

PRIORITIZATION OF ENABLERS OF 5S IMPLEMENTATION IN SERVICE ORGANIZATIONS USING TOPSIS APPROACH

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Abstract

5S methodology is considered as a base for different continuous improvement methodologies like total quality management. This has enforced the management of service organizations to exhibit the application of 5S in their organizations. 5S methodology implementation is affected by different factors (enablers). Effective deployment of enablers makes the fruitful implementation of 5S. So, this paper is aimed at the prioritization of enablers of 5S using TOPSIS approach.

Keywords: 5S, ranking, enablers, service organizations.

1. Introduction

5S methodology consists of 5 different words namely Seiri (Sort), Seiton (Set in order), Seiso (Shine), Seiketsu (Standardize) and Shitsuke (Sustain). 5S implementation has resulted into improvement of management, inventory control, quality of work and decrease in time along with reduction in cost of construction (Kuklare and Hedao, 2017). Jebadurai et al., (2017) stated that 5S implementation results into elimination of waste and better space utilization. Ashraf et al., (2017) enumerated various benefits such as space saving, money saving, increased productivity, decreased rejection of components of 5S implementation.

Kuklare and Hedao, (2017) analysed the feasibility of application of 5S methodology in construction industry. Islam et al., (2016) applied 5S approach on trims store's documentation system in an apparel industry. Kanamori et al., (2016a) performed study in Senegal to assess the impact of Japanese 5S management method on patients satisfaction. In another paper, Kanamori et al., (2016b) performed a review on the applicability of 5S approach for the improvement of quality in healthcare facilities. Chourasia and Nema (2016) performed literature review on the implementation of 5S methodology in the service sector. The

benefits of implementing the 5S methodology have been highlighted in this paper.

Marzban and Limouni, (2016) performed study for 5S implementation in university libraries. Ishijima et al., (2016) utilized 5S approach for improving the working environment Northern Tanzania hospitals. Kanamori et al., (2015) analyzed the staff perception on 5S implementation in health centers of Senegal. Jiménez et al., (2015) presented the implementation of 5S approach in the laboratories of an industrial engineering university school. Young (2014) performed a literature review on the application of 5S methodology in healthcare services. Jamian et al., (2014) implemented 5S methodology for improving the quality and environmental performance of Malaysian Oil Palm Dealers.

Tafreshi and Safavi, (2014) implemented 5S approach in information department of Iranian National Library. Yusof et al., (2014) assessed the sustainability of QE/5S implementation in an administration office of a higher education institution. Khandelwal et al., (2014) have assessed the effect of implementing the 5S methodology on physical workload. Aziz et al., (2014) performed a survey to evaluate the impact of 5S methodology in hospital of Malaysia. Shinde and Shende, (2014) presented a case study for the improvement of plant layout by using 5S approach. Chang and Chen, (2014) performed a study on prioritisation of 5S initiatives for a semiconductor wafer fabrication.

Salunkhe et al., (2013) applied 5S, kanban and kaizen concept for the inventory control and spare part management. Gürel, (2013) developed evaluation model for 5S in hotels. Withanachchi et al., (2007) evaluated the 5S based TQM implementation program. Ananthanarayanan (2006) presented the application of 5S management system in NDE Laboratory.

In literature, several works have been carried out by numerous authors for exploring the benefits of 5S methodology implementation in manufacturing

and service organizations. The main objective of this paper is to identify and prioritize the different enablers of 5S implementation in service organizations. For this purpose, Technique for order of preference by similarity to Ideal solution (TOPSIS) approach has been used.

2. Identifications of enablers of 5S implementation

The enablers affecting the successful implementation of 5S in service organizations have been identified through the critical literature analysis. On the basis of Ablanedo-Rosas et al., (2010); Fotopoulos and Psomas, (2010); Gupta and Jain, (2014); Ishijima et al., (2014); Kaluarachchi, (2009); Korkut et al., (2009); Sidhu et al., (2013); Singh and Ahuja, (2015); Srinivasan et al., (2016); Tsuchiya, (1999), following enablers have been identified:

- Continuous improvement
- Continuous monitoring
- Education and training
- Contribution by workforce
- Top management involvement
- Good working environment
- Information sharing
- Integration with organizational objectives
- Knowledge of 5S
- Motivation and empowerment
- Effective communication
- Good leadership
- Standardization of work/processes

3. TOPSIS methodology

TOPSIS approach is mainly used for ranking of various attributes of the considered problem or issue. The applications of TOPSIS approach is largely documented in literature. It is increasingly utilized by the numerous authors in different aspects of science, engineering, technology and management.

The various steps involved in TOPSIS methodology are as follows:

Step 1: Formation of decision matrix

TOPSIS approach starts with the formation of decision matrix.

Step 2: Normalization of decision matrix

Decision matrix is normalized with the help of following equation:

$$X'_{ij} = \frac{X_{ij}}{\left(\sum_{i=1}^m X_{ij}^2\right)^{1/2}}$$

Step 3: Compute +ve ideal solution and -ve ideal solution from the normalized decision matrix.

Step 4: Compute distance from +ve ideal solution and -ve ideal solution by using following equation:

Distance from +ve ideal solution:

$$S_i^+ = \left[\sum_{j=1}^n (X'_{ij} - X_1^+)^2 \right]^{1/2} \quad (i = 1, 2, m \dots)$$

Distance from -ve ideal solution:

$$S_i^- = \left[\sum_{j=1}^n (X'_{ij} - X_1^-)^2 \right]^{1/2} \quad (i = 1, 2, m \dots)$$

Step 5: Compute relative closeness to ideal solution by using following equation:

$$C^* = \frac{S_i^-}{S_i^+ + S_i^-}$$

Step 6: Rank the different alternatives in descending order.

3. Ranking of enablers

Ten service organizations were chosen for the finding the impact of enablers on the 5S implementation process. For this purpose, questionnaire was developed on the basis of literature study and expert views. The experts were having good experience in industrial background. The questionnaire consisting of 13 enablers of 5S implementation in service organizations were sent to different experts through the e-mail. The main objective of survey was to take the importance of each enabler on the five point scale. On this scale, 1 represents least important and 5 represents highly important. The details of experts are given in Table 2.

Table 2: Details of experts

Expert	Position of expert	Type of organization	Experience	Organization implemented 5S or not
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1	Assistant Manager	Automobile	05	Yes
2	Manager	Automobile	09	Yes
3	Manager	Automobile	08	Yes
4	Senior manager	Automobile	12	Yes
5	Manager	Automobile	08	Yes
6	Manager	Air-conditioning	08	No
7	Assistant Manager	Air-conditioning	05	No
8	Manager	Air-conditioning	09	Yes
9	Manager	Air-conditioning	10	Yes
10	Senior manager	Air-conditioning	15	Yes

The data received from the ten experts through the questionnaire is presented in Table 3.

Table 3: Data received from experts

S. No.	Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
1	Continuous improvement	3	4	3	4	5	5	5	4	3	3
2	Continuous monitoring	3	3	4	4	4	4	4	3	3	3
3	Education and training	4	4	4	5	4	5	5	5	3	4
4	Contribution by workforce	3	4	4	4	4	3	5	4	4	4
5	Top management involvement	4	4	4	4	4	4	4	3	4	5
6	Good working environment	2	3	4	4	3	3	4	3	3	3
7	Information sharing	3	3	3	1	2	2	2	3	3	3
8	Integration with organizational objectives	3	3	3	4	3	3	4	2	3	3
9	Knowledge of 5S	3	3	3	3	4	4	3	3	4	5
10	Motivation and empowerment	3	3	3	3	4	4	4	4	3	3
11	Effective communication	2	2	1	4	4	3	3	3	3	3
12	Good leadership	3	3	2	3	4	4	3	3	4	4
13	Standardization of work / processes	3	3	3	2	3	2	3	3	3	2

Afterwards, data received from experts (Table 3) is normalized by using equation (2). Normalized data is shown in Table 4.

Table 4: Normalized data

S. No.	Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
1	Continuous improvement	0.272 7	0.338 1	0.254 5	0.307 7	0.368 6	0.379 0	0.358 1	0.327 7	0.249 1	0.233 6
2	Continuous monitoring	0.272 7	0.253 5	0.339 3	0.307 7	0.294 9	0.303 2	0.286 4	0.245 8	0.249 1	0.233 6
3	Education and training	0.363 6	0.338 1	0.339 3	0.384 6	0.294 9	0.379 0	0.358 1	0.409 6	0.249 1	0.311 4
4	Contribution by workforce	0.272 7	0.338 1	0.339 3	0.307 7	0.294 9	0.227 4	0.358 1	0.327 7	0.332 2	0.311 4
5	Top management involvement	0.363 6	0.338 1	0.339 3	0.307 7	0.294 9	0.303 2	0.286 4	0.245 8	0.332 2	0.389 3
6	Good working environment	0.181 8	0.253 5	0.339 3	0.307 7	0.221 2	0.227 4	0.286 4	0.245 8	0.249 1	0.233 6
7	Information sharing	0.272 7	0.253 5	0.254 5	0.076 9	0.147 4	0.151 6	0.143 2	0.245 8	0.249 1	0.233 6

8	Integration with organizational objectives	0.2727	0.2535	0.2545	0.3077	0.2212	0.2274	0.2864	0.1638	0.2491	0.2336
9	Knowledge of 5S	0.2727	0.2535	0.2545	0.2308	0.2949	0.3032	0.2148	0.2458	0.3322	0.3893
10	Motivation and empowerment	0.2727	0.2535	0.2545	0.2308	0.2949	0.3032	0.2864	0.3277	0.2491	0.2336
11	Effective communication	0.1818	0.1690	0.0848	0.3077	0.2949	0.2274	0.2148	0.2458	0.2491	0.2336
12	Good leadership	0.2727	0.2535	0.1696	0.2308	0.2949	0.3032	0.2148	0.2458	0.3322	0.3114
13	Standardization of work / processes	0.2727	0.2535	0.2545	0.1538	0.2212	0.1516	0.2148	0.2458	0.2491	0.1557

After the data has been normalized, the next step is to compute the +ve ideal solution and -ve ideal solution (Table 5).

Table 5: +ve ideal and -ve ideal solution

S. No.	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
S+	0.3636	0.3381	0.3393	0.3846	0.3686	0.3790	0.3581	0.4096	0.3322	0.3893
S-	0.1818	0.1690	0.0848	0.0769	0.1474	0.1516	0.1432	0.1638	0.2491	0.1557

Afterwards, calculate the distance from +ve and -ve ideal solution (Table 6).

Table 6: Distance from +ve and -ve ideal solution

S. No.	Enablers	S+	S-
1	Continuous improvement	0.2434	0.5465
2	Continuous monitoring	0.3092	0.4599
3	Education and training	0.1357	0.6522
4	contribution by workforce	0.2353	0.5353
5	top management involvement	0.2215	0.5596
6	Good working environment	0.3924	0.4119
7	Information sharing	0.5675	0.2387
8	Integration with organizational objectives	0.4122	0.3677
9	Knowledge of 5S	0.3237	0.4312
10	Motivation and empowerment	0.3169	0.4075
11	Effective communication	0.4891	0.3141
12	Good leadership	0.3640	0.3661
13	Standardization of work / processes	0.5081	0.2596

Then, calculate the relative closeness to ideal solution (Table 7).

Table 7: Relative closeness to ideal solution

S. No.	Enablers	C	Rank
1	Continuous improvement	0.6919	4
2	Continuous monitoring	0.5980	5
3	Education and training	0.8278	1
4	Contribution by workforce	0.6947	3
5	Top management involvement	0.7164	2
6	Good working environment	0.5121	8
7	Information sharing	0.2961	13
8	Integration with organizational objectives	0.4715	10
9	Knowledge of 5S	0.5712	6
10	Motivation and empowerment	0.5625	7
11	Effective communication	0.3911	11
12	Good leadership	0.5014	9
13	Standardization of work / processes	0.3382	12

Table 7 also shows the ranking of the various enablers of 5S implementation.

5. Conclusion

Application of TOPSIS methodology reveals that education and training is the most significant enabler in the implementation of 5S technique in service organizations. Afterwards, it is tracked by Top management involvement, Contribution by workforce, Continuous improvement, Continuous monitoring, Knowledge of 5S, Motivation and empowerment, Good working environment, Good leadership, Integration with organizational objectives, Effective communication, Standardization of work / processes. Information sharing is the least significant barrier in the implementation of 5S. The management of service organizations needs to look on the ranking of 5S enablers and effectively deploy them.

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