DOES THE EXISTING ADMINISTRATIVE FRAMEWORK HELP TO INCREASE EFFICIENCY? A CASE STUDY ON THE UNIVERSITY OF KELANIYA, SRI LANKA

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Abstract

In the current global context, there is a growing interest in streamlining higher education institutions in particular. In this context, this study was aimed at making Sri Lankan universities more efficient. The immediate impetus for this study was the policy agreement of the authorities to make the University of Kelaniya efficient according to the Zero-Defect concept. The study was conducted as a prelude to the university's attempt to adopt a new strategy. This study has a main objective and two specific objectives. The main purpose of the study was to investigate the extent to which the existing administrative framework contributes to achieving the goals of the Zero-Defect concept. In addition, among the specific objectives, 1. To identify the process priority that the Zero-Defect concept should be introduced to improve efficiency 2. To calculate the expected effectiveness of introducing the Zero-Defect concept to priority processes within the existing administrative framework. 21 processes of the Research and Publication Unit of the University of Kelaniya were selected for this study. The time spent on each process was calculated in minutes, and on three occasions the same data was collected to obtain an average value. The time frame of the study was considered as one year and the frequency of each process was calculated accordingly. Percentage values and Pareto Analysis were used for data analysis, while tables, charts and graphics were used for data presentation. This study confirmed that 72% of the time spent on the research and publishing unit's operations depends on uncontrollable factors. It was further established that the maximum effect on controllable factors to increase efficiency was 38%. This study further highlights the need for further studies to minimize the impact of uncontrollable factors as much as possible to increase unit efficiency.

Keywords: Process Efficiency, Zero Defects, Higher Education

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1. Introduction

In the contemporary world, both public and private institutions are driven to become more efficient in product or service processes in the hope of providing a better-quality service to their clients. Gary P. Moynihan (2018). Institutions use a variety of strategies to streamline corporate operations. For example, the use of model-assisted DoE (mDoE) built by adding statistical models to the conventional design of experiments (DoE) methodology Kuchemüller, Kim et al (2020), Simulation Methods Schwich G et al. (2014), Business Process Management (BP) La Rosa, Marcello (2015), and such methods can be pointed out. Meanwhile, the Lean concept of a process-oriented methodology, Naslund Dag (2008), Resta Barbara (2015), Suhardi Bambang et al. (2019) as a tool to increase efficiency while minimizing waste had been gaining more popularity over the past few decades.

In 2019, the University of Kelaniya decided to introduce a strategy to enhance corporate administrative efficiency through process enhancements in an environment where global attention is focused on process enhancements in this way. The concept of Zero Defect was chosen as the tool to improve the process, and administrative and financial departments and faculty offices were instructed to join in this work separately. The institute is structured into three main administrative units. Namely, the faculty offices under the deans, the administrative units under the registrar and the financial units under the bursar. There are seven, fifteen and seven sub-units under these three main divisions, respectively. Each of these units has a significant number of processes, and they have different values. It is not successful to focus on improving all the activities of the organization equally in an environment where all kinds of resources are limited.

Therefore, by implementing the guidelines given, the organization's ability to reach the desired goals by launching this concept may be uncertain. Therefore, it is more successful to come to a conclusion after a scientific study on which processes should be given priority. Based on such need, this study aimed to present a methodology to identify a list of priorities at the corporate level. Therefore, the Research and Publication Unit, one of the fifteen administrative units, was selected for the preliminary study. Accordingly, this study had a main purpose and two specific objectives. That is, the main objective of this study was to investigate the extent to which the existing administrative framework contributes to achieving the goals of the Zero-Defect concept. Also, two specific objectives were established as follows. 1 To identify the process priority that the Zero-Defect concept should be introduced to improve efficiency. 2. To calculate the expected effectiveness of introducing the Zero-Defect concept to priority processes within the existing administrative framework.

2. Literature Review

During the two centuries of scholarly attention, the manufacturing industry has evolved through several paradigms. Hu SJ, Ko J et al (2011). Craft production is said to be the starting point of the historical evolution of the production process. Partouche, R. et al. (2008). This 'production model', which was created with a focus onunique abilities of the human beings, started with his own satisfaction. Haynes, Michael. (2008). In the early days, the good coexistence between the craft industry

and the political framework was able to forge a relationship with supply and demand. (Wailes, 1996). The social evolution that took place with the latest technological innovations, expansion of demand, and low investment, confirms that the Craft product model is no longer able to satisfy the market. Childe, 1942, 1956; Wailes, 1996). Mass production was needed to meet the gradual increase in demand. Accordingly, in 1913, Henry Ford introduced the moving assembly line at Highland Park. Later, this new methodology was able to significantly improve production speed and reduce assembly costs. (eyewitnesstohistory.com). The mass production methodology, which was developed with the aim of expanding the production capacity to meet high demand, had avoided thinking about consumer preferences as it focused more on the production process. This led to lower product quality, lower sales, and higher wholesale costs. The division of labor created by this system was able to raise issues between employees and management. Production strategies are now geared towards a personalization production process as a solution to the problems that had arisen during mass production. There, the customer and the manufacturer will jointly design the required products. Hu, S Jack. (2013).

Process efficiency

Lakhal, Lassaad (2006) pointed out that the quality management practices affect the performance of an organization and that core practices of an organization affect the product quality. This illustrates the importance of practice in meeting an organization's expectations. Efficiency is a matter of great concern at the individual, institutional and governmental levels across all countries. Although the relationship between inputs and outputs is considered in the definition of efficiency, it is a condition that each application level has achieved high productivity to be considered as an efficient level. Coelli, T. et al. (1998) further defined efficiency as the ability to maximize output through a given input.

Preliminary studies confirmed that experts had conducted efficiency enhancement studies, examining the entire production process from different dimensions. Their studies often focused on improving the efficiency of a chosen part of the overall production process, which consisted of three sub-processes: input, transformation, and output. Ferretti, S. et al (2013) studied machine processes to identify the potential for zero defect part manufacturing in order to obtain a quality product, and there they identified the need to focus on both direct and indirect actions. Myklebust, Odd. (2013) further demonstrates the need for a process-oriented approach to zero defect manufacturing. They presented an integrated model called the product-plant lifecycle model, emphasizing the importance of both the lifecycle for the manufactured product and the plant that performed the manufacturing. Similarly, Wang, Ke-Sheng. (2013) indicated that the manufacturing process must be maintained at a zero-defect level to achieve a zero-defect production level. In addition, others pointed out that in order to increase the efficiency of the production process, both supply and operation processes needed to be addressed. Accordingly, Auramo, Jaana et al. (2004) pointed out that for a successful customer satisfaction one must focus on both supply and processing processes. This approach can be pointed out as the most successful motivation that had taken place in the scholarly discussions on process efficiency.

While studying various methods to make a manufacturing process efficient, criteria were being set to measure its efficiency. Abdallah Hussien Fathy (2018) answered a ResearchGate question and pointed out five ways in which the efficiency of a process can be measured namely 1. Measure time, Process time measures how long it takes to complete the steps of creating a product or service 2. Measure costs, Cost metrics assess the total cost of the production process 3. Measure quality, Quality metrics measure customer satisfaction 4. Measure output and 5. Measure process complexity.

Lean

For decades, scholars had focused on the concept of lean as a successful tool for improving efficiency and quality. The lean management model is widely recognized as a concept that can be used to enhance the performance of a wide range of businesses. For example, the use of this concept in a wide range of areas, from vehicle manufacturing to administrative and financial services, can be pointed out. Zhu et al., (2014). Lean methods is defined as a performance-based process to increase competitive advantage in an expanding global market used by manufacturing organizations. Holweg M (2007), Fawaz A. A., Jayant R. (2007), Fullerton R. R. and others (2003). Kovács, György (2018) described the potential and importance of using lean tools to improve an organization's production process. It further showed the importance of focusing on the supply chain, the raw material flow system, and the facility layout. Thus, it is convincing that a process needs to be considered more broadly. The Lean method introduced a time-based measuring device called Process Cycle Efficiency = Value Added Time / Total Lead Time. M. L. George (2002). Sutherland, Jeff et al (2018) confirmed that the efficiency of a process can be enhanced by the use of lean tools. The original concept, introduced by Toyota in the 1950s as the Toyota Production System (TPS), later spread around the world as Lean. Lean is the common term for waste reduction, and included a number of concepts that could be used to reduce waste, such as Six Sigma, Lean Six Sigma, Kanban, 5S, Kaizen, Poka-Yoke, Zero-Defect, Value Stream Mapping, Pareto Analysis, Jit, and more. Out of all these, the concept of Zero-Defect took precedence because it had the association of all other concepts.

Zero-defect

Of these, many studies were conducted by scholars on the use of the concept of Zero-Defect in a variety of ways to reduce waste in manufacturing and service organizations and to increase the efficiency of processes. Myklebust, Odd. (2015) pointed to the Zero-Defect Manufacturing Frame as a Quality Control Process System. He further emphasized that value added to enhance quality leads to continuous improvement in the process as well as the product. This model was further developed by MAY, Gökan & Kiritsis, Dimitris. (2019) introduced the latest zero-defect manufacturing model that integrated ICT technology. They further explained that Zero-Defect Manufacturing could be upgraded to online product management in European factories. Eleftheriadis, Ragnhild. (2016) succeeded in formulating zero-defect manufacturing guidelines and restructuring the TQM structure to further the Six Sigma approach. The 'Zero Defect, Zero Effect concept' introduced by the Prime

Minister of India on the occasion of the 68th Independence Day showed a new path to the traditional concept of Zero Defect. This means that the product must be zero defect to the customer and at the same time be 'zero effect' to the environment. Suhas, & Sharanabasappa (2020). This can be termed as an opportunity to integrate management concepts directly into the concept of sustainability.

However, there are also criticisms of the concept of zero defect. For example; Psarommatis, Foivos et al. (2019) recently published a review of 280 studies on zero-defect published in various academic journals. They pointed out seven major shortcomings of the studies that have been conducted so far: (i) focus on a single strategy instead of a holistic approach for global optima; (ii) certain industries are under-researched; (iii) full potential of industry-academia collaboration is not achieved; (iv) not enough focus on the beginning of manufacturing lifecycle; (v) cost – benefit comparative analysis is not evident; (vi) standard and clear definition of terms are missing. These further pointed to four approaches that required scholarly attention: (i) shift from local to global solutions; (ii) investigate pros and cons; (iii) role of people and human activities in manufacturing; (iv) new business models for zero defect manufacturing.

Pareto principle

The well-known 80/20 Pareto principle is useful in management in three situations. Namely as classification, differentiation and resource allocation. Grosfeld-Nir, et al. (2007). Studies were conducted in various fields on the accuracy of using the Pareto concept as a decision-making tool and the concept has the potential to be used as a decision-making tool in production processes and organizations. Craft, Ralph & Leake, Charles. (2002). The Pareto concept can be used to identify the tasks that need the most attention, especially in project management, when there are many processes that belong to the same task. Stojcetovic, Bojan et al. (2015). It also has the potential to improve the manufacturing process and streamline the overall business by identifying the priorities of failure. It is possible to use this concept as a rational methodology for the process of identifying these priorities. Banduka, Nikola et al. (2020).

In this way, previous literature showed how pareto analysis had been used for many selected processes. Otherwise, these studies will help us to understand the 20% share that needs to be focused on to improve the selected process by 80%. According to these sources, the identification of processes that should be prioritized in order to increase the efficiency of an organization has been looked at from several perspectives. Either the whole organization is considered as one or we try to identify the processes that should be given priority. Otherwise, action will be taken to identify a process that is expected to be effective and to identify the areas that need to be prioritized in that process. While it may be appropriate to prioritize an organization as a whole to improve efficiency, such decisions can still be considered top-level decisions. Also, trying to identify isolated processes and identify the priorities involved in making that process efficient can be considered low-level decisions. But that does not rule out the possibility of solving an organization's day-to-day problems. It is clear that there is another gap between these two approaches. That is, to separate each division of an organization and to investigate which of the sector's activities

should be prioritized in order to increase the efficiency of that division. But these studies did not reveal such an effort. This study is expected to address that gap.

Higher education

The market competition created in the current global context has become a factor in the existence of all institutions, including higher education institutions. Thus, higher education institutions use different management concepts as strategies to improve the quality and efficiency of their administrative processes in order to ensure their survival in the current market competition. For decades, scholars around the world have been conducting research from different perspectives to test the competence and capability of using different management concepts to improve the quality and efficiency of the administrative processes in higher education institutions. Hamouda, A.M.S et al. (2016) discussed the quality of the educational process by combining Lean Thinking and Zero-Defect concepts. They pointed out that students' learning outcomes depend on an assessment of the quality of the education system. They further confirmed that there is a potential for creating a zero-defect student in a 'lean thinking practice'. After a study on Public Expenditure at Sri Lankan Universities, Indeewari GKD., Ranasinghe A (2018) pointed out that the authorities need to rethink the method of allocating funds. They further suggested the need for an efficiency-based funding system. Wijetunge et al. (2020) studied the productivity of Sri Lankan universities through research papers presented by individual universities, pointing out that there are a number of positive aspects to the presentation of research in universities. But at the same time, they pointed out that there is much that university libraries continue to miss in order to increase the effectiveness of their research. Thuraiyappah and Weerasooriya (2015) who conducted a study on the quality of the Sri Lankan university system based on professors' high index research papers, found that the faculties of arts at all universities except Peradeniya and Colombo were in a poor position. Chandra Gunawardena (2017) further confirmed that the quality of the teaching process in public universities in Sri Lanka also shows weakness in some areas, taking studies of the quality of the university system to another dimension.

Kelaniya university

There are a number of studies that have examined the efficiency of the administrative process at the University of Kelaniya. For example: Kalansuriya J. (2007) proved that the internal mail delivery process of the University of Kelaniya shows a significant degree of inefficiency. He further confirmed that the process, which is to be completed in four kilometers, will take place over a distance of 240 kilometers. Tharangani and Jayantha (2019) who conducted a study on the Leave Management Process in Sri Lankan universities using the Lean instrument 'Value Stream Map', showed that the existing process had become inefficient due to unwanted sub-processes and practices. Tharangani et al. (2019) pointed out that the process of issuing Examination Admission Cards at the University of Kelaniya is inefficient with unnecessary functions and practices. A case study conducted by the University of Kelaniya, Tarangani, P., Jayantha K (2020) confirmed that the existing supply chain is inefficient. They further pointed out that the existing supply process is a conventional process and the resulting over-processing, waiting time and unnecessary

transportation had contributed to this inefficiency.

It is clear that many studies have been done to improve the existing process. Meanwhile, a recent study made a different kind of discovery. Thus Kábele, Pavel & Edl, Milan (2019) showed that in order to get the most out of a production cycle, its layout must be changed.

3. Methods and Materials

Study area

Out of the 15 administrative units under the direct supervision of the Registrar of the University of Kelaniya, the Research and Publication Unit (R&P Unit) was selected for this study. This unit was designed to be developed according to the Zero-Defect concept, which led to that choice.

Sample selection

All the major processes in the R&P unit were taken into consideration in selecting the required sample for the study. There, 21 processes were selected in such a way that each process did not overlap and did not include each other twice.

Separation of under control and beyond control

Nine factors were considered in classifying the processes under consideration. Namely, UGC Circulars, UGC Circular Letters, University Act, Government Establishments Code, University Establishments Code, and Internal Circulars, Policies, Traditions, Procedures. When these factors had no effect on the duration of the entire process, they were termed as controlled processes. When these factors were influenced over the course of the entire process, they were termed as Beyond Control processes. When only a portion of a process was affected by these factors, the time was divided between controlled and beyond control processes according to the 'magnitude of the effect'. See Figure 01 for 'Flow of 21 Processes'.

Measurement unit

Data from 21 of the processes under consideration were collected in the preliminary investigation in years, months, weeks, days and hours. All these values were then converted to minutes for ease of final analysis. Considering the need for a more practical investigation in this process, a year was considered to be 12 months, a month was considered to be 22 days, a week was considered to be 5 days and a day was considered to be 8 hours. Accordingly, minutes are the measurement unit of the study.

Data collection

The reports of the R&P unit were based primarily on data collection. In addition, the participatory research methodology was followed for two years. This was facilitated by the fact that the lead researcher was attached to this division. Initially, unit activity was identified separately as only one cycle per year and more than one cycle per year. Three years of data were collected separately in each of the processes considered in order to obtain a more reasonable data, and steps were taken to obtain the average value of that data for the study. The data collection plan is described under Figure 01.

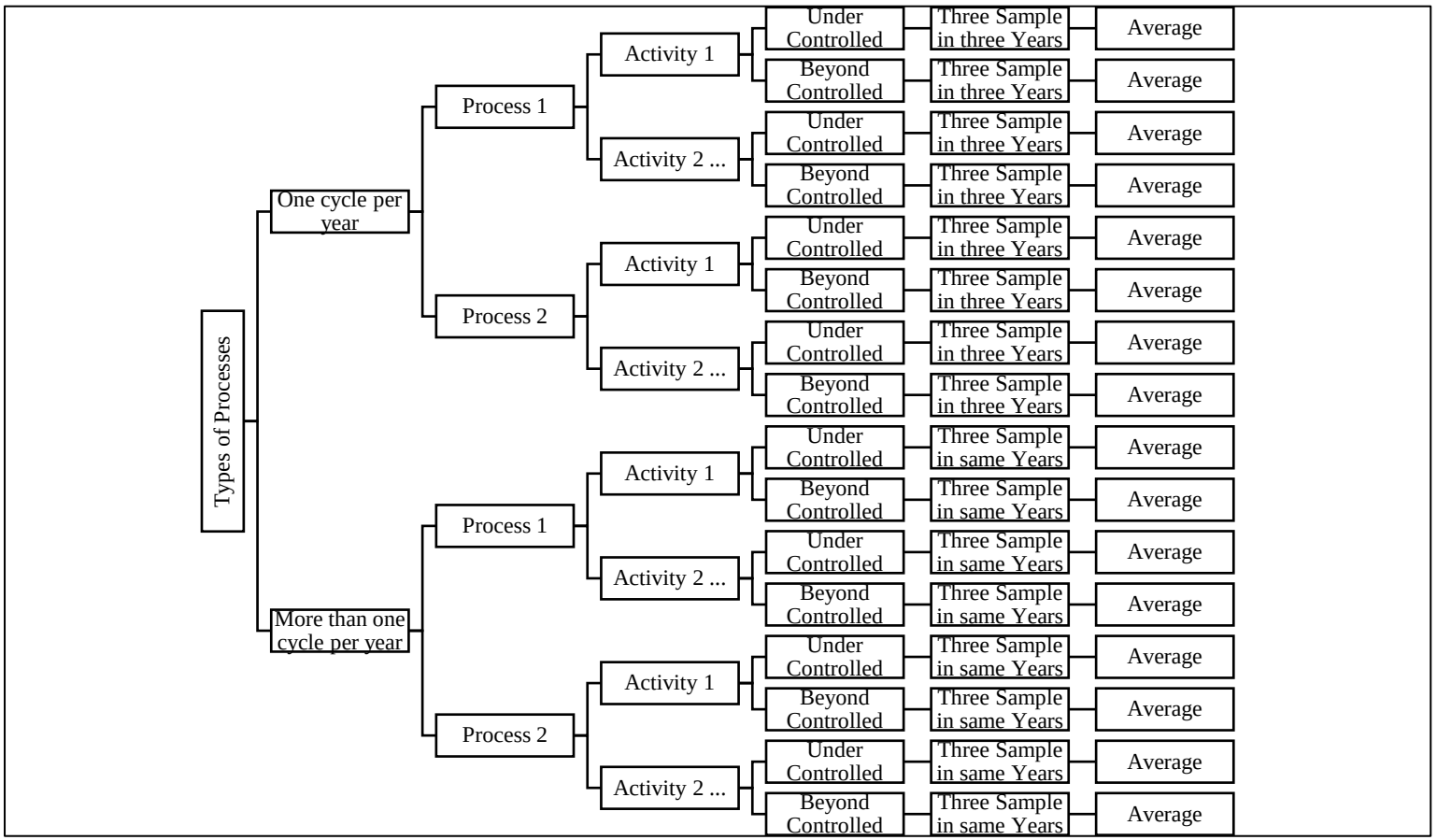
Study plan

The study was conducted in several steps. Namely 1. Identifying the processes in the unit under consideration 2. Dividing them into Under Control and Beyond Control 3. Obtaining the time taken for those processes in the language of use and translating them into minutes 4. Tabling to suit the data analysis. 5. Calculating Pareto Value Using Excel.

Analytics tools

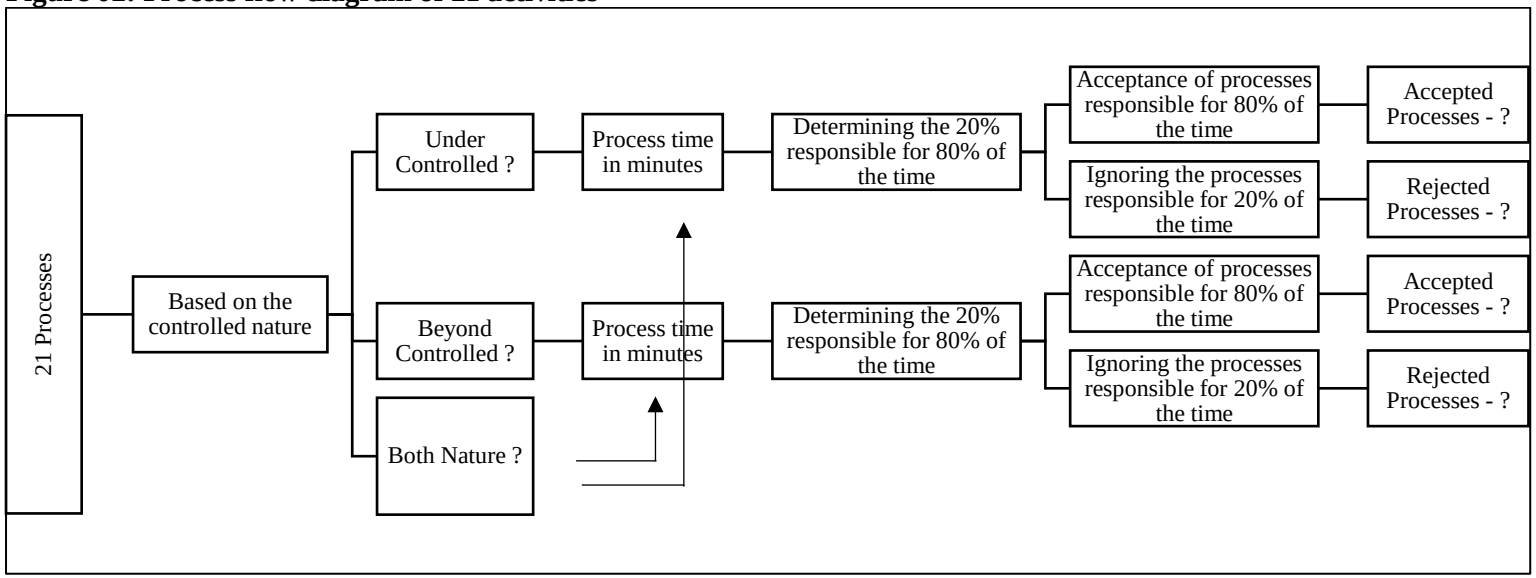
The Pareto Analysis Tool was used for this study, and Excel software was used to obtain the results.

Figure 01: **Data collection plan**



Source: Developed by researchers based on the research methodology

Figure 02: Process flow diagram of 21 activities



Source: Developed by researchers using the analytical methodology of the study.

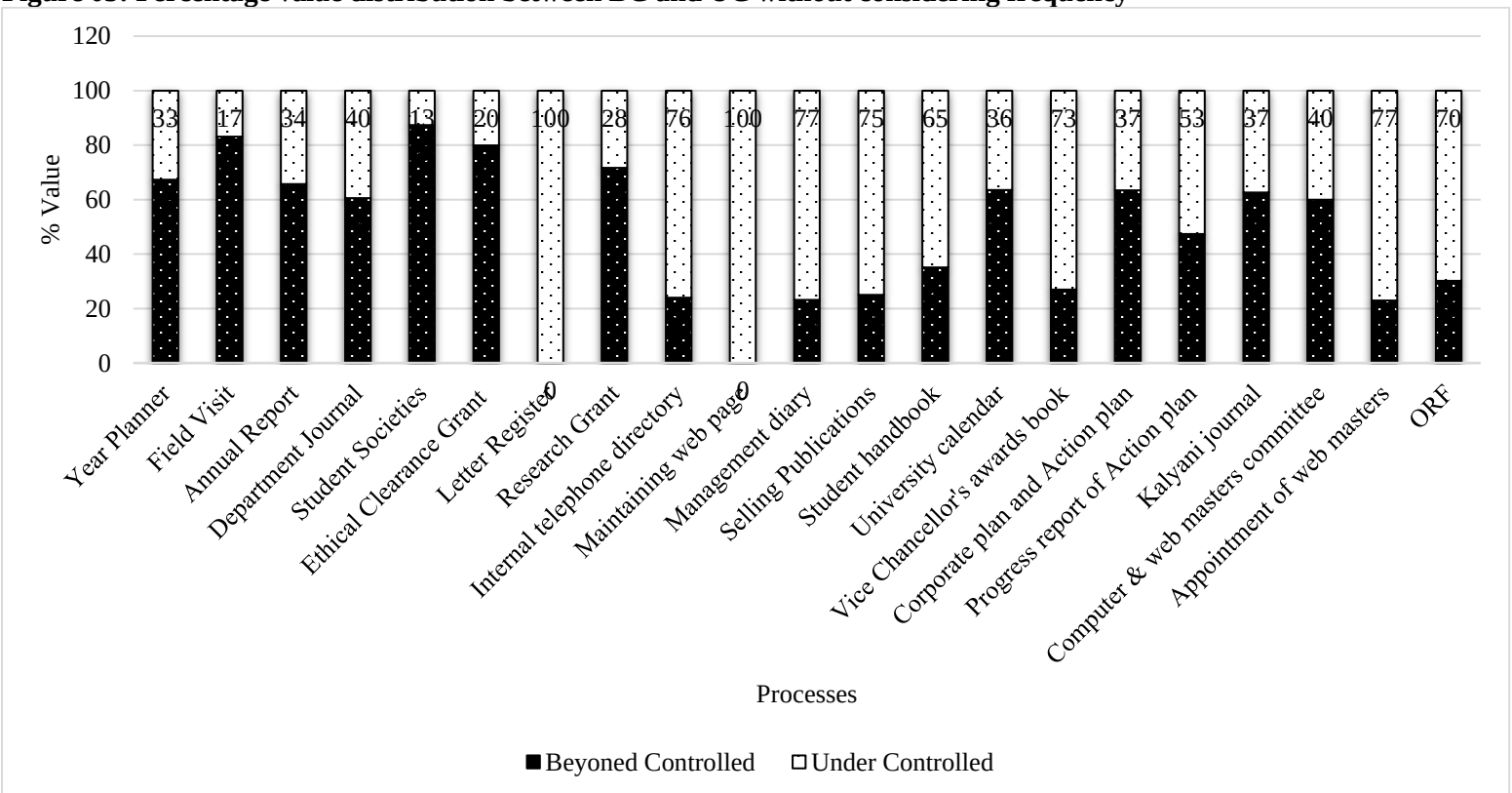
Table 01: Percentage of time distribution between beyond control / under control and time spent on each process

	1	2	3	4	5	6	7	8	9	% Value	
	Process Name	Hours	Minutes	BC	UC	F	BCF	UCF	Total	BCF	UCF
1	Year Planner	944	56640	38100	18540	1	38100	18540	56640	67	33
2	Field Visit	664	39840	33120	6720	118	3908160	792960	4701120	83	17
3	Annual Report	5640	338400	222413	115987	1	222413	115987	338400	66	34
4	Department Journal	648	38880	23520	15360	17	399840	261120	660960	60	40
5	Student Societies	700	42000	36702	5298	6	220211	31789	252000	87	13
6	Ethical Clearance Grant	1840	110400	88161	22239	4	352643	88957	441600	80	20
7	Letter Register		53	0	53	2064	0	109392	109392	0	100
8	Research Grant	3752	225120	161433	63687	14	2260063	891617	3151680	72	28
9	Internal telephone directory	1832	109920	26315	83605	1	26315	83605	109920	24	76
10	Maintaining web page	19	187	0	187	12	0	2244	2244	0	100
11	Management diary	2136	128160	29746	98414	1	29746	98414	128160	23	77
12	Selling Publications		40	10	30	14	140	420	560	25	75
13	Student handbook	1768	106080	37223	68857	1	37223	68857	106080	35	65
14	University calendar	3676	220560	140150	80410	1	140150	80410	220560	64	36
15	Vice Chancellor's awards book	464	27840	7518	20322	1	7518	20322	27840	27	73

16	Corporate plan and Action plan	2032	121920	77280	44640	1	77280	44640	121920	63	37
17	Progress report of Action plan	760	45600	21600	24000	1	21600	24000	45600	47	53
18	Kalyani journal	7952	477120	298881	178239	1	298881	178239	477120	63	37
19	Computer & web masters committee	97	833	499	334	6	2995	2003	4998	60	40
20	Appointment of web masters	384	23040	5280	17760	12	63360	213120	276480	23	77
21	ORF	848	50880	15360	35520	1	15360	35520	50880	30	70
21	Total Value						8121998	3162156	11284154	58	42
	% Value						72	28			

Source: Created by researchers based on the study data.
Key: 1 day = 8 hours, BC = Beyond Control, UC = Under Control,
Note: The division of time between BC and UC is done taking into account the practical functionality.

Figure 03: Percentage value distribution between BC and UC without considering frequency



Source: Created by researchers based on study data

Table 02: Cumulative percentage of processes beyond control

S/N	Process Name (1)	Process Given Name (2)	BCF (3)	% (4)	Cumulative percentage value
01	Field Visit	B	3908160	48.12	48.12
02	Research Grant	H	2260063	27.83	75.94
03	Department Journal	D	399840	4.92	80.87
04	Ethical Clearance Grant	F	352643	4.34	85.21
05	Kalyani journal	R	298881	3.68	88.89
06	Annual Report	C	222413	2.74	91.63
07	Student Societies	E	220211	2.71	94.34
08	University calendar	N	140150	1.73	96.06
09	Corporate plan and Action plan	P	77280	0.95	97.02
10	Appointment of web masters	T	63360	0.78	97.80
11	Year Planner	A	38100	0.47	98.27
12	Student handbook	M	37223	0.46	98.72
13	Management diary	K	29746	0.37	99.09
14	Internal telephone directory	I	26315	0.32	99.41
15	Progress report of Action plan	Q	21600	0.27	99.68
16	ORF	U	15360	0.19	99.87
17	Vice Chancellor's awards book	O	7518	0.09	99.96
18	Computer & web masters committee	S	2995	0.04	100.00
19	Selling Publications	L	140	0.00	100.00
20	Letter Register	G	0	0	100.00
21	Maintaining web page	J	0	0	100.00
			8121998	100	

Source: Created by researchers based on study data

Table 03: Cumulative percentage of processes under control

S/N	Process Name (1)	Process Given Name (2)	*UCF (3)*	*% (4)*	Cumulative Percentage Value
01	Research Grant	H	891617	28.20	28.20
02	Field Visit	B	792960	25.08	53.27
03	Department Journal	D	261120	8.26	61.53
04	Appointment of web masters	T	213120	6.74	68.27
05	Kalyani journal	R	178239	5.64	73.91
06	Annual Report	C	115987	3.67	77.58
07	Letter Register	G	109392	3.46	81.03
08	Management diary	K	98414	3.11	84.15
09	Ethical Clearance Grant	F	88957	2.81	86.96
10	Internal telephone directory	I	83605	2.64	89.60
11	University calendar	N	80410	2.54	92.15
12	Student handbook	M	68857	2.18	94.32
13	Corporate plan and Action plan	P	44640	1.41	95.74
14	ORF	U	35520	1.12	96.86
15	Student Societies	E	31789	1.01	97.86
16	Progress report of Action plan	Q	24000	0.76	98.62
17	Vice Chancellor's awards book	O	20322	0.64	99.27
18	Year Planner	A	18540	0.59	99.85
19	Maintaining web page	J	2244	0.07	99.92
20	Computer & web masters committee	S	2003	0.06	99.99
21	Selling Publications	L	420	0.01	100.00
			3162156		

Source: Created by researchers based on study data

Table 4.a: Uncontrollable fraction of seven of the operations covering 81% of the controlled processes

UC	BC	UC	Total
H	2260063	891617	3151680
B	3908160	792960	4701120
D	399840	261120	660960
T	63360	213120	276480
R	298881	178239	477120
C	222413	115987	338400
G	0	109392	109392
Total	7152717	2562435	9715152
81%	74%	26%	-

Source: Created by researchers based on the study data

Table 4.b: Controllable share of 3 of the operations covering 81% of the beyond controlled operations

BC	BC	UC	Total
B	3908160	792960	4701120
H	2260063	891617	3151680
D	399840	261120	660960
Total	6568063	1945697	8513760
81%	77%	23%	-

4. Data Analysis

The processes considered in this study and the corresponding time hours and minutes are given in Table No. 01 under Columns 01, 02 and 03 respectively. The minutes are shown in columns 04 and 05, corresponding to the Beyond and Control processes. Column 06 shows the frequency of each process occurring in a year. The time taken per year for each process corresponding to that frequency is given in columns 07 and 08, corresponding to the Beyond and Control processes. Column 09 shows the total time taken for each process in a year. The last two columns show the total time divided by the percentage of 'Beyond' and 'Control' processes, respectively.

According to Table 01, (See Page 09) the total time taken for the Beyond Control and Controlled processes was 8121998 minutes and 3162156 minutes respectively. Also, the total time taken for the whole process was 11284154 minutes. Thus, it is clear that 72% of the total time taken for the entire process is spent on the Beyond Controlled processes and the remaining 28% on the Controlled processes.

Percentage Value Distribution Between BC and UC without Considering Frequency is presented under Figure 03 below. It displays percentages on the vertical axis and 21 related processes on the horizontal axis.

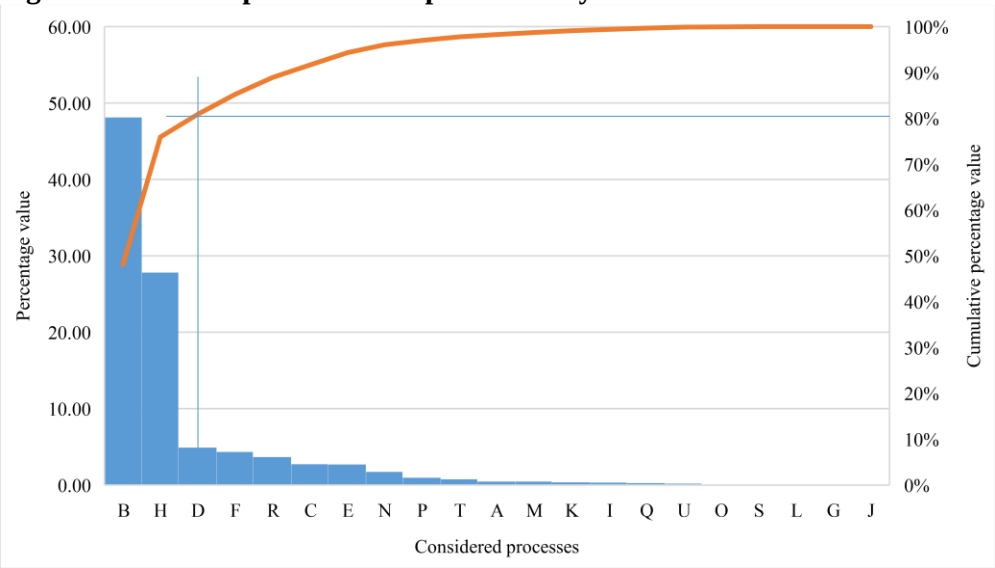
Figure 03 (see page 10) shows Beyond Controlled actions in blue and Controlled actions in orange. The control power of 11 of the 21 processes under consideration exceeds 50% of the control power of 'Beyond Controlled Processes.' Also, the control power of 10 controlled processes is over 50%. This includes the fully controlled nature of two processes. By considering the percentage distribution of time according to the Beyond Control and Controlled processes, it is possible to determine the number of processes responsible for 80% of the time it takes.

Table No. 02 (see page 11) shows the Cumulative Percentage of Beyond Control Processes. The processes considered in column number 01 of the table is listed in order from the most time-consuming process to the least time-consuming process. The names given to each process are given under column 02. These names are given from A to U before aligning according to the value of the process, and the table shows that order after mixing. Column 3 shows the alignment of the frequency value of the Beyond Controlled processes. 'Column 04 shows the percentage value of each process relative to the total duration of the Beyond Controlled processes. Also, the last column shows the cumulative value of those percentage values.

According to Table 2, the total time taken per year for Beyond Controlled processes was 8121998 minutes. 80.87% (approximately 81%) of this total time is completed by the B, H and D processes. These activities are Field Visit, Research Grant and Department Journal respectively.

The Pareto optimum of these data is shown by Figure 04. The processes considered in the horizontal axis of the figure are shown in order of magnitude from high to low.

Figure 04: Pareto optimization of processes beyond control



Source: Created by researchers based on study data

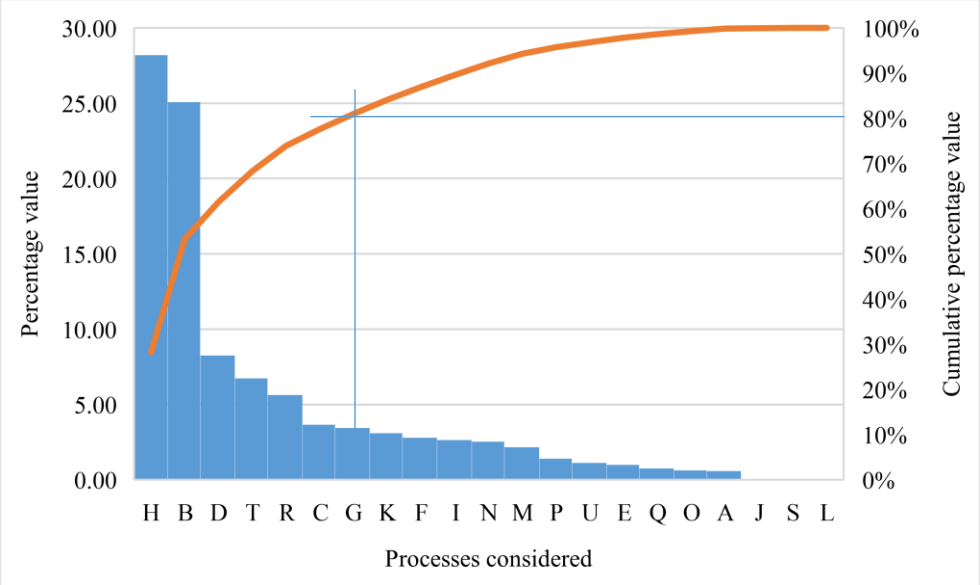
It also shows the percentage value of each of these processes on the left vertical axis and the cumulative value on the right vertical axis. Here, the horizontal line drawn from 81% of the vertical axis on the right touches the D process from the point where the Pareto line intersects, and the line drawn downwards. This means that the first three processes in the picture cover 81% of the time taken for the whole process.

Table No. 03 (see page 12) represents the Cumulative Percentage of Processes Under Control. Its column 01 shows the 21 controlled processes considered in the order of their value. Column 2 gives the name given to each process and column 4 shows its value in minutes. Column 2 shows the name given to each process and column 3 shows their frequency in minutes. Also, column number 4 of the table shows the percentage value of each process relative to the total value and the cumulative value of those values in the last column.

Table 3 shows that out of the 21 processes considered, 7 processes are sufficient to cover 81% of the time spent on all processes. These 7 processes are capable of covering a total of 2562435 minutes out of a total of 3162156 minutes spent on controlled processes.

Figure 05 shows Pareto Optimization of Under Control Processes. Its horizontal axis shows the controlled processes, the left vertical axis shows their percentages, and the right vertical axis shows their relative percentages.

Figure 05: Pareto optimization of under control processes

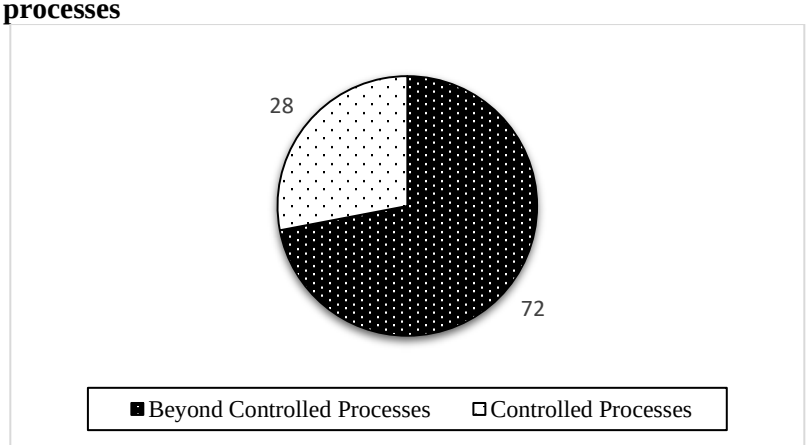


Source: Created by researchers based on study data

Figure 05 The orange line expresses the pareto line. The horizontal line drawn from 81% of the right vertical axis and the line drawn vertically from the G process intersects at the pareto line. This means that 81% of the time in the controlled whole process is covered by the 7 basic processes up to G.

Figure 06 describes Percentage Dependence on Beyond Control and Under Control Processes. It is clear that Beyond Controlled processes account for 72% of the total value of the 21 processes. Accordingly, the share of controllable processes is relatively small at 28%.

Figure 06: Percentage dependence on beyond control and under control processes



Source: Created by researchers based on study data.

Table 4. A - The table on the left shows the uncontrollable fraction of the seven processes that cover 81% of the controlled processes. Also, Table 4. B on the right shows the controllable share of 3 of the functions that cover 81% of the Beyond Controlled processes.

The total value of the processes covering 81% of the controlled processes is 9715152 minutes. Of this total value, only 2562435 minutes can be truly controlled and the remaining 7152717 minutes are out of control again. Accordingly, only 26% of the selected controlled processes can actually be manipulated. The remaining 76% will be treated as uncontrolled activities. Therefore, the final 81% of controllable processes will be equal to 21% (UC - (81/100) x 26 = 21%). Similarly, only 23% of the 81% of selected Beyond Controlled processes can actually be controlled. Therefore, in the end, 81% of uncontrolled processes will be equal to 17% (UC - (81/100) x 23 = 17%). Overall, the end result is a 38% (UC 21% + BC 17 = 38%) improvement even when the concept of zero defect is fully implemented for the seven selected control processes and the three uncontrolled processes. This further indicates that 62% of the considered processes (UC-7, BC-3 = 10) are still out of control.

5. Discussion

This study was conducted to satisfy a main purpose and two specific objectives. The main objective was to investigate the extent to which the existing administrative framework contributes to achieving the goals of the Zero-Defect concept. Considering the administrative framework, the focus was on the extent to which there is a conducive environment for the introduction of a new concept. An appropriate environment meant estimating the size of the controllable environment. Among the specific objectives was to identify the process priority that the Zero-Defect concept should be introduced to improve efficiency. 21 processes related to the research and publishing unit were considered. Accordingly, Pareto's theory was used to examine priority. The second specific purpose was to calculate the expected effectiveness of introducing the Zero-Defect concept to priority processes within the existing administrative framework. Here, the controlled nature of the existing framework was used to evaluate the effectiveness of introducing a new concept. In conducting this study, a number of literatures related to process efficiency were reviewed. From the beginning of the manufacturing process to the present, from the Kraft production model to the personalized production model Hu, S Jack (2013). The scholars considered the major processes of supply, transformation and output as 'integrated' as well as 'separately' and proved that various efforts have been made to improve efficiency by improving the processes. It was identified that a number of concepts are being used to enhance the efficiency of processes, mainly in conjunction with the Lean concept. Of these, the concept of zero defect proved to be the most popular. Abdallah Hussien Fathy (2018) further confirmed by Literature that time is used as a special tool to measure efficiency and that there are many other tools. The review included research on the effectiveness of educational and administrative processes at several Sri Lankan universities, including the University of Kelaniya.

However, although various methods had been used to enhance the efficiency of the process, studies had not been able to find out which process should be prioritized. Also, it proved that there was less attention paid to pre-evaluation techniques before replacing efficiency-enhancing methods. Both of these gaps were filled by this study.

Table 1 revealed that 72% of the total processes considered to be dependent on the total time span. Accordingly, it was confirmed that only 28% are allowed to work independently under the existing administrative framework. Analyzes given only by Tables 2, 3 and Figure 4 and 5 can be misleading. All these reports confirmed that there is a possibility of increasing the efficiency by 81% by targeting 3 and 7 processes respectively. However, the analysis had to be taken one step further to further confirm this situation. The data of that analysis are shown in Table 4. According to those data, with the full introduction of a new concept, the chances of achieving the desired goals are limited to 38%. That percentage is divided into controlled and uncontrolled processes by 21% and 17%, respectively. In this way all the objectives of the study were achieved. Finally, the overall results confirmed that only a small contribution can be expected from the existing university framework for approaching efficiency enhancement strategies.

6. Conclusion

Unstable and uncontrollable process result in producing nonconforming product, which affect the overall production performance. According to the findings of the study, several conclusions can be reached. In order to make the Sri Lankan university system more efficient, it is necessary to identify the uncontrollable factors and formulate strategies to avoid them. It is advisable to conduct further studies to identify barriers that are common to the university system and unique to each university in order to increase efficiency. However, according to the Japanese management philosophy, the idea of 'do it now, even with a small investment' is appropriate in this context (Imai M, 1997).

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