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LEAN SIX SIGMA TOOLS FOR IMPROVING ADMINISTRATIVE PROCESSES IN DIFFERENT SECTORS: A SYSTEMATIC REVIEW

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ABSTRACT

Lean Six Sigma (LSS) is widely accepted as an effective management concept in minimising wastes and variation of the processes. However, few studies can be found to integrate LSS for improving administrative processes in manufacturing and services industries. Out of the practicing LSS tools, identification of the most suitable LSS tools for each stage of LSS is vital to streamline the administrative process. Although, studies were conducted on lean implementation in different sectors in ad-hoc manner, dearth of studies were focused to compare the existing literature in detail. Therefore, the study aimed to conduct a systematic literature review (SLR) on LSS tools used in administrative processes in different sectors for every LSS stage. This SLR was conducted to addressing the above-mentioned research gap by adopting to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) 2020 guideline for healthcare, education, public administration and other sectors. The initial repository comprised with 1817 and the final repository was comprised with 23 articles. The SLR has contributed to the theory by exploring suitable LSS tools and techniques for each DMAIC (Define, Measure, Analysis, Improvement, and Control) stages of LSS. Out of the identified tools, SIPOC and project charter can be recommended for the define stage whereas, process map is suggested for the measure stage. Further, Cause and effect analysis, Value Stream Mapping (VSM) and control charts are recommended for analysis, improvement and control stages. Further, some specific LSS tools were screened as a specifically applied to a particular sector. Ultimately, the results will propose to industry by applying appropriate LSS tools for administrative processes in different sectors which are not transformed into LSS incorporated internal environment.

Keywords: *Administrative Process; DMAIC; Lean Six Sigma; Lean Six Sigma Tool; PRISMA.*

1. INTRODUCTION

Administrative processes are referred as totality of generic processes and in extremely polymorphous activity in any organisation (Marume, 2016; Coughlan & Lister, 2018). Many researchers indicated that, 70% to 80% of all costs to deliver any service or product

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are comprised with the administrative processes (Ventura et al., 2020). The study by Berwick and Hackberth (2012) highlighted that the complexities in administrative processes are responsible for higher cost of production in healthcare. Consequently, Richmann et al. (2022) stated that 31% of US healthcare cost incurred with billing and insurance related activities which are one of the main administrative functions. Similarly, cost of administrative processes is remarked as high in healthcare (Kaplan and Porter, 2011; Richmann et al., 2022) as well as in higher education (Leslie & Rhoades, 1995). In addition, administrative processes may be formulated with entry points, completion of tasks with key actions and with some prerequisites with subjective paths for each individual (Coughlan & Lister, 2018). Hence, some variations may associate with administrative processes. Further, Kaplan and Porter (2011) emphasised on reducing non-value adding activities (NVAA) through standardising time in administrative processes. Therefore, administrative processes are required to regulate by adapting waste reduction principles and reduce variation with in the whole process. This underpins with the principles of lean six sigma (LSS). LSS is a business development methodology aiming to maximise shareholder's value through improving quality, speed customer satisfaction and reducing cost (Laureani and Antony, 2012). Similarly, Singh et al. (2023) indicated LSS as a technique to improve the operational effectiveness and efficiency of an organisation to achieve the competitive edge.

Laureani and Antony (2012) remarked that LSS uses tools from both toolboxes to obtain the better results than adopting Lean and Six Sigma separately. As per the recommendation by George (2003) the combination of these two concepts is deployed in organisational context by early 2000s' (Cudney & Furterer, 2020). Hence, the integrated approach of lean and six sigma is widely accepted in accomplish the business performances enhancement now (Antony et al., 2017). Similar to lean though LSS originally designed for manufacturing sector the application of LSS practices have been diversified in to various sectors as healthcare, education, finance, and public administration (George, 2003 and Singh & Rathi, 2019). Even though, Singh and Rathi (2019) investigated the LSS adaptation to different sectors as healthcare, human resource management and finances, the insight to types of LSS tools was not studied. Although, LSS application was popularised in industry sector recently LSS in servicers sectors is overreaching to manufacturing sectors (Singh & Rathi, 2019). Further, author has explored that LSS has highly implemented in financial, healthcare and educational sector about 40%, 36% and 24% respectively (Singh & Rathi, 2019).

Cudney et al. (2018) conducted a systematic review on application of lean and LSS for the processes including, academic and administrative functions of higher education. Demast et al. (2013) systematically reviewed the deploying LSS in financial sector. But, the most applicable tools were not studied. Moreover, Kuiper et al. (2022) argued that LSS tools selected in healthcare sector revolve around quick response and swift setup in terms of maximum inventories and patients in the operations. Besides, the lean implementation to administrative processes is still at the fledgling stage. Hence, it is vital to study on lean tools and its application in different sectors. Rodgers and Antony (2019) investigated on LSS application to public sector areas as healthcare, education, central government. Indeed, broader studies without limiting to public or private sectors are in need. However, application of tools in each stage of LSS was not studied. Henceforth, study in relation to tools applied in LSS stages are still lag in in-depth study. Hence, a systematic literature review (SLR) is vital to ascertain the research aim and objectives.

The aim of the research is to investigate the LSS tools and techniques in administrative processes in different sectors as education, healthcare, public administration and others. The objectives include, to identify the LSS tools and techniques used in administrative processes, to explore specific LSS tools used in administrative processes in different sectors, to evaluate the adaptation of LSS tools and techniques in administrative processes in different sectors at specific LSS stages, to suggest future research direction for the use of LSS tools and techniques in administrative processes.

2. DMAIC APPROACH IN LSS

Many researchers have utilised LSS tools and techniques to assess the improvements in the process. More to then, LSS can be embedded with Six Sigma five-phase methodology referred as DMAIC (Define, Measure, Analysis, Improvement, Control) (Laureani & Antony, 2012). George (2003) stated that tools applicable in each DMAIC stage are vital to place the human resource accordingly. Thomas et al. (2017) introduces DMAIC approach as the central driver of LSS which the appropriate lean and Six Sigma tools can be applied in each stage of DMAIC. Snee (2010) and Cano et al. (2012) recommended that since LSS is a problem-solving approach and no any improvement process is effective than DMAIC approach in LSS. By these justifications DMAIC is the most appropriate approach in LSS journey and suitable tools and techniques should be applied to achieve the desired outcome of each stage.

The '*define'* stage simply known as project charter and define the project scope, objectives, internal and external stakeholders, and roles and responsibilities of the team (Cano et al., 2012). In addition, Hafiish (2022) mentioned that, problems of the process can be initially identified at define stage. At '*measure'* stage, the flow of value through current state of the process is achieved (Hafiish, 2022; Salah et al., 2010). In next stage, '*analysis'* may continue with value stream analysis (Salah et al., 2010) or including other six sigma and lean tools such as, Pareto analysis, Failure mode effect analysis (FMEA). Next, '*improve'* phase is adjusted to make the flow in an expected way as designed in future state of the value steam analysis (Salah et al., 2010). Further, provide control procedures, continuous review and ensure the improvements have been done at the '*control'* stage (Conde et al., 2022; Salah et al., 2010). Further, the typical LSS tools applicable to processes were initially proposed by George (2003). Accordingly, both lean and six sigma tools are incorporated in DMAIC stages. Although, many LSS tools can be deployed some of the authors have recommended highly compatible LSS tools for many sectors. Therefore, applicable LSS tools in each stage of DMAIC are required to explore in to different sectors.

3. METHODOLOGY

The PRISMA 2020 statement comprises with advances in methods to identify, select, appraise, and synthesise studies with 27-item checklist (Page et al., 2021). In here, five reliable search engines are selected for the study as Scopus, Science Direct, Emerald, Taylor and Francis and Google Scholar. Further, Kuckertz and Block (2021) and Wijewickrama et al. (2021) have confirmed that above publishers are reputable databases for the search process of systematic literature review. Asnan et al. (2015) stated that around 1990s, the lean application to manufacturing sector is at widely accepted and Womack and Johnes (1996) disclosed its applicability to the service sector. Therefore, the ideology of diversion "lean" from manufacturing to service sector was planted in

1996. Hence, the systematic literature review has conducted from 1996 to 2022 timeline. As the initial step a search string with several keywords relating to the administrative processes and LSS which is presented in Figure 1.

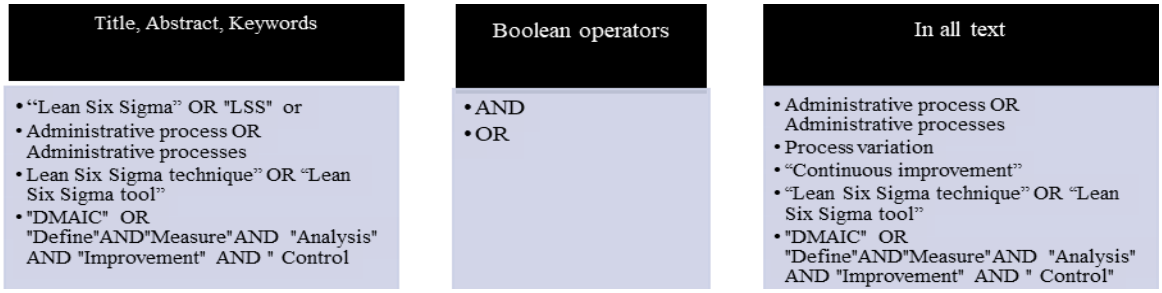

Figure 1: Search string used for SLR

According to Figure 1, search string is comprised with LSS related terms, "Lean Six Sigma Tools", "Lean Six Sigma techniques" and "administrative processes". The keywords are used to in-depth search in title, abstract, keywords search and in all text of the sources. Consequently, screening process has to be done to select the relevant studies out of the initial repository.

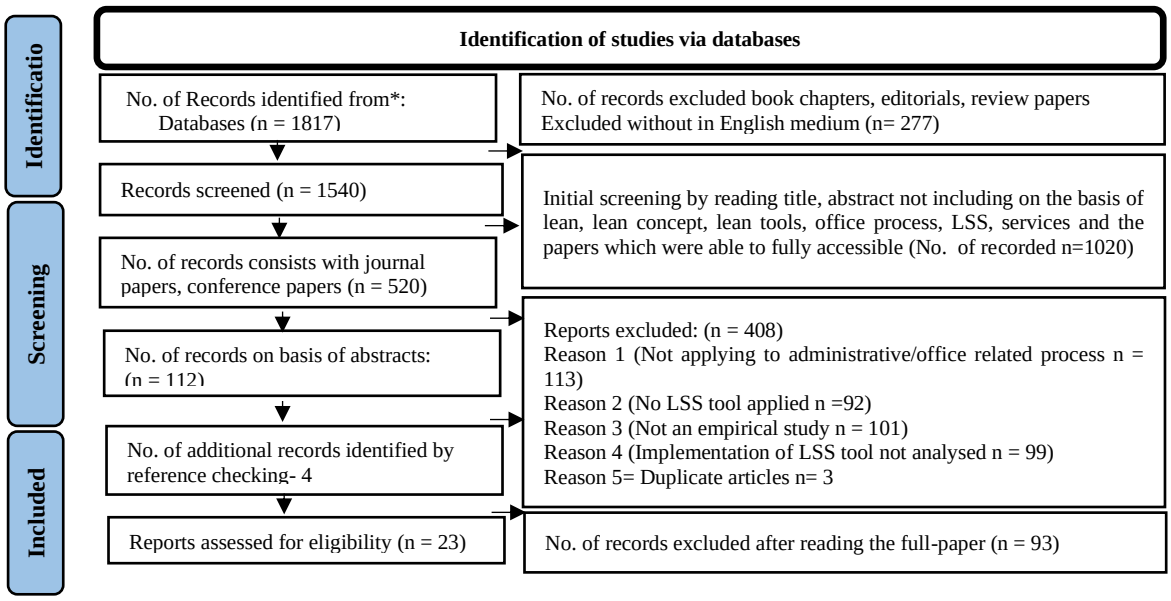

Figure 2: PRISMA flow diagram

The preliminary screening process was performed by including journals, conference papers, and unpublished thesis while excluding chapters, editorials and publications except in English. Further, administrative processes are inseparable in-service sector, industry or public sector. Hence, the relevant articles were further screened thorough reading of full articles. The PRISMA flow diagram used for the study is given in Figure 2. Initially 1817 articles were selected from the searched protocol. After the first screening, 1540 articles were subjected to the subsequent screening. Progressively, the articles refined up to 112 based on the 4 reasons: not applying to administrative/office related process, no LSS tool was applied, not an empirical study and implementation of LSS tools but not analysed. Meanwhile, the 4 articles were added to the repository and refine through reading full paper and totally 93 articles were rejected from the screening

and further removing the duplicates. As a result of the above robust selection process the final repository contains 23 articles and subsequently, subjected to content analysis.

4. RESULTS AND DISCUSSION

After the screening process the infiltrate of 23 studies were extensively subjected to the content analysis. The findings are presented in following sections.

4.1 LSS TOOLS AND TECHNIQUES APPLIED IN ADMINISTRATIVE PROCESSES OF DIFFERENT SECTORS

As per Figure 3, various types of tools and techniques were applied to streamline the administrative processes in different sectors. These tools are comprised with both LSS and Six Sigma tools. Out of them, Process map is the highly used tool in LSS incorporated administrative processes irrespective to any sector. Consequently, SIPOC, Cause and Effect diagrams, Control plan, CTQ, Project charter, Standardisation of process and Value stream mapping (VSM) are frequently used tools and techniques in administrative processes. Further to then, VSM and process maps are considered as lean tools while SIPOC, Cause and Effect diagrams, Control plan, CTQ, Project charter are known as Six Sigma tools. Further, Brainstorming and Standardisation of process are highly used techniques in administrative processes. Overall, above tools and techniques are investigated as commonly used tools and techniques in streamlining the administrative processes under LSS. Further, above tools and techniques are also adapted in most of the administrative processes in education, public administration and other sectors.

The tools and techniques used in administrative processes are mentioned in Figure 3.

4.2 SECTOR SPECIFIC LSS TOOLS AND TECHNIQUES USED IN ADMINISTRATIVE PROCESSES

According to Figure 3, many specific LSS tools and techniques can be distinguished specifically applied for a particular sector. Contrary, most of the statistical techniques are widely used in healthcare related administrative processes. For instance, χ^2 test, ANOVA table, two sample-t test are some of the specific techniques used for healthcare sector. Apart from that calculation of cycle time, VOC, GEMBA, Kanban also demarcated as specifically used in healthcare sector. In education sector, affinity charts, takt time calculations are specifically applied in streamlining the administrative processes while, spaghetti charts, run charts, kaizen are particular to public administration sector. Further, lean consumption map is exclusively used for improving tax services in Indonesia (Sunaryanto & Sysh, 2019). However, sector specific LSS tools are still not tested for the administrative processes in other sectors.

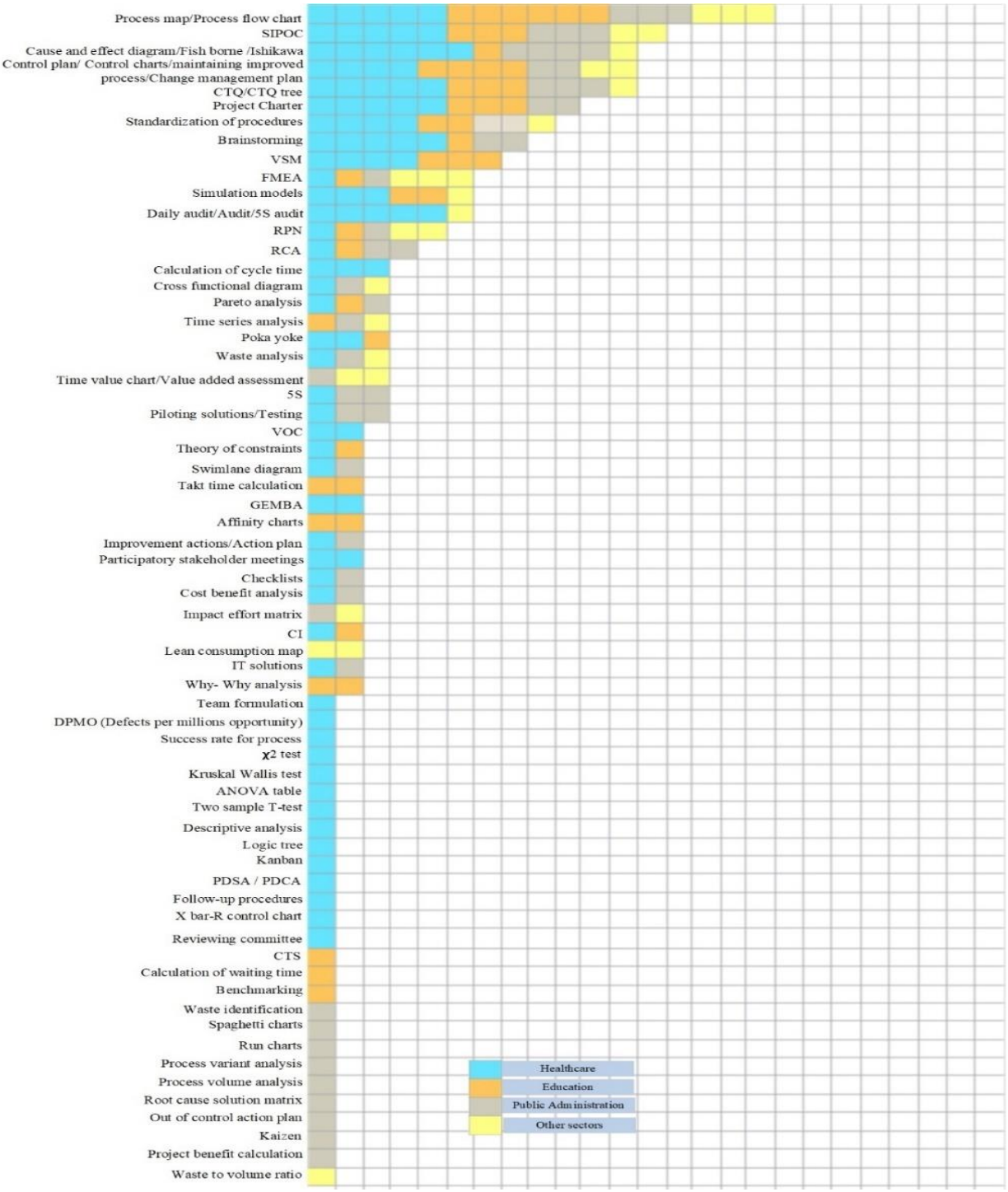

Figure 3: Different LSS tools and techniques used in administrative processes

4.3 DMAIC STAGE SPECIFIC TOOLS APPLIED IN LSS ADMINISTRATIVE PROCESSES IN DIFFERENT SECTORS

Tools and techniques used at DMAIC stages in different sectors were segregated and presented in Table 1.

Table 1: Tools applied in LSS administrative processes in different sectors at different stages of DMAIC

LSS phase	Type of Tool/Technique	SECTOR																								Total
		HEALTHCARE									Sub-total	EDUCATION						Sub-total	PUBLIC ADMINISTRATION					Sub-total	OTHER SECTORS			Sub-total	
		A	B	C	D	E	F	G	H	I		J	K	L	M	N	O		P	Q	R	S	T		U	V	W		
Define	Project Charter	√	√	√	√					√	5	√	√				√	3	√			√		2				0	10
	CTQ/CTQ tree		√	√					√		3				√	√	√	3			√	√		2			√	1	9
	SIPOC		√	√	√	√				√	5	√	√				√	3	√	√		√		3	√	√		2	13
	VOC				√	√					2							0						0				0	2
	Process map					√					1			√				1						0				0	2
	Team formulation						√				1							0						0				0	1
	Theory of constraints							√			1						√	1						0				0	2
	CTS										0	√						1						0				0	1
	Stakeholder analysis										0							0				√		1				0	1
	Waste identification										0							0					√	1				0	1
Measure	Process map/Process flow chart		√		√					√	3	√	√			√	√	4	√	√	√			3	√	√	√	3	13
	Calculation of cycle time			√		√			√		3							0						0				0	3
	CTQ	√				√					2							0		√				1				0	3
	DPMO (Defects per millions opportunity)		√								1							0						0				0	1
	SIPOC						√				1							0						0				0	1
	Swimlane diagram						√				1							0		√				1				0	2
	Spaghetti charts										0							0					√	1				0	1
	Cross functional diagram						√				1							0		√				1		√		1	3
	Success rate for process							√			1							0						0				0	1
	VSM								√		1			√	√			2						0				0	3
	Calculation of waiting time										0	√						1						0				0	1
	Collection of voice of process (VOP) data										0	√						1						0				0	1
	Time series analysis										0		√					1		√				1				0	2
	Takt time calculation										0			√			√	2						0				0	2
	Run charts										0							0	√					1				0	1
	Waste analysis										0							0	√					1				0	1
	Lean consumption map										0							0						0		√		1	1
	5S										0							0			√			1				0	1
	Process volume analysis										0							0				√		1				0	1
	Process variant analysis										0							0				√		1				0	1
Analysis	χ^2 test	√									1							0						0				0	1
	Kruskal Wallis test	√									1							0						0				0	1
	Brainstorming	√	√								2							0	√			√		2				0	4
	VSM		√		√				√		3						√	1						0				0	4
	Cause and effect diagram/Fish borne /Ishikawa			√	√	√	√	√		√	6		√					1	√		√	√	√	4			√	1	12

LSS phase	Type of Tool/Technique	SECTOR																							Total
		HEALTHCARE									Sub-total	EDUCATION						Sub-total	PUBLIC ADMINISTRATION					Sub-total	OTHER SECTORS			Sub-total	
		A	B	C	D	E	F	G	H	I		J	K	L	M	N	O		P	Q	R	S	T		U	V	W		
	GEMBA		√	√							2							0						0				0	2
	Pareto analysis		√								1				√			1	√					1				0	3
	ANOVA table		√								1							0						0				0	1
	Simulation models			√					√		2	√						1						0				0	3
	Two sample T-test			√							1							0						0				0	1
	RCA			√							1				√			1	√		√			2				0	4
	Descriptive analysis				√						1							0						0				0	1
	IT solutions					√					1							0						0				0	1
	FMEA					√					1		√					1		√				1	√	√	√	3	6
	RPN					√					1		√					1		√				1	√	√		2	5
	Logic tree							√			1							0						0				0	1
	Poka yoke								√		1					√		1						0				0	2
	Affinity chart										0			√			√	2						0				0	2
	Why- why analysis										0						√	1						0				0	1
	Piloting solutions										0							0	√					1				0	1
	Added value analysis										0							0				√		1		√	√	2	3
	Waste analysis									√	1							0						0	√			1	2
Improvement	Improvement actions/Action plan	√									1							0					√	1				0	2
	Simulation models		√								1	√						1						0	√			1	3
	Kanban			√							1							0						0				0	1
	Brainstorming				√		√			√	3				√			1						0				0	3
	Affinity charts										0						√	1						0				0	1
	PDCA/PDSA				√						1							0						0				0	1
	VSM (FS)					√					1			√				1	√					1			√	1	4
	5S									√	1							0				√		1				0	2
	Daily audit/Audit/5S audit					√	√				2							0						0				0	2
	Participatory stakeholder meetings					√	√				2							0						0				0	2
	Pilot testing						√				1							0						0				0	1
	Checklists							√			1							0				√		1				0	2
	Follow-up procedures							√			1							0						0				0	1
	Cost benefit analysis								√		1							0			√			1				0	2
	FMEA										0		√					1						0			√	1	2
	RPN										0		√					1						0				0	1
	Why-Why analysis										0						√	1						0				0	1
	Impact effort matrix										0							0		√				1		√		1	2
	Root cause solution matrix										0							0				√		1				0	1
	Time series analysis										0							0						0		√		1	1
	Time value chart/Value added assessment										0							0						0		√	√	2	2

LSS phase	Type of Tool/Technique	SECTOR																						Total
		HEALTHCARE									Sub-total	EDUCATION						Sub-total	PUBLIC ADMINISTRATION					Sub-total	OTHER SECTORS			Sub-total	
		A	B	C	D	E	F	G	H	I		J	K	L	M	N	O		P	Q	R	S	T		U	V	W		
	Benchmarking										0					√		1						0				0	1
	IT Applications										0							0			√			1				0	1
	Lean consumption map										0							0						0	√			1	1
	Control plan/ Control charts						√	√	√	√	4	√		√	√		√	4	√	√				0	√		√	2	12
	Poka yoke	√									1							0						0				0	1
	Daily audit/Audit/5S audit	√	√							√	3							0						0	√			1	4
	X bar-R control chart	√									1							0						0				0	1
	Standardization of procedures	√	√	√				√			4		√				√	2	√			√		2	√			1	9
	Reviewing committee			√							1							0						0				0	1
	CI				√						1					√		1						0				0	2
	Out of control action plan										0							0		√				1				0	1
	Run charts										0							0	√					1				0	1
	Piloting solutions										0							0	√				√	1				0	1
	Kaizen										0							0			√			1				0	1
	Project benefit calculation										0							0				√		1				0	1
Control	Waste to volume ratio										0							0						0		√		1	1

A- Basta et al. (2016), B- Bhat et al. (2014), C- Bhat and Jnanesh (2014), D- Cheung et al. (2016), E- Daly et al. (2021), F- Kovach and Borika (2018), G- Laureani et al. (2013), H- Southard et al. (2012), I- Antony et al. (2022), J- Furterer et al. (2019), K- Li et al. (2019), L- Oko and Kang (2015), M- Sunder and Mahalingham (2018), N- Svensson et al. (2015), O- Webb and Furterer (2019), P- Antony et al. (2017), Q- Ginanjar and Sysh (2019), R- Kim (2020), S- Kregel and Coners (2018), T-Zefaj (2021), U- Artadi and Syah (2019), V- Sunaryanto and Sysh (2019), W- Lee et al. (2013)

LSS tools are deployed at DMAIC stages in different sectors has been studied. In order to assess the administrative factors, lead to the inefficiencies, VSM, Gemba walks, SIPOC tools are used by Cheung et al. (2016). However, Tortorella et al. (2016) revealed the use of VSM is successful at the journey of lean initiatives in healthcare. Similarly, Argiyantari et al. (2021) adopted with Gemba walks, VSM, Pareto analysis for delaying the transportation in pharmaceutical products. Obviously, these tools have to be included in LSS process. At each stage some of the tools are frequently used and some of the tools are not frequently used. Several papers reported that SIPOC tool is highly recorded in define stage while project charter and critical to quality (CTQ) characteristics are also frequently used in administrative processes related studies (Basta et al., 2016; Cheung et al., 2016; Furterer et al., 2019; Li et al., 2019). According to the Basta et al. (2016) aim of the define phase of LSS is to select and design the project to reach the target. Additionally, Bhat et al. (2014) disclosed that the scope of the project and the areas to be improved will be identified in this stage. Thus, a tool which can be deployed to scan the respective organisation environment may effective to use. Next, process maps or flow charts are abundantly applied at the measure phase.

Further, VSM can be derived from process flow charts including performance data, information flow with linking the works (Cheung et al., 2016). Therefore, VSM can use in measure phase too. However, in most cases time related parameters are concerned measure stages such as calculating cycle time (Bhat & Jnanesh, 2014; Cheung et al. 2016; Southard et al. 2012), takt time calculation (Oko & Kang, 2015; Webb & Furterer, 2019) calculation of waiting times (Furterer et al., 2019). Kaspin (2022) assured that cause-and-effect analysis can be utilised in analysis phase. This study investigated that, not only that tool, FMEA, RPN, and VSM tools are also applicable. By reviewing the above Figure, tools and techniques used in measure and analysis phases are comparatively high. Indeed, the application of VSM in improvement phase. Apart from that, impact effort matrix, daily audit, FMEA, Checklist, Kanban tools are used. In Control phase, control plan, Standardisation, CI, 5S audits are adapted. However, some of the strategies were coincided in some phases such as SIPOC, CTQ and process maps tools are in both define and measure phases, FMEA, why-why analysis are coincided in analyse and improvement phases. Not only the common tools but some of the tools are identical for a particular phase in LSS. Obviously, Project charter tool is specific for the define phase (Webb and Furterer, 2019; Antony et al., 2017; Kregel and Coners, 2018) whereas cause and effect diagram tool (Kovach and Borika, 2018; Laureani et al., 2013), GEMBA (Bhat et al., 2014; Bhat and Jnanesh, 2014), pareto analysis (Sunder and Mahalingham, 2018; Antony et al., 2017) are specifically used at the analysis phase. Moreover, PDCA, Kanban tools are identical to improvement stage while control plan, standardisation, Kaizen, continuous improvement are explicated for the control phase. By recapitulating the above findings when designing a LSS approach to streamline an administrative process in any sector suitable tools and techniques can be selected from the above tools and techniques in a respective phase.

Nevertheless, some of the tools and techniques are widely used in a particular sector but not adapted to other sectors. For instance, theory of constraints is applied in both healthcare and education sectors and it can be adapted to the public administration and other sectors such as construction, manufacturing etc. Furthermore, process maps are widely used in all sectors at measure phase. Contrary, calculating cycle time is specifically studied in healthcare sector and still not adapted to the education, public

administration and other sectors. Bhat and Jnanesh (2014) calculated the cycle time at the operations in Outpatient Department in Indian rural hospital while Daly et al. (2021) calculated the cycle time of scheduling Orthopedic surgical processes at the measure phase. Despite waiting times of students in commencing the tutoring sessions were studied in education sector (Furterer et al., 2019). In analysis phase cause and effect diagram is highly applied in healthcare and public administration sector whereas less studies relating to administrative processes in education sector. In spite of that, effects of adapting RCA is studied in relation to the education sector as well. Additionally, RPN, FMEA tools are adapted in many sectors in fewer studies. On the other hand, the applicability of why-why analysis, Poka-yoke and logic tree tools related to public administration sector and other sectors (finance, banking, construction) can be studied. Obviously, VSM is recorded as the highly used tool at Improvement phase in every sector. Although PDCA is accepted in applying healthcare sector but lesser studies in relation to other sectors such as education, public administration, logistics, construction. Moreover, out of control action plan, Kaizen, run charts are adapted in public administration sector and still not adapted to education, healthcare and other sectors. Indeed, there is a potential to use these tools in DMAIC stages of a LSS process.

5. CONCLUSIONS

This SLR was conducted to synthesis the body of knowledge of LSS application and through the content analysis. 66 LSS tools and techniques were investigated as applicable in administrative processes. Overall, Process map, SIPOC, cause and effect diagram, control plan, Process change management plan, CTQ, Project charter, Standardisation of procedures are highly applied in all sectors. Further, it was revealed number of LSS tools which are applicable in each stage of DMAIC approach. However, the most applicable tools were investigated. At define stage, SIPOC, project charter tools are highly acceptable irrespective to a sector. Further, process map can investigate as the highly recommended tool in measure stage in administrative processes. Cause and effect analysis is screened as a specifically used in analysis stage. In improvement stage, VSM was investigated as the most applicable tool while, control charts and standardisation of process for the control phase. Moreover, when considering the specific LSS tool for a particular sector, waste identification and stakeholder analysis was specifically used at the define stage in public administration sector. In healthcare sector, DPMO and SIPOC was specifically applied at the measure stage. Further, most of the statistical methods as Kruskal Wallis test, x^2 test, are specifically used in healthcare sector. This SLR contributes to industry, when designing LSS approach in any sector any of tool can be selected from the tools and techniques clustered in each phase. Furthermore, the study contributes to theory by investigate on frequently used tools and specific tools for DMAIC stages in above sectors.

6. THE WAY FORWARD

The development of the usage of LSS tools and techniques with the chronological order is not analysed. Still, some of the tools and techniques are specifically used in a particular sector such as Kanban tool is used for healthcare sector, Kaizen tool used for public administration sector. However, the applicability of these tools in administrative processes in other sectors can be investigated. Hence, considering the sector-wise comparison, some sectors have limited studies on adapting LSS in administrative

processes. Therefore, the studies are linked with administrative processes in other sectors like physical infrastructure projects, banking, and tourism industries. Further, this study emphasises the necessity of adapting LSS tools in administrative processes in any sector to restructure the administrative processes and direct to improved performances of the organisation. Consequently, the specific tools and techniques explored in particular sector can be tested for the other sectors to enhance the novelty of the future studies. Finally, this study is a part of the initial study and these findings will be validated through an empirical study.

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