Looking for Employees' Efficiency? Change the System through Value Stream Mapping

Tharangani D. P.[1], Jayantha K[2],

[1]Assistant Registrar, Faculty of Social Sciences, University of Kelaniya, Sri Lanka
[2]Senior Lecturer, Department of Sport and Physical Education, University of Kelaniya, Sri Lanka

Abstract:
'Inefficiency' is considered as a buzz word with regard to the administration system of government organisations (ASGO) in Sri Lanka. Within a context of increasing annual budgetary allocation in each year, the universities are equipped with modern facilities such as information technology and continuously doing researches in different levels, conduct workshops to train employees and continuously recruit educated people. As like as the other government sectors, government universities experience inefficiency in different levels and different volumes. The inefficiency of ASGO in Sri Lanka would negatively impact on the brand identity of each organization and this study aimed to develop an efficient leave management process (LMP) for the government-university system in Sri Lanka. The key objective of the study was to propose a process map with lesser lead time instead of existing LMP of the university. The specific objectives were to recognize the existing LMP, to measure the lead time of the existing LMP, to understand the existing rules and procedures belong to leave management process and to measure the lead time of the proposed leave management process. Sample data were collected from the existing leave management process of the university in the last three years and simple statistical tools such as mean values and percentage values were associated in the analyzing process of the study. The results showed that there was a waste due to unnecessary processes and practices in the existing process and therefore it leads to inefficiency. The proposed Value Stream Map (VSM) shows lesser lead time to improve the efficiency of the LMP and then the efficiency in ASGO.

Keywords: *Lean, Process Efficiency, Public Organisation, Lead Time, Value Stream Mapping*

Introduction:
The employment rate of the public sector is gradually improving in Sri Lanka. In 1968, the total numbers of employment were 419029 and that was expanded to 853,298 and 1,117,808 in 2006 and 2016 respectively (Preliminary Report, 2016). 61.1% of these employments have education qualifications in general certificate of education at an advanced level or above. 38.8% of the public and semi-government sector employees demonstrate English proficiency in reading, writing and speaking and 60% of these employees are having the ability to use a computer (Director General, 2018). At the opening ceremony of Eval Colombo 2018, which was held at Colombo Hilton in 17th of September, president of the democratic socialist republic of Sri Lanka, Maithripala Sirisena mentioned that only about 35% of government sector employees are efficient (Zacki Jabbar, 2018). This statement emphasizes that 65% of government sector employees are inefficient. Aforementioned statistics raised our major concern on the efficiency of the government sector. It is clearly visible that almost all the employees in the government are having suitable education qualifications to continue with their work. Yet, how can an organisation have the majority of inefficient employees? Do these statistics correct or the qualifications of the employees should be questioned? As the aforementioned statistics were coming from a reliable source, hardly the statistics can be denied. Hardly the qualifications of the employees can also be rejected as the employees are selected to an organization through a thorough screening process. Therefore, we hypothesised that the current process that

is being used by the government organisations to increase its efficiency is having deficiencies and as a result of such processes the employees have become inefficient.

Different scholars in Sri Lanka have suggested various solutions to enhance the efficiency of government sector organisations in Sri Lanka. But, we have identified that some of those solutions did not directly approach the root cause of the problem but indirectly. N.P.K. Opatha (1991), conducted a study to identify and assess the performance evaluation systems being followed by selected organizations in Sri Lanka, to present ways and means, in terms of suggestions and to advance current performance evaluation systems in selected organizations. Dhammika, K.A.S., (2013) revealed that the behavioural factors such as the job, career, team, innovator and organization are important aspects to be concerned in the assessment of the performance of employees. In addition to that Hettiararchchi and Jayarathna (2014) in revealing that there is a significant impact of employee-related work attitudes on the job performance of the employees of the tertiary and vocational education of government sector in Sri Lanka. Not only researches in the field but also the government support links with the performance appraisal systems. As an example, Public Administration Circular No. 08/98 is based on the performance appraisal of staff officers. And most of the studies related to the public sector's efficiency concludes with a description pertaining to the nature of efficiency rather than introducing a mechanism to reduce inefficiency. i.e. Ariyarathna Jayamah (2012) discussed about reducing efficiency and Chandrasiri, ML et. al (n.a.) discussed the weaknesses in prevailing training and development procedure, Wijesundara, Tilak et. al (n.a.) emphasized on employee stress. Apart from that, the second school of researchers have directly addressed the topic of efficiency or productivity improvement in public sector organisations. Weerasinghe et. al (2016) in their study related to enhancing efficiency revealed facts on effectiveness and relevance of Lean tool kit in procurement management in the public sector. Wijewardana and Rupasinghe (2016) verified the benefits of applying Lean thinking in healthcare administration. Furthermore, Sri Lanka Passport Office and Department of Motor Traffic (RMV) operate as government organisations but comparatively in an efficient manner. They have achieved operational efficiency by using Lean Six Sigma techniques (Arosha Jayasundera, 2015).

Considering the existing literature this study was associated with the second school researches who directly focus on the inefficient domain through a Lean approach. Hence the aim of the study was to understand the waste in the LMP of the University of Kelaniya and to find solutions to eliminate the same using VSM approach. This study further aimed to implement the suggested solution in the University of Kelaniya in order to validate the results of this study in a practical manner. Hence the particular study aims at finding a solution for an immediate problem that is facing by the University of Kelaniya and considered to be a non-systematic inquiry (Kothari, C.R., 2004). The results of this study are usually launched by the University of Kelaniya in order to address a specific problem. Hence, the study can be considered as applied research (Bajpai, N., 2011).

Brief Introduction to Concepts of the Study

This study used several concepts such as Lean, Value Stream Mapping and Lead Time. **Lean:** The concept of Lean started with the Toyota company with the Toyota Production System (TPS) in the 80s (Toughnickel). Now the concept has become matured and developed a number of other concepts around Lean that alines with the Lean philosophy. Lean is considered at present as a basket of tools rather than a single concept. At present, the concept of Lean is defined as 'a production system which is steeped in the philosophy of the complete elimination of all waste imbuing all aspects of production in pursuit of the most efficient methods' (Toyota Global).

Value Stream Mapping: The Value stream mapping process allows to create a detailed visualization of all steps in your work process. It is a representation of the flow of goods from the supplier to the customer through an organization. It is important to clarify that, according to Lean, the value is everything that the customer would pay for. However, when it comes to mapping a value stream, there are steps that may not bring direct value to the customer but help to ensure that will be able to deliver the final product or service (kanbanize).

Lead Time: Number of minutes, hours, or days that must be allowed for the completion of an operation or process, or must elapse before the desired action take place (business dictionary) is considered as lead time. Besides that, the Cambridge dictionary explains this concept as the time between the design of a product and its production, or between ordering a product and receiving it. Collins dictionary also explains the same (Lead time is the period of time that it takes for goods to be delivered after someone has ordered them). However, there is no contradiction among those definitions and all definitions attempt to express the time between start to end.

Methods and Materials

In the process of recognizing the existing LMP of the University of Kelaniya, empirical data were gathered using observation and interview methods as appropriate. The number of Leave Forms, number of non-academic staff members, different stations in LMP, the process time in each station in minutes, transportation time in minutes and existing rules and procedures belongs to LMP were the data and materials of the study. In order to validate the number of leave forms of the LMP, three-year data were gathered and averaged. The number of non-academic staff members was taken from the records of the non-academic establishment division. Observation method was associated to verify the stations in LMP and whole LMP process. A simple stopwatch was used to calculate time in each activity and 10 samples from each station were taken and averaged to understand the time taken per each unit (leave form). In order to get real data, the data were collected in a natural setting. The respondents were not informed until they complete the activity. The rules and regulations pertaining to leave management were taken from relevant sections and authorities. As the main aim of the study was to improve the efficiency in LMP Lean tools namely Lead Time and Value Stream Mapping were used to analyse the data.

Data Presentation

Data are presented in this paper based on the objectives of the study.

1) To recognize the existing LMP of the University of Kelaniya

In order to understand any process, we need to verify its subcomponents from inputs to the output. Hence the number of leave forms were defined as the inputs of the LMP. We were able to recognize the existing strength and volume of the LMP. Table 01, shows the number of employees who applied for leave and the number of leaves that the employees have obtained in 2015, 2016 and 2017. Accordingly, the average number of leave forms produced per year is 17, 626.

Table 01- The leave forms produced by Non-Academic Staff in 2015- 2017

Number of Employees	Year			Average
	2015	**2016**	**2017**	
704	16926			17626
717		17312		
707			18640	

Source: Observation Data, 2019

Table 02, presents the time taken in each station of the existing LMP. The name,es of the three stations, which the data obtained were: leave form preparation and approval time, the first point leave document checking the time and Non-Academic Division checking time along the LMP. The time is taken by each station in respective years and total and mean time of each station are indicated in table 02. Accordingly, the average time taken in each process, leave form preparation and approval, first checking and non-academic division checking time indicated 52878, 70504 and 52878 minutes respectively as indicated by table number two. These statistics point out that 2937 working hours devote to three stations of LMP annually.

Table 02- The Time Taken in each Station of the existing LMP

Description	Year				
	2015	**2016**	**2017**	**Total**	**Mean**
Leave form preparation and approval time	16926x3min[1]=50778min = 846.3hours	17312x3min=51936min = 865.6 hours	18640x3min=55920min=932 hours	158634min 2643.9hours	52878min 881.3 hours
The first point leave document checking time	16926x4min[2]= 67704min 1128.4hours	17312x4min=69248min =1154.1 hours	18640x4min=74560min = 1242.6 hours	211512min 3525.2hours	70504min 1175.0 hours
Non-Academic Division checking the time	16926x3min[3]=50778min = 846.3hours	17312x3min=51936min = 865.6 hours	18640x3min=55920min = 932 hours	158634min 2643.9hours	52878min 881.3 hours
	169260 min 2821 hours	**173120 min 2885.3 hours**	**186400 min 3106.6 hours**	**528780min 8813 hours**	**176260 min 2937.6 hours**

3min[1] – *This time included filling the Leave form, transportation time to the employee, Approval to Head of Department, transportation time to Subject Clerk*

4min[2] - *Entering and Preparing final document (Per one leave form) and Approval for Final document*

3min[3] - *Checking the final document in Non-Academic Branch and Approval*

Table 03, shows the time taken for transportation in the existing LMP. There are four transportation gaps across the three stations namely (1) employee to first point, (2) first point to the second point, (3) second point to the third point, and (4) third point to the fourth point. The average time taken for transportation in each gap shows 43 hours, 43 hours, 8 hours and 15 minutes respectively. The annual cumulative average sum of time devoted to transportation for the entire LMP is 96 hours.

Table 03- The Leave Form Transportation Time

Description	Year									
	2015			**2016**			**2017**			**Average Time**
	Time per employee	No. of employees	Total time	Time per employee	No. of employees	Total time	Time per employee	No. of employees	Total time	
Employee to first point	04Min	704	2016 Min	4 Min	717	2868Min	4 Min	707	2828Min	2571 Min = 43 hours
First point to the second point	04Min	704	2016 Min	4 Min	717	2868Min	4 Min	707	2828Min	2571 Min = 43 hours
Second point to the third point	15Min	31	0465 Min	15Min	31	465Min	15Min	32	480Min	470 Min = 8 hours
Third point to the fourth point	05Min	3	0015 Min	05Min	3	15Min	5Min	3	15Min	15 Min
									Total	5627 Min = 94hours

Source: Observation Data, 2019.

After recording the observations and the discussions held with the employees, we carefully measured the time using a stopwatch. We decided that the average leave form preparation time as 28 minutes. Time per each employee was taken like 4 minutes, 4 minutes, 15 minutes and 5 minutes from the first to second checking points respectively (Table 01).

Figure 01: - the Existing Leave form Transportation Process of the University of Kelaniya

Source: Observation Data, 2019.

Figure 01 illustrates the leave form transportation process of existing LMP of the University of Kelaniya. According to the University Establishment Code, employees are entitled to forty-five days of annual leave. The employees have to complete leave forms and should submit those to respective in-charges and receive the approval from the respective 1st staff officer. Then the employees should deliver their leave form to the subject clerk. At the end of each month, subject clerk for leave prepare the final document and sends it to the Non-Academic Establishment division for further checking.

2) To Understand the existing rules and procedures of the existing LMP

The University system follows chapter X on leave of the University Establishment Code in Sri Lanka. The establishment code describes five areas such as (1) Division I - General, (2) Division II-Leave to teachers and officers, (3) Division III - Administrative staff and employees other than minor employees, (4) Division IV - Principle Executive Officers of Higher Educational Institution/ Institutions and (5) Division V - Minor Employees. In addition, we should mention that the Internal Circular Number (NAE/2011/01) was introduced in 2011. Simultaneously fingerprint machines were also introduced to all non-academic staff grades at the University of Kelaniya.

Analysis of Data

We analysed data according to the objectives of the study. As per the data are shown below (Table 04), the average time taken for transportation in the existing LMP is 94 hours. This creates a cost of 15980 LKR per year. The calculations were made by using the actual average rate of labour hours, which is of 170 LKR. The Lead Time of the existing leave process shows by the figure below (Figure 02). As demonstrated by the figure (Figure 02) the Lead Time of the existing LMP is 3031.6 hours which annually costs 515372 LKR.
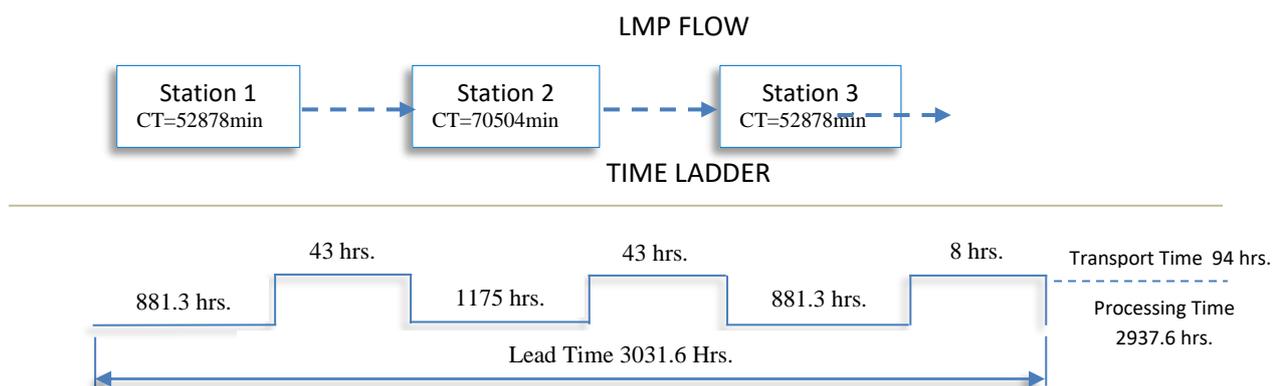
Table 04 - The Total Average Transportation and Process Time and Cost

Cost Components	The average Measurement	Hours	Value (LKR)
No of Leave forms *(from table no 1)*	17626 numbers	-	-
Leave form preparation and approval time	52878 minutes	881.3 hours	x170* = 149821.00
The first point leave document checking time	70504 minutes	1175 hours	x170* =199750.00
Non-Academic Division Checking time	52878 minutes	881.3 hours	x170* =149821.00
Transportation *(from table no 3)*	5627 minutes	94 hours	x170* =15980.00
Process Time *(from table no 2)*	181887 minutes	2937.6 hours	499,392.00

Existing Rate of Labour hour

Figure 02: Step one - Simplified Value Stream Map for Existing LMP of the University of Kelaniya

Simplified Value Stream Map of Existing LMP of the University of Kelaniya (Figure 2) was constructed considering the table no 02 and 03 and also the figure no 01 of this paper. The Cycle Time (CT) was defined as the cumulative average time of one year base and process (station). The Lead Time was considered as the measurement of the average amount of transport time and process time in the entire LMP from the beginning to the end. The Time Ladder provides a somewhat simplistic visual representation of the value stream timeline. The upper portion of the time ladder represents the average cumulative amount of time spends on transportation in the process. The lower portion of the time ladder shows the average amount of time that each feature was actively being worked on, or more specifically when the value is actually being added to the LMP during that specific station. Accordingly, figure no 02 shows 94 hours in total. Transport time is considered as a non-value added time (2937 hours). The Lead Time of the LMP is 3031.6 hours as per the figure no 02.

Proposed Leave Management Map (LMM)

Because of the availability of information technology facilities, Management Information System (MIS) was used to develop a new LMM. It was convenient to reduce and eliminate non-value added activities from the existing LMP and proposed a new LMM with the support of MIS. Non-value added activities in this particular study were 94 hours. Transportation time could totally be eliminated from the proposed LMM. Besides that, we reduced the work process stations into two and reduced the CTs. Table 04 shows the average measurements of the proposed LMM. Consequently, the number of leave forms (17626) remained the same as it is depended on the employees' behaviour. The 1st and 2nd leave process stations proceed with 587.5 hours and 293.7 hours respectively. Hence the total process took 881.2 hours and at a cost of 149804 LKR. The hours were converted to financial values by multiplying by 170 LKR, which is the current cost of a labour hour. Furthermore, figure 03 shows the proposed simplified Value Stream Map for LMP of the University of Kelaniya. As indicated by figure 03, there are only two process stations and zero transportation with 881.2 hours of Lead Time.

Table 04 - The Average Measurements: for Proposed Leave Management Map

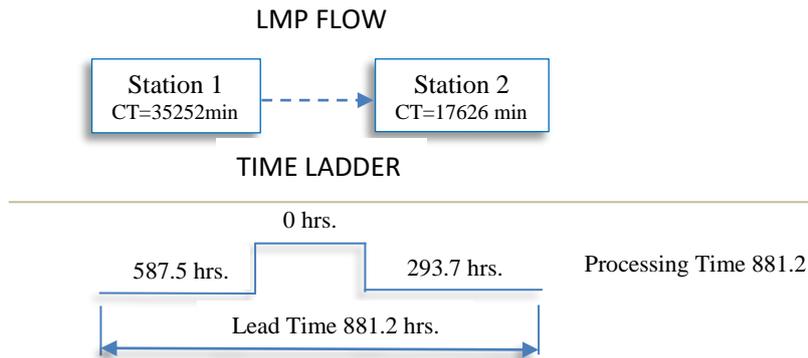| Cost Components	The average measurement	Hours	Value (LKR)
No of Leave form	17626	-	-
Leave form preparation and approval time	17626x2min=35252min	587.5 hours	x170 = 99875.00
The first point leave document checking time	17626 x1min=17626 min	293.7hours	x170 = 49929.00
Lead time	52878 min	881.2 hours	149804.00

Figure 03: Step Three - The Proposed Simplified Value Stream Map for LMP of the University of Kelaniya

Source: Observation Data, 2019.

Process Efficiency

Table 05, indicates the Lead Time, value added time (VAT), process efficiency and the respective cost relating to both current VSM and Future VSM. The current VSM was 3031. 6 days and the future VSM is 881.2 days. The difference between current and future VSMs is 269 days. It is clear that we could save 269 days per annum from the LMP. The VAT was calculated by deducting the non-VAT from the entire process. When calculating the VAT for current LMP we could find that the transporting time is 94 hours by eliminating unnecessary processes from the Lead Time (LT). Hence VAT of the current VSM was considered as 110 days. Furthermore, VAT with respect to the future VSM was considered as 110 days (LT/8 (working hrs. = 881.2/8)). In addition, there is no transportation and unnecessary processes in future VSM. Additionally, the Process Efficiency (PE) was measured by dividing VAT from LT (PE = VAT/LT). Accordingly, the table further shows 269 days of reduction from the main process. Therefore the PE of current VSM was 29% (110/379*100) and PE of future VSM was 71% (110/110*100). Accordingly, future VSM shows 100% PE which is 71% of a drastic improvement of the LMP. However, 100% PE of future VSM should be considered with respect to the existing knowledge on non VAT in the process. Finally, the table explains the cost with respect to the current VSM and future VSM. Consequently, the current VSM shows 499392 LKR and future VSM shows 149804 LKR which is a money-saving of 349588 LKR per year. However, we should note that the other material costs such as 17626 leave forms have not been considered here.

Table 05 – Value Stream Mapping Result Analysis

	Lead Time (days)	Value Added Time Days	Process Efficiency 100%	Cost (LKR)
Current Stream	379	110	29%	499392
Future Stream	110	110	100%	149804
Increase (Reduction)	(269)		+71%	349588

Sourse: Observation Data, 2019.

Conclusions

This study followed a process-oriented approach (POA) with special reference to the improvement of efficiency of the LMP of the University of Kelaniya, Sri Lanka. Over 50 years of practical experiences in relation to Sri Lankan public organisations, we employed POA. Our results of this study showed that both the possibility and validity of considering POA in enhancing efficiency in public organizations, especially in the Sri Lankan context. The results of this study further confirmed the studies of Weerasinghe et. al (2016)

and Wijewardana and Rupasinghe, 2016 who employed the same approach. Finally, we would like to suggest two further research avenues that can further confirm this study. (1) As this is a case study in nature further studies in other POA can be suggested. (2) There are many organizations with poor processes where research can be conducted more effectively by employing POA rather than using people-oriented approaches such as employee performance, labour efficiency, employee motivation and employee satisfaction. Eventually, we suggest that ineffective processes effect on employees and their performances, satisfaction and finally the employee efficiency. Therefore, as we did as like as in this study managers should focus on introducing efficient systems to generate efficiency of the employees.

Reference;

[1]   Ariyarathna Jayamah (2012) Efficiency of Small Financial Institutions in Sri Lanka Using Data Envelopment Analysis, Journal of Emerging Trends in Economics and Management Sciences (JETEMS) 3(5): 565-573, available at; jetems.scholarlinkresearch.org, accessed Jan 25

[2]   Arosha Jayasundera (2015) Making the State Sector more efficient, Cylontoday, available at; http://www.asianiexcellence.com/wp-content/uploads/2017/10/stateefficiency.pdf, accessed Jan 25

[3]   Bajpai, N. (2011) "Business Research Methods" Pearson Education India

[4]   Chandrasiri, ML; Fernando, NG; Saubhagya, T ( )training and development framework to improve employee job performance in public sector banks in Sri Lanka, available at; http://dl.lib.mrt.ac.lk/handle/123/11265, accessed Jan 27

[5]   Dhammika, K.A.S., (2013). Measuring Employees' Performance in the Public Sector in Sri Lanka: Testing of Two Models. Kelaniya Journal of Human Resource Management. 8(1), pp.1–20.

[6]   Director General, Department of Census and Statistics (2018) Public and semi-Government sector employees exceed 1.1 million, Daily FT, Available at; http://www.ft.lk/columns/Public-and-semi-Government-sector-employees-exceed-1-1-million/4-658694, accessed Jan 24

[7]   Hettiararchchi H.A.H, Jayarathna S.M.D.Y (2014) The effect of Employee Work-Related Attitudes on Employee Job Performance: A Study of Tertiary and Vocational Education Sector in Sri Lanka. IOSR Journal of Business and Management (IOSR-JBM)e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 16, Issue 4. Ver. IV (Apr. 2014), PP 74-83. www.iosrjournals.org. *(10) (PDF) The effect of Employee Work-Related Attitudes on Employee Job Performance: A Study of Tertiary and Vocational Education Sector in Sri Lanka*. Available from: https://www.researchgate.net/publication/280495670_The_effect_of_Employee_Work_Related_Attitudes_on_Employee_Job_Performance_A_Study_of_Tertiary_and_Vocational_Education_Sector_in_Sri_Lanka [accessed Jan 27 2019].

[8]   http://www.businessdictionary.com/definition/lead-time.html. accessed Jan 28

[9]   https://dictionary.cambridge.org/dictionary/english/lead-time. accessed Jan 28

[10] https://kanbanize.com/lean-management/value-waste/value-stream-mapping/ accessed Jan 28

[11] https://toughnickel.com/industries/WhatisLeanManufacturing accessed Jan 27

[12] https://www.collinsdictionary.com/dictionary/english/lead-time. accessed Jan 28

[13] https://www.toyota-global.com/company/vision_philosophy/toyota_production_system/ accessed Jan 29 27

[14] Kothari, C.R. (2004) Research Methodology Methods and Techniques. 2nd Edition, New Age International Publishers, New Delhi.

[15] Opatha N.P.K. (1991) A Review of Employee Performance Evaluation of Selected State Sector Organizations, the master thesis of the University of Sri Jayawardhenepura. Abstract available at; http://dr.lib.sjp.ac.lk/bitstream/handle/123456789/1453/ pdf, accessed Jan 25

[16]   Preliminary Report - Census of Public and Semi-Government Sector Employment – 2016 (Conducted on 17 November 2016) Department of Census and Statistics Ministry of National Policies and Economic Affairs 2017 February. Pp 8-9. Available at http://www.statistics.gov.lk/pdf. accessed Jan 25

[17]   Public Administration Circular No. 08/98 (II) Performance Appraisal of Staff Officers http://www.pubad.gov.lk/web/eservices/circulars/1998/E/08-1998(ii)(e).pdf, accessed Jan 26

[18]   Weerasinghe W.A.V.C.M., Palliyaguru R.D.H., Yakupitiyage Y.D.L., Jayasinghe G.D.I. (2016) An Empirical Study on the Application of Lean Management to Enhance Procurement Management in the Public Sector, available at; http://dspace.sliit.lk/bitstream/123456789/340/1/pdf, accessed Jan 27

[19]   Wijesundara, Tilak; Wijesinghe, WAND; Chinthani, Rangika () Is Stress a Bad Factor in Employee Work Performance (EWP) in Sri Lankan Public Sector? Available at; http://ir.kdu.ac.lk/handle/345/1593, accessed Jan 27

[20]   Wijewardana A.R.L., Rupasinghe T.D. (2016) Lean Healthcare Framework for Sri Lankan Healthcare Supply Chains: A Case Study of Teaching Hospitals, Universal Journal of Management 4(10): 517-527, available at; http://www.hrpub.org/download/20160930/UJM1-12102860.pdf, accessed Jan 26

[21]   Zacki Jabbar (2018) the Island 2018 September 17. Available at http://www.island.lk/index.php?page_cat=article-details& page=article-details&code_title=191388, accessed Jan 27