

SERVICE QUALITY IMPROVEMENT BY KAIZEN THROUGH MAKIGAMI ANALYSIS

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Abstract: Organizational processes have composed culture of the Product and Service. Sound management of service quality is one of the cost effective solution to survive and lead in today's competitive era. In this study, an Office TPM tool 'Makigami Analysis' through PDCA is introduced to lean the administrative activities. 'Improvement of 'Goods Receipt to Vendor Payment Process' by Kaizen at 'Tata Hitachi Construction Machinery Co. Ltd., Dharwad' is described as a case study of Makigami Analysis. Importance of activities are discussed and results are communicated.

Keywords: Service quality improvement, Office TPM, Makigami Analysis, PDCA, Kaizen, ESCAP, PDCA, Goods Receipt to Vendor Payment Process.

I. INTRODUCTION

Industrial Business Functions can be broadly classified as 'Manufacturing' and 'Supportive functions' like Supply Chain, Quality Management, Administrative Management etc. These 'Supportive Business functions' have composite nature of product as well as service characteristics.

The way to succeed any kind of the Organization in competitive scenario is to strive continuously for improving the quality of the product or service, to focus towards customer satisfaction. This improvement is achieved through implementing the best suitable practices to meet particular objective.

1.1 Problem Statement:

Generally, 'Lean and Agile philosophy' is highly centered about 'Manufacturing'. But, it is equally important to deploy these concepts to the 'supportive functions' to really en-cash upon. Improving Service Quality of 'supportive Business Functions' through 'Lean and Agile Philosophy' is more beneficial as it is easy, it has higher Return On Investment (ROI) and shorter Payback Period.

The primary reason for this study is lack of sufficient evidence for 'Lean drive in services', which has considerable impact on the organizational performance.

1.2 Objective:

There are many practices to improve the quality of the product or service, and to keep the customer orientation in business dealings. This study aims to frame the service sector in 'Lean Philosophy' through Total Productive Maintenance (TPM), to improve service response and to capture the impact of Lean services on the organization.

1.3 Scope:

This study encompasses the introduction of the 'Makigami Analysis' and the case study of 'Goods Receipt to Vendor Payment Process' (A Supply

Chain Activity) analysis at Tata Hitachi Construction Machinery Co. Ltd. (THCM), Dharwad.

II. MAKIGAMI ANALYSIS

Total Productive Maintenance (TPM) is the success key of the Lean Management. 'Office TPM' is one of the pillars of TPM, which imparts 'Lean' characteristics to the administrative activities. 'Lean' administrative activities improve the service characteristics; which enhance the customer satisfaction. 'Makigami Analysis' is one of the LEAD [Lean Enterprise Across Disciplines] techniques to Office TPM.

2.1 Overview:

Makigami literally means 'Role of the Paper' in Japanese [1]. It makes visible the tracking of the paper movement [rolling] through the office, and helps to get the holistic view of the process through systematic thinking; which leads organization to the next successful level. This tool is used for investigation of the current 'Business Process', which identifies 'Seven Deadly Losses' those further used to design future state 'Business Process Map' [1].

Makigami Analysis consists of mapping every step – sub step activities, places the process into structured swim lanes (PSD – Process Structure Diagram) to make concurrent processes deeply accessible [2]. Although, there are enough similarities between 'Value Stream Mapping (VSM)' and 'Makigami', but it can handle the non tangible and non visible products (service) flow and value creations, unlike VSM [2].

2.2 Analysis methodology:

Analysis moves through *Plan-Do-Check-Act (PDCA)* steps as follows:

Plan:[3]

1. Team formation is the first key step to succeed the project. The team should consist of people from all the business functional and 2 - 3 people who don't know the

process, to contribute 'Silly questionnaire' during brainstorming.

2. 'Ninja' (analyser) creates 'Birds Eye View (BEV)' of the process after Team formation.
3. Then team defines objective and SMART (Specific, Measurable, Attainable, Realistic and Timely) goals of the project.

Do: [2]

4. Team maps the process in matrix form, with the movement of the information, activities performed by different parties and people involved, document or media used in communication and there hand-offs, products, time needed for activities and associated problems, standard work formats, additional resources required to expand the working scope, wasteful and Non Value Added (NVA) activities, ways to eliminate them etc.

Some Analysis charts are shown in Figure 1 and Figure 2.

Check:

5. Process Brainstorming reveals the 'deep loss analysis', composed of various losses like control loss, process loss, stagnation loss, operational losses like over production, defect, rework loss etc [1, 4].
6. This develops 'as if' process map, with improved 'through put time', better 'cycle time', fewer transfers, reduced man power requirements and errors. This mapping also helps in the formulating Top Priority (must do) projects, High Potential (high impact, but difficult to implement) projects, Quick Hits (low impact, easy to implement) projects, and Long Term (low impact, difficult to implement) projects. Kaizen Projects are the most valuable outcome of the project [2].

Act:[2]

7. After approval through 'decision makers', standard working document is prepared, new process is communicated to the involved personnel, training is provided for proper implementation.

Again PDCA: [2]

8. Follow – up audits are critically examined for sustained improvement, and to define further project.

2.3 Outcomes:

Changes proposed by Makigami Analysis are simple, but having considerable impact on the service quality. Though, major changes are achieved within 2 to 3 months, but to orient people towards 'new behaviour', from 'tasks or functions' to 'processes or systems' takes at least one year [2].

'Lean process' and 'Reduced throughput time' as outcome of the analysis, can be reinvested in the addition of 'extra value things' or can be used for 'new loss reduction activities'. This leads to quicker service response, which indirectly means improved

service package can be offered to customer within stipulated time frame. The essence of being 'Lean' can be extracted by turning the negative spiral of 'starvation due to cost cutting' to the 'profit growth to betterment' [1].

Makigami Analysis can be customized as per the priorities. Activities and sub-activities can be divided into small – small tasks for further studies. But, team has to take wise decision about activity break downs, based on real value addition to the analysis, and whether skipping some of the activity breakdown keep the losses undetected or not. Even, displaying the analysis also differs from organization to organization, and is the decision of the team.

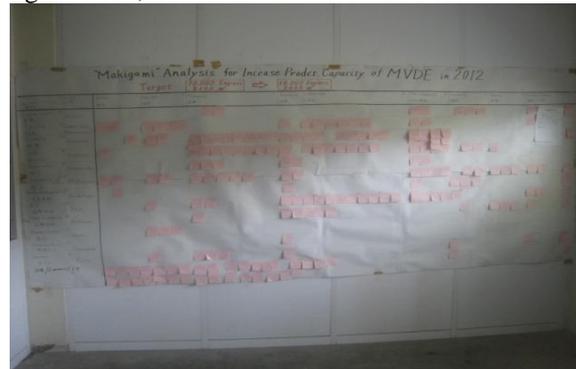


Figure 1: Makigami Analysis at Mitsubishi



Figure 2: Makigami Analysis at THCM, Jamshedpur.

2. CASE STUDY:

'Goods Receipt to Vendor Payment Process' (here onwards mentioned as 'process') under the scope of 'Supply Chain Management (SCM)' at 'Tata Hitachi Construction Machinery Company Limited, Dharwad [THCM]' is targeted to analyze by Makigami to improve vendor satisfaction.

3.1 Background:

'Quick turnaround of the goods' vehicles' and 'Knowledge about material transit status' were the demands of the transporters and vendors (customers) to THCM, have alarmed the investigation of the process. TPM circle has initiated the drive with orientation of the process.

3.2 Process orientation:

Plan:

Process is composed of 10 activities, out of which last 'Vendor Payment' is financial last activity, governed

by finance. In all, 9 activities left with the circle to go with. They are as follows:

1. Transporter reporting at Material Gate.
2. Goods Receipt MIGO (103) entry in SAP
3. MIRA entry in SAP
4. Physical verification at gate for overall consignment
5. Physical verification at stores and material unloading
6. Acknowledgement to the transporter
7. Goods Receipt in SAP through MIGO (105)
8. Vehicle moving out of the factory premises
9. Availing CENVat credit

Process has formed by rolling of four documents (papers):

1. Goods Receipt No. (GRN)
2. Material Movement Control Form (MCF)
3. Vehicle Release Note (VRN)
4. Excise copy of the invoice.

These activities are composed of physical and service (knowledge management) activities. Problem can be tackled either by improving the logistic activities or by service activities. But, improving logistic activities is costlier than handling service activities. Project of service activities has higher ROI and shorter Payback Period.

Again, activities' times need to be recorded on the basis of either Invoice or Consignment, as every consignment has different no. of invoices. So, every activity time is converted to per invoice, considering average 10no. of invoice / consignment, for better clarification in the analysis. This time is recorded after averaging of the months' time studies.

TPM team has formed the Office TPM team, and 'Ninja' is also assigned to work with the service sector of 'Knowledge Management'.

Office TPM team has simply decided to map and analyse the process by 'Makigami Analysis'.

Office TPM team has decided the target to reduce the process turnaround time at least by 30%

3.3 Analysis*:

Do:

'Vehicle Reporting at Material Gate' takes 6 min for registering invoice details and to issue GRN to

*Entire analysis sheet is difficult to describe and attach, but only important points are described herewith. the consignment.

Under smooth material flow** 'gatemanager sends vendor person to 'invoice entry MIGO (103) in SAP', as the turn comes-up. Here invoices are checked thoroughly and they are entered manually in the SAP, which consumes 3 min. MIGO (103) entry indicates material receipt, inventory ready for processing like inspection, painting and suppose to be consumed, to minimize inventory overheads. Team has found this manual entry as time consuming and laborious activity. Brainstorming through 'Why - Why analysis' reveals that, this time consumption can be

cut - shortened by providing simple bar-coding and scan gun technique, as shown in Figure 4.

This can't be tackled by restricting no. of invoices / consignment as it deviate financial practices, as per 'What - If analysis'. So, bar-coding and scan gun idea can be implemented by incorporating 'Supplier Relationship Management (SRM)' portal in SAP, deploying the responsibility of correct invoice entry in SAP to vendor end, and accessing the invoice data through Automatic Serial No. (ASN) code scanning. This automation has reduced the activity time to 0.5 min only***. SRM portal also takes care to convey the online material receipt status to vendor.

**Smooth material flow indicates no extreme emergency of the material demand. This emergency may arise due to short shipment, rejection of the material, handling damage, any unrecognized material defect, any uncertain production mishap.

***Provided invoices are correct and complete. (Ex. Sufficient no. of copies of the invoice, matching Part No. with Part name, Correct Purchase Order (P. O.), Correct quantity of the material mentioned as in the P.O. etc.)

A wise solution for better tracking of the internal logistics of the material and SAP entry, is to paste the barcode on the material itself for 'A / Super A and some of the B' class items and on the sizable packets of the C class items. But this has some practical limitations. This may increase the physical movements of the scan-gun operator. It increases the vendors' workload beyond their acceptable limit, as 'What - If' suggests. Search for suitable and ergonomically accessible place on the material surface, to paste the barcode is matter of further studies. This may change the surface integrity of the structural items, which needs to be painted to make them ready for assembly.

MIGO (103) provides MCF (transcript invoice to standard THCM format) to Vendor person, their onwards used as reference document through the process.

'MIRA entry' is input to finance given by SCM, which linkages 'Goods Receipt' to 'Vendor Payment'. Manual invoice feeding for MIRA, also gets omitted after SRM and again 2 min are saved.

Superficial physical verification of the material against overall consignment at material gate and detail verification while unloading the material are mandatory and Value Added (VA) activities, and are bounded by THCM policies. This develops better accountability, and provides double check to the consignment. They take 1 min and 5 min [10 min / consignment and 50 min / consignment] respectively. Material is unloaded at various locations in the plant, like centralized stores, attachment area, open yard etc. Some materials are directly feeded on the line on Just-In-Time (JIT) basis. (These vendors are termed as Plant-In-Plant (PIP) vendors, according THCM terminology.)

After unloading of the material, transporter is provided with Material Receipt acknowledgement

(MR) and VRN, counts for 30 sec (5 min / consignment). VRN is considered as redundant storage of the same knowledge (data) [(which has registered already at material gate) (activity 1) and in the system at MIGO (103) (activity 2)]. So, MR is counted as VA and VRN as Non VA (NVA) activity, by the team.

Team has decided to modify the acknowledgement process to combine MR with VRN. Team has also found that, time can be saved if dismantling and sorting of the invoice document set can be avoided. Use of 'Easy hold pins', and modification of MR stamp can save 15 sec (2.5 min / consignment), as team has reported.

'MIGO (105) entry in SAP' counts for 2 min (20 min / consignment). Period between MIGO (103) and MIGO (105) is the period for which inventory is blocked, and it is the time during which inventory causes to erosion of company overheads. Again, this is the period available for activities like quality checks, material rectification (if any), invoice clarification (if any) etc. MIGO (105) back-flushes the material blocked by MIGO (103) for production consumptions. Vendor needs to be paid after stipulated credit period that starts from MIGO (103), where as MIGO (105) actually permits to consume the material. So, shortening the period between MIGO (103) and MIGO (105) is important by the financial cycle point of view, and at the same time it should be enough for material pre-processing (before consumption). No NVA is found by the team during MIGO (105), but it's routing through SRM makes aware to vendor about material short shipment, rejection, acceptance etc. After MIGO (105), excise copy of the invoice is sent to excise officer for CENVat. No NVA observed by the team for MIGO (105) entry in SAP.

Quick feedback about material receipt and acceptance status at MIGO (103) and MIGO (105) respectively, considerably enhances vendor satisfaction. Vendor can chase easily about the payment.

Vehicle can move out of the vehicle premises within 3 min / consignment. Transporter shows the VRN to gateman, gateman checks the vehicle for empty stands / pallet loadings, abnormalities if any, and releases the vehicle.

CENVat credit availing activity also gets eliminated after implementation of SRM, and 3 min (15 min / consignment) are saved, as this process goes automatically in the system.

Process completes formally by Paying the Vendor after 30 days of credit period after MIGO (103) (material receipt).

So, in nutshell, SRM portal is implemented in SAP as Kaizen countermeasure, to hit all the potential activities and to lean the process through ESCAP (Eliminate, Simplify, Combine, Automate, and Parallel) way.

3.4 Results*:

Check:

- Eliminated Activities:
 - MIRA entry in SAP
 - CENVat Credit availing

*Results are Graphically Represented in the [Annexure](#).

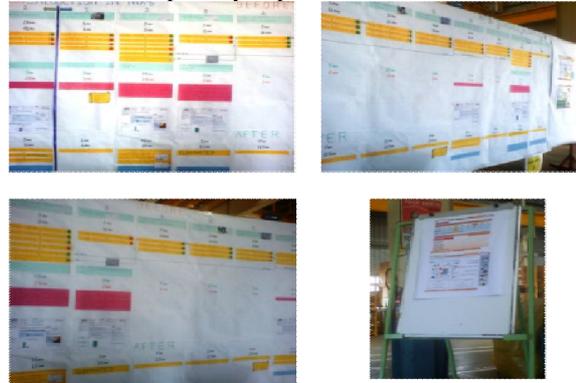


Figure 3: Makigami Analysis Display Board at THCM, Dharwad.

- Automated hence Simplified Activity:
 - MIGO (103) entry in SAP
- Intangible benefits:
 - Increased Vendor Satisfaction
 - Increased Employee Morale
- Tangible benefits:

Man-Hours savings(approx.) (Annual)	4500 Man - Hours
Annual amount savings (Millions Rs.)	6.77 /-

Process time is reduced by 25.55% by modification, and 85% target is achieved by the team.

3.5 Future Scope:

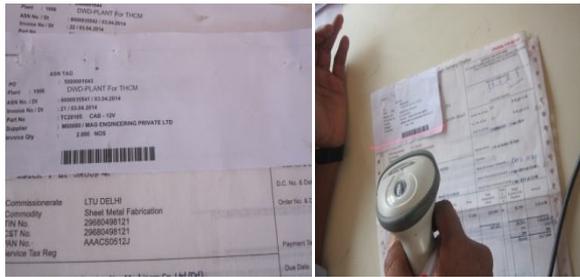
Presently, Makigami Analysis does not have considered the possibilities like material short shipment, material rejection etc. These inherent processes can be integrated for thorough understanding of the process and downsizing of the 'Through-Put-Time'.

Act:

This step calls for the actual implementation of the process, followed by document preparation for the standard working procedure and training to the personnel supposed to be involved in the process.



Before Kaizen



After Kaizen

Figure 4: Before Kaizen and After Kaizen status of the MIGO (103) entry in SAP (Activity 2)

Currently, SRM is implemented at THCM, for 60% of the vendors' consignment. These Vendors are targeted based on Parato Analysis of their Business Share.

THCM PROFILE

Organization was established and known as TELCO, in 1964. Currently, THCM is joint venture of 'Tata Motors' and 'Hitachi Construction Machinery, Japan', producer of construction equipments like Hydraulic Excavators, Backhoe-loaders etc., since 1984.

It has manufacturing bases at Kharagpur, Jamshedpur and Dharwad. Organization is market leader in Indian Construction Equipment Industry and has more than 50% market share in excavator segment.

CONCLUSIONS

Makigami Analysis is very simple and cost effective VSM tool in administrative (service) sector (office TPM), which simply tells to map the existing process, to modify it. Basically, Makigami makes the process visible, and hence suitable to investigate. It brings all the new seven management tools under common roof, to incur considerable savings.

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PROCESS:													
STATIONS	STATION 1		STATION 2		STATION 1		STATION 3		STATION 4		STATION 5		
Activity	OP1		OP2		OP3		OP4		OP5		OP6		
	Start	Duration											
Registering at the gate	0	6											
MIGO (103) entry in SAP			6	3									
MIRA entry in SAP			9	2									
Overall consignment verification at gate					11	1							
Physical verification & unloading at stores							12	5					
Acknowledgement to the transporter									17	0.5			
Goods Receipt in SAP through MIGO (105)									17.5	2			
Availing CENVat credit											19.5	3	
CYCLE TIME [minutes]				5		7		5		2.5		3	
OPERATOR LOADING				0.22		0.32		0.22		0.11		0.13	

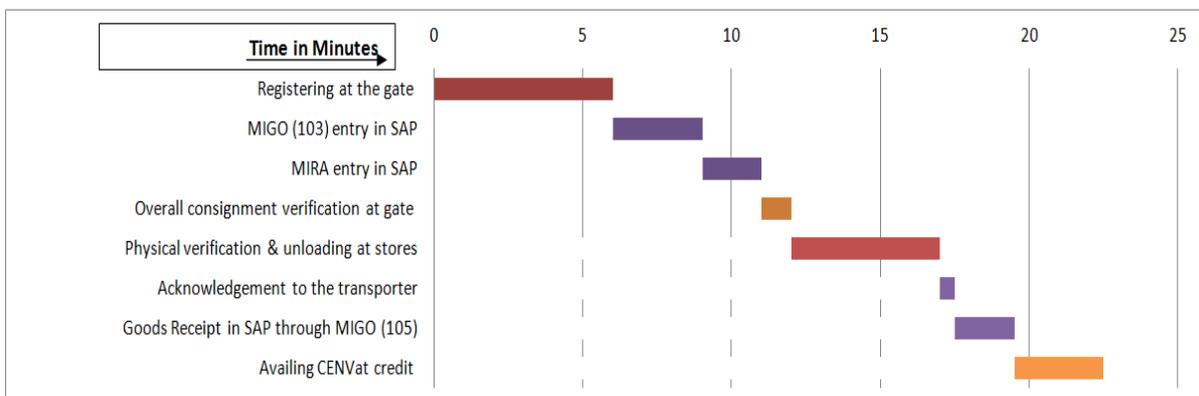


Figure 1: Graphical representation of the process before modification

MODIFIED PROCESS:													
STATIONS	STATION 1 OP1		STATION 2 OP2		STATION 1 OP3		STATION 3 OP4		STATION 4 OP5		STATION 5 OP6		
Activity	Start	Duration	Start	Duration	Start	Duration	Start	Duration	Start	Duration	Start	Duration	
Registering at the gate	0	6											
MIGO (103) entry in SAP			6	0.5									
MIRA entry in SAP													
Overall consignment verification at gate					8.5	1							
Physical verification & unloading at stores							9.5	5					
Acknowledgement to the transporter									14.5	0.25			
Goods Receipt in SAP through MIGO (105)									14.75	2			
Availing CENVat credit													
CYCLE TIME [minutes]			2.5		7		5		2.25				
OPERATOR LOADING			0.15		0.42		0.30		0.13				
					ELIMINATED Activity AUTOMATED hence SIMPLIFIED Activity								

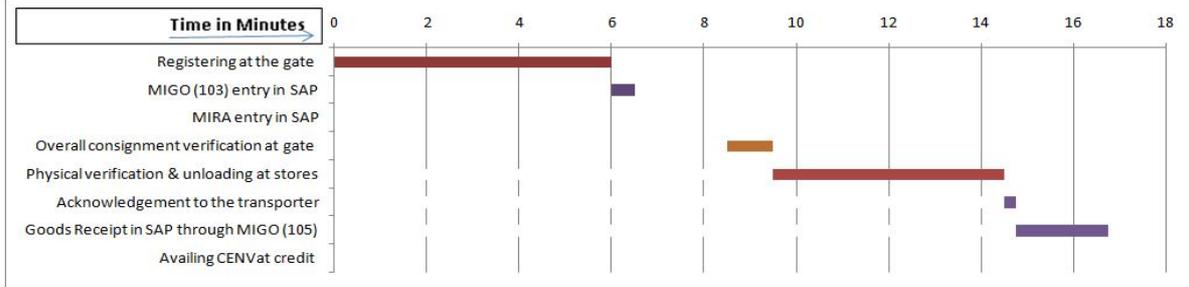
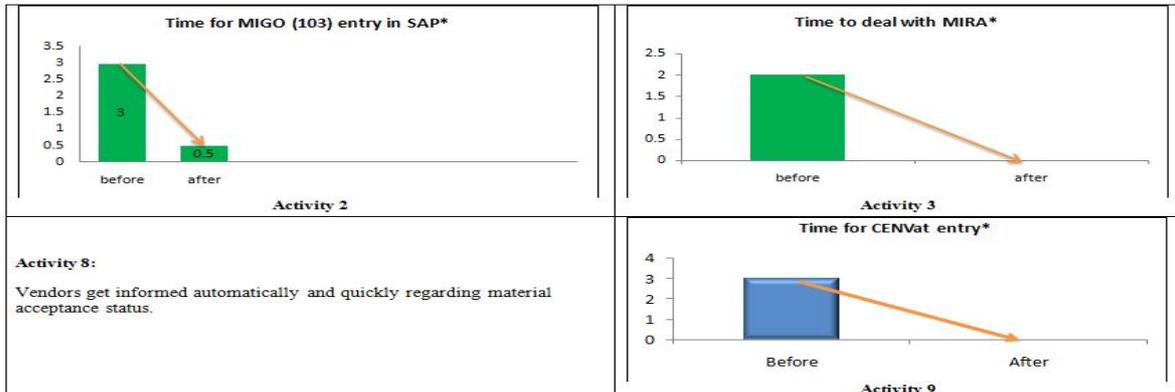


Figure 2: Graphical representation of the modified process.



*y- Axis indicates time required for the activities in minutes.