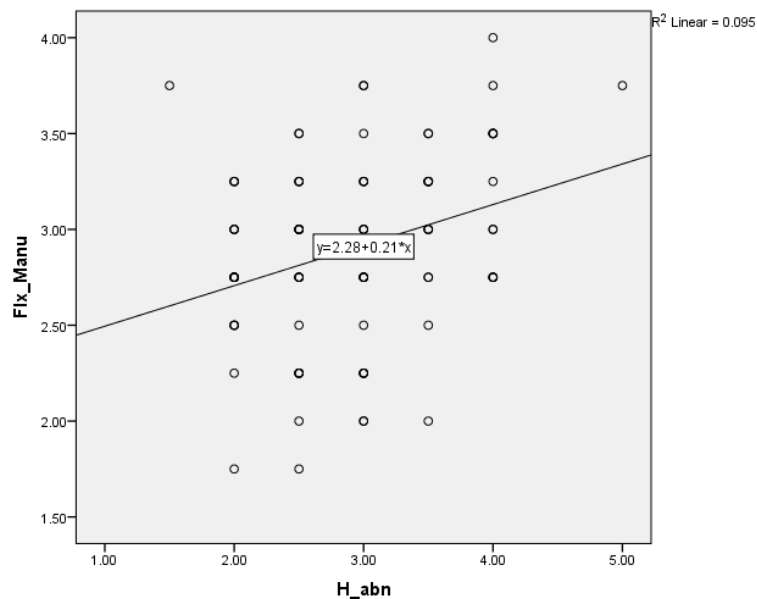


Figure 57: Correlation; Highlighting abnormalities and Manufacturing flexibility (non-pilot)

In the pilot area, the Pearson's correlation R value of 0.198 indicates a **weak positive** relationship between the two variables.

➔ **Correlations - Highlighting Abnormalities and Manufacturing Flexibility (Pilot Area)**

Correlations			
		Flx_Manu	H_Ab
Flx_Manu	Pearson Correlation	1	.198
	Sig. (2-tailed)		.583
	N	10	10
H_Ab	Pearson Correlation	.198	1
	Sig. (2-tailed)	.583	
	N	10	10

Figure 58: Correlation; Highlighting abnormalities and Manufacturing Flexibility (pilot)

The scatter plot of the pilot area also shows that the answers are scattered across the scale. This indicates that there is lack of focus and attention is given to develop the eye calibration on identification of abnormalities (see figure 58) .

Standard work should be the platform for all processes. Problem solving should be happening at each and every level, promoting the ideal span of support and continuous improvement of the process. The management should involve at each and every level of the organization to provide insight and coaching. The model demonstrated will be an ideal platform for value adder orientation.

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