RESEARCH ON APPLICATION OF LEAN TOOLS: SOME CASES FROM SERVICE COMPANIES

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Abstract: The focus of this paper is to present expert's research for application of Lean toolbox in service providing companies. Expert groups have been explored with the purposes to demonstrate their assessment for the most applicable five Lean instruments in service providing companies and to extract further guidance for higher efficiency and effectiveness in the service organizations. Reading this, Lean managers are expected to be able to invest in the implementation of the selected toolset, with the aim of receiving higher commercial benefits for the company, which has been proven by the experts' research. The present research examines practical cases from service companies and gives statistical examples for applying Lean toolbox.

Key words: Lean Tools, Operations Management, Services.

JEL classification: M11, L84, M2

I. Introduction

The application of Lean toolbox in service-providing companies is important due to the dynamic development of the global market and the influences coming with the risk areas for the business created due to the total restrictions. The latter include quarantine restrictions for movement, employees' sick leaves, travel bans, closed market branches and completely changed working schedule due to the health prescriptions, all of which directly and indirectly reflect on the business.

Now more than any time in the last 10 years, the companies are trying to find the effective solution for their survival and focus on it. There are many kinds of improvement sets for the Lean production such as proper capacity planning, production turnover control, adequate delivery speed of the supply chain materials, number of the materials stored on site, control of the inquiries turned into sales, which are a sample of the efficiency indicators (Vitliemov, 2014).

Besides them, the indicators for company improvement - KPI indicators, could be extracted as number of the total company clients, orders received for the sampled period, volume of the sales, claims and concerns, market share per volume and segment. (Davies, 1991; King, 1994). A Lean toolset could be managed for the service-providing companies predicting and expecting a certain level of improvement of the efficiency and effectiveness indicators on site.

How these indicators could be applied for the service companies and what the level of the differences is, compared with material production will be studied in this paper. It will be measured in direct correlation with the Lean model as part of the service management (Kumar & Suresh, 2009).

If the company is focused on the process value, it will be able to remove all three

types of waste (Muda) by corrective actions.

However, there is no general framework prescribed for improvement of the service company's process based on the 25 Lean Toolbox. The blank area in the most recent articles is the lack of recommendation as to which of all Lean instruments could be considered as most applicable for service providers and which of them are expected to improve the KPI indicators of the companies once they are implemented in the organization structure. The main objectives of this study are: 1. To extract theoretical features of Lean tools and service management; 2. To suggest opportunities for the service management to be improved through expert group research; 3. To sample and analyze some preliminary Lean instruments, which provide benefits for service management companies after application.

II. Methods

The context of this study is intended to aid all managers in their decision-making process on how to invest and where to focus in the company organization chart.

When corrective actions are needed and commercial indicators in the service management need to be improved, Lean thinking could help.

These instruments are applicable since Toyota Company has escalated their benefits into the material production and they are basic pillars to deliver higher quality with lower levels of waste, defects, and mistakes (Chiarini, 2012; Meran, John, Roenpage & Staudter, 2013; Ries, 2011; Womack, 2015).

Waste definition could be a model of long-term heavy procedure depending on the company mindset and the toolbox which the management applies to update their performance level.

From theoretical point of view, in this research will be reviewed all 25 lean tools and their application in the service-providing companies. Some papers dealing with related topics can be used as fundamental reading during the process of Lean toolbox assessment in service providing companies (Yorgova, 2018) including competitiveness as a major

factor in the innovation process of the companies (Kirova, 2010).

On the other hand, a framework for trends in the IT service companies (Boneva, 2018) and the quality problems in operations management of services (Nedyalkov, 2012) are analyzed. The population of this study are 20 experts from service management companies, selected due to their expertise, practical and academic knowledge and research level. Most of them are with University degree (MBA or technical profile) and with 5 to 20 years of practical experience in the field. The study design was sampled randomly based on their age and sex. The main instruments used for the collection of data were interviews and completing of quiz tests, asking the experts to rate individually, as per their opinion, 5 most applicable Lean instruments, which are expected to give the most significant benefits for the service organization once they were applied.

III. Results

Data collection was done through remote interviews and the quiz test was completed by the experts online. Their response rates were evaluated as highly effective. All the experts chose five Lean tools, only. Demographic sampling covered 50% males and 50% females. The sample included experts with High school diploma, University degree and Academic degree.

The central research question was for the participants in this practical case research to indicate according to their experience 5 tools, out of all 25 provided, as most effective for the company. The listed toolsets in the quiz were: 5S, Andon, Bottleneck analyze, Gemba, Continuous flow, Heijunka, Hoshin Kanri, Judoka, Kaizen, Just in time, Kaizen, Kanban, KPI, Muda, PDCA, Six Sigma, OEO, Poke-Yoke, Root cause analyses, Value Stream Mapping, Visual factory, SMED, SMART, Takt time, Standard work, TPM. As a result of the expert group research were evaluated the following 5 (*marked in grey) from all 25 Lean instruments (tools) most applicable for service providing companies - Table 1:

Table 1. Lean toolset ranging as per expert's opinion for Service management.

N	Lean tool	Expert value	Final value after ranking
1	5S (sort-set in order-shine-standardize-sustain)	1	23
2	Andon (Paper Lantern)	0	1
3	Bottleneck Analysis	0	1
4	Continuous Flow	0	1
5	Gemba (The Real Place)	0	1
6	Heijunka (Level Scheduling)	0	1
7	Hoshin Kanri (Policy Deployment)	0	1
8	Jidoka (Autonomation)	0	1
9	Kaizen (Continuous Improvement)	0	1
10	Just-In-Time (JIT)	1	23
11	Kanban (Pull System)	0	1
12	KPIs (Key Performance Indicators)	0	1
13	Muda (Waste)	1	23
14	PDCA (Plan-Do-Check-Act)	0	1
15	Overall Equipment Effectiveness (OEE)	0	1
16	Poka-Yoke (Error Proofing)	0	1
17	Root Cause Analysis	0	1
18	Visual Factory	0	1
19	Value Stream Mapping	0	1
20	Total Productive Maintenance (TPM)	0	1
21	Takt Time	0	1
22	Standardized Work	0	1
23	SMART Goals	0	1
24	Six Big Losses	0	1
25	Single-Minute Exchange of Dies (SMED)	0	1

The coefficient of concordance W (or Kendall's W) for the experts is calculated as per the formula (Montgomery & Runger, 2013):

$$W = \frac{S}{(1/12).\,m^2.\,(n^3 - n) - m.\sum_{i=1}^{m} T_i} = \frac{6537.5}{(1/12) \cdot 5^2 \cdot (25^3 - 25) - 5 \cdot 3212.5} = 0.4$$

where $T_i = \frac{1}{12}\sum_{i=1}^{m}(t_i^3 - t_i)$

The figure W is the indicator for medium concordance among the experts in the group.
W = 0.4 shows a low level of concordance between the experts and their feedback.

Consequently, analysis will be conducted for concordance coefficient control check, applying Pearson's chi-squared test:

$$\chi^2 = \frac{S}{\left(\frac{1}{12}\right) \cdot mn(n+1) + \frac{1}{n-1}\sum T_i} = \frac{6537.5}{\left(\frac{1}{12}\right) \cdot 5 \cdot 25(25+1) + \frac{1}{25-1} \cdot 3212.5} = 47.73$$

After the calculations done, the value K = n-1 = 25-1 = 24, following the indicators in the table and α = 0.05, χ^2 = 47.73 ≥ table χ^2 = 36.41503. W = 0.4 – shows as a result that these calculations are reasonable and could be used as collected data in the research.

During the interviews with the selected 20 experts, they marked and consolidated over the following 5 most applicable Lean

toolset instruments: Just in Time, 5S, Kanban, Kaizen, Muda (extracted from Table 1).

The selection was confirmed through expert surveys and open discussion groups. The key findings identified during this research were that all the experts indicated 5S, Just in Time and Muda as Lean toolsets included in the list of the first 5 most effective ones for the service company management.

The secondary findings identified by the experts during their second ranging tour of the Lean instruments selected Kaizen and Kanban as the additional two sets for the purpose of this study. Due to the medium level of concordance, they did not select all 5 instruments unanimously although during the expert commission discussion all of them were chosen by a majority vote.

The steps used during the expert's research were:

- Collecting data from the experts through checklists.

- Extracting the 5 most popular Lean instruments by the experts as applicable for the service management area.

- Completing the received data in statistical tables for their further analyses.

- Calculating coefficient of concordance W (or Kendall's W) for the experts.

- Cross-checking the data as per Pearson criterion.

- Discussion and final analysis by experts at a working meeting for determining the vote.

IV. Discussion

The limitations of this study come from the possibility for verification of the proposed instruments in practice. Once selected by the experts, it will be important for them to be verified in several companies and the results to be compared with the trend of the expertise prediction and statistical approach. During the second-round of discussions, the group speaker of the experts has presented the following case as a good example for application of Kaizen Lean toolset associated mainly with material production but efficiently implemented in a service providing company.

Organizations implement Human Resource and Lean management through Kaizen as they show significant benefits from this afterwards, which is demonstrated also in Lecheva & Antonova (2012).

The perspectives for future work sampled by the group were discovered through the study case discussed for the business of Wiremold Ltd. They implemented Lean toolset of Kaizen in 1991 as the project was led by Mr. Art Burn (Lean manager of Wiremold Ltd).

Before starting the project, he found the company with a lot of delays in the customers' requests, with long time for processing the client's orders, high level of concerns and slow turnover of the actives.

Processing time sometimes takes up to 4 weeks from the client's request to the final execution of the order. As a result, each year the new services provided for the clients were between two and three. Their administration offices were separated by walls and the communication between employees was insufficient.

The first step in the Lean project of the company was to improve personnel organization, which increased the KPI indicators of the process. The total employees number once improved with up to 30%, affected the productivity of the services.

The next Lean steps were to segregate the organization chart of the company, defining each position according to the following criteria:

1. Value added position.

2. Non-value-added position, needed according to customer point of view.

3. Non-value-added position, not needed according to customer perspective.

After this process, each management role was evaluated, based on the criteria of whether the management employee is:

- Able to add value according to the client's perspective.

- Able to add value according to the client's expectation, but only after additional training.

- Not able to create value-added results even after training of the skills.

There were implemented several Kaizen improvement sessions on a weekly basis, evaluating each process continuously

several times. Lean transformation was a process taking 8 years and engaging all managers in the customers' flow directly. Otherwise, if they had not been involved in the customers' flow of issues and concerns, they would have managed the company only based on figures. As a result of the Lean transformation, each emp-loyee increased his efficiency and effec-tiveness with 20% on annual basis.

V. Conclusions and recommendations

The basic solutions of this study are that building of Lean improvement guidance for the service companies is of great demand in the modern economy. Optimizing and applying the recommended five Lean instrument toolsets for service mana-gement allows supporting the employees at a management level in increasing efficiency and effectiveness, thus making a faster way for the Lean management of the services in their companies.

Application of 5S, Kaizen, Kanban, Just in Time, and Muda in this cluster is especially effective for improvements, which require short-term management decisions. The results are based on the experts' research and discussion of the practical application of the toolbox. The conclusions drawn can be structured as opportunities to improve service-providing companies in econo-mical and organizational way that will bring preliminary benefits for service management.

Acknowledgments

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