

Assoc Prof. Chew Ek Peng | Prof. Gong Dah-Chuan

Heng Zhongwei (U095567B)
Yeo Han Liang (U095570R)

Phyu Phyu Thinn (U095606L)
Vaishali Raja (U095588E)

Introduction

Background

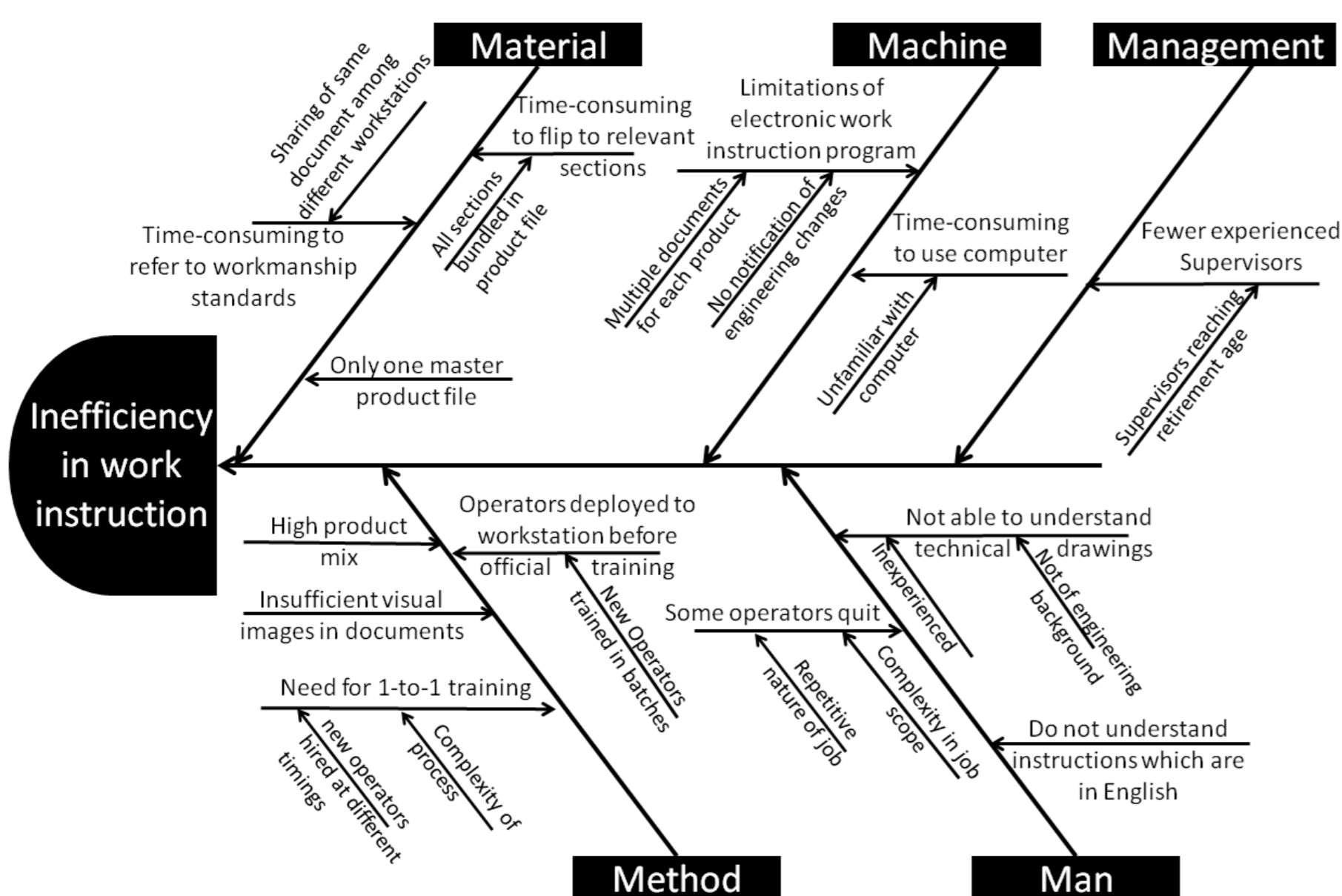
Pepperl+Fuchs (Mfg) Pte Ltd (P+F) is a leading developer and manufacturer of electronic sensors and components for the global automation market. It has plants around the world, including Germany, Singapore, Vietnam and Indonesia. For P+F, work instructions are typically relayed in English. However, foreigners make up a large proportion of the operators, more than half of whom are English-illiterate. This often leads to inconvenience in relaying workplace instructions.

Objectives

For this Systems Design Project, the group's role will be to analyze the work instruction system in P+F, and propose solution(s) to improve P+F's work instruction practices. The solution(s) should avoid manual translation efforts and ensure that operators can perform their duties according to the work instructions with minimal guidance from supervisors.

Analysis

Ishikawa Diagram



- Despite the above-mentioned constraints, the current situation in the production line is very much under control. Product quality has remained high at all times due to regular checks made and tighter supervision by supervisors. Moreover, there are various continuous improvement programs in place to help improve quality yield, efficiency and productivity.
- Nevertheless, in order to free up the time spent on regular checks and tighter supervision for more value-added tasks, a longer-term solution to improving the work instruction system is to be sought.

Solution Criteria Matrix

		Evaluation							
		A	B	C	D	E	F	Total	
To improve efficiency of Work Instructions	Management	Change culture of being reliant on notebook	3	2	1	3	2	2	2.1
	Machine	Improve DocViewer functionality	3	3	3	3	3	2	2.85
	Man	Train operators to understand technical drawings	1	3	1	1	1	1	1.4
		Train operators to understand english	1	3	1	1	1	1	1.4
	Material	Split product file into different sections	2	3	3	1	3	2	2.35
		Copy product files and workmanship standard documents for each workstation	2	3	3	1	2	3	2.35
		Have coloured photographs for product file	1	3	3	2	2	2	2.3
	Method	Improve quality of instructions	2	3	3	3	2	2	2.6
		Implement work instruction software	2	4	4	4	3	3	3.5
		Implement translation software	2	3	3	3	3	3	2.9

Rating	Opportunity Cost - 10% (A)	Reliability - 20% (B)	Team Ability - 20% (C)	Company Direction - 20% (D)	Completion - 15% (E)	Implementation - 15% (F)
1	More than \$10,000	High chance of not working at all	25% confident the team can do it	Solution is not what company wants	More than a year	Extremely difficult
2	Between \$5,000 and \$10,000	Might not work as expected	50% confident the team can do it	Solution deviates from objective	In between 6 months and 12 months	Difficult
3	Between \$1,000 and \$5,000	Will work fairly well	75% confident the team can do it	Solution very close to objective	In between 3 months and 6 months	Manageable
4	Less than \$1,000	Definitely will work	90% confident the team can do it	Solution fulfils objective	Less than 3 months	Easy implementation

Solution

1. Proposed Solution

The solution of implementing work instruction software was proposed. Work instruction software would contain operational instructions in the form of interactive videos and photographs, and allow for independent learning with translation features. Due to limited time for this project, it was decided that only a component of work instruction software – producing training videos of the production process – would be done.

3. Solution Analysis

Supervisors and operators from two workstations in the production line were asked to view the training videos which we produced, and feedback was obtained from them. A summary of the results is shown in the following table:

Potential Benefits	Limitations
Consistency in training	Language barrier not eradicated as video is produced in English
Cut down frequency of requesting assistance from supervisors	Operators having queries regarding the videos still require consultation with supervisors
Consistent exposure to technical terms	Does not significantly reduce frequency of human errors
Reduce supervisor training time	
Maximize number of operators in training	

2. Video Screenshots

- Step-by-step instructions with subtitles
- Highlights common mistakes
- Picture-in-Picture (Screenshot in video)
- Short and succinct with narration

Conclusion

Through feedback obtained from the supervisors and operators involved, it was found that our solution (i) saves the trainers' time in conducting repeated trainings, (ii) enables more operators to be trained simultaneously, (iii) allows operators to refer to the videos whenever in doubt and also (iv) have a better grasp of technical terms used. Further analysis recommends (i) the reduction of speed of video for operators to process the information better, (ii) more prominent highlighting of important areas to look out for, (iii) more detailed, step-by-step instructions in the videos and (iv) improvement in resolution and size of computer screenshots in the videos. After making refinements to the video production process, this solution can then be implemented on a larger scale in P+F. This large-scale implementation should be targeted at critical areas of production in which training takes up too much time and resources, so as to maximize the effectiveness of the solution.