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LEAN THINKING AND UNIVERSITY PERFORMANCE: THE INTERVENING EFFECT OF LEADERSHIP AMONG CHARTERED UNIVERSITIES IN KENYA

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Abstract The competitive environment of organizations the world over, coupled with constrained resources, ever increasing customer awareness and advances in technology, has forced manufacturing and service operations including Higher Education Institutions (HEIs) to rethink their strategies and focus on removing “waste” from their processes. One strategy that has successfully been used in manufacturing and is increasingly being adopted in the service sector is “Lean thinking”. The study sought to explore the current state of application of lean thinking in chartered universities in Kenya; determine the relationship between lean thinking and performance of these institutions, and evaluate the possible intervening effect of leadership on this relationship. The study was underpinned by the Theory of Constraint (TOC) and Transformational Leadership Theory (TLT). A cross-sectional survey research design was employed and both primary and secondary data collected. From a purposive sample of 34 chartered universities (20 public and 14 private), a questionnaire was administered to academic registrars and 18 public and 10 private universities responded, giving response rates of 90 and 71 percent respectively for public and private universities. Results indicated that although no university in Kenya had implemented lean thinking, the concept was known and being applied in the institutions. Further, lean thinking had a significant effect on performance of chartered universities but with private universities showing stronger predictive power. In addition the study established a significant partial intervening influence of leadership on the relationship between lean thinking and performance of chartered universities in Kenya. The study affirms that lean thinking can improve university performance but this could be enhanced by strong commitment and support of leadership. Policy makers may use these findings to formulate policies focused on efficiency, waste elimination and customer value. The findings could also stimulate lean thinking implementation in universities across Kenya and other developing countries. A holistic lean thinking implementation is recommended for chartered universities in Kenya. Future research may concentrate on waste identification and elimination in Kenyan universities.

Key Words: Lean thinking, leadership, chartered universities, university performance

1. INTRODUCTION

The current global competitive market environment, coupled with constrained resources, ever increasing customer awareness and advances in technology, has forced manufacturing and service organizations including the public sector and Higher Education Institutions (HEIs) to rethink their strategies and focus on removing “waste” from their processes. With customer demands increasing and their expectations becoming more complex, López-Fresno (2016) argues that today’s organizations must emphasize on efficiency, high service levels, high quality products/services at lower costs, and rapid response in order to thrive and grow, hence the need for the adoption of lean thinking.

As a management philosophy and a process optimization strategy, lean thinking aims to identify and eliminate steps or activities in the value-creation processes that add no value to the end-use customers but consume resources (waste) (Suárez-Barrazaa, Smith, & Dahlgaard-Park, 2012). However, for lean thinking to succeed as a performance improvement strategy, authors argue that the need for change must be supported from the top and embraced by all employees through organizational culture change (Rainfsnider & Kurt, 2004; Sinha & Mishra, 2013), hence the relevance of leadership in this study.

Higher education in Kenyan has been identified as the principal stimulus towards the attainment of the social pillar in the Vision 2030 which places greater emphasis on aligning education and training with the skills needs of the employment market and the society at large (World Bank, 2019). However, performance of universities has been under criticism from the government, employers and other stakeholders. Concern over graduate quality is on the rise (Federation of Kenya Employers, 2018; Munene, 2016); high operating costs with escalating debt levels (Mutai, 2019; Nganga, 2018) and inefficient use of resources (Ligami, 2017; Magoha, 2019) have become widespread among Kenyan universities. Although most universities have initiated a number of cost reduction measures, their systems and processes have remained fundamentally unchanged. This study therefore sought to evaluate the state of lean thinking in chartered universities in Kenya and determine the relationship between lean thinking and performance of these institutions, while examining the possible intervening effect of leadership on the relationship

1.1 Lean Thinking

Developed over time, “lean thinking” has its origins in the manufacturing system of a Japanese automobile company, Toyota, where it was first termed as the “Toyota Production System” (TPS). It was an initiative to correct the delays and duplications that were characteristic of a number of Toyota Company’s mass production processes after the Second World War, when the Japanese economy was faced with scarcity of input resources in terms of capital, raw materials and qualified labour, and the manufacturers had to “do more with less” (Liker, 2004). Lean applies tools and techniques to develop a change in organizational culture to one that fosters operations and process improvement practices which allow for reduction of wastes, improvement of flow and greater focus on customer needs (Ohno, 1988), and, it is founded on proven principles.

The principles on which lean thinking is anchored were summarized by Womack and Jones (1996) as: Value (value specified from customer perspective); value stream (a series of value-adding activities identified for a specified product or service); flow (processes are synchronized to allow for continuous flow of physical products, services and information); pull (production or operations are aligned to precisely meet customer demand), and perfection (constantly striving to eliminate waste, improve flow and satisfy customer needs through continuous improvement). In order to operationalize these principles lean applies tools and techniques to develop a change in organizational culture that fosters process and operations improvement practices which allow for reduction of wastes, improvement of flow, and greater focus on customer needs (Ohno, 1988).

Kusler (2011) describes waste (or “muda” in Japanese) as any activity that a customer would not want to pay for and that which adds no value from the customer perspective. Ohno (1988) and Shingo (1981) came up with the first seven categories of “muda” that were typical of a manufacturing setting, namely: Inventory, transportation, motion, overproduction, over-processing, waiting, and defects. In higher education systems, similar wastes have been identified, translated in the higher education context and grouped into four broad categories (Lareau, 2003), namely: People waste (arising when universities fail to make full use of the skills,

abilities and knowledge of employees); asset waste (arising when the university fails to use its resources-facilities, financial, human and materials- in the most efficient way); process waste (arising from deficiencies in the design and/or implementation of the university processes), and information waste (arising when available information is inadequate for purposes of supporting university processes). Authors concur that waste directly causes inefficiency, increased costs, process delays (time element), variation in the quality of process outcome, unnecessary consumption of resources and diminished performance (Ziskovsky & Ziskovsky, 2007). This challenges leaderships of HEIs to focus on improving the critical processes as key to value-creation in the achievement of their institutions' core business.

1.2 Leadership

Leadership has been identified as the driving force for increasing organizational performance. In the context of lean thinking, Dombrowski and Mielke (2013) contend that leaders do not directly participate in value addition in organizations to improve performance but contribute to the efficiency and effectiveness of performance by directing employees and setting conducive work environment. As a result, the authors developed a model of five core lean leadership principles or attributes that could be tailored to any industry to operationalize leadership in organizations. These include: Improvement culture (practices and behaviours of a leader that create a never-ending striving for perfection); self-development (requires a leader to understand that a change to lean leadership need new skills); qualification (attributes that enable a leader to support long-term development of employees through involvement, empowerment and learning); Gemba, also known as "shop floor management"; (requires that a leader personally goes to the actual work place where value is being created, which enables informed decision-making) and. Hoshin kanri, also known as "target management" (emphasizes the ability of a leader to align goals at all levels of the organization with customer focus). This study adopted the five principles, modified to suit higher education context.

1.3 Chartered Universities in Kenya

The Kenyan's Commission for University Education (CUE) list of accredited universities of 2017 (CUE, 2017), indicates that the number of private and public universities had grown to 74, up from 58 in 2011. There were 31 public and 18 private universities with full charter, compared to 7 public and 8 private universities in 2011. Private universities are non-state owned or governed institutions but operate under state regulations in terms of accreditation and quality assurance. These universities exist in two categories, namely: for-profit and not-for profit (or faith-based).

Public universities are funded by the government through grants for both recurrent and development expenditure. They also receive external aid and contributions mostly for capital development, staff training and technical assistance. Comparatively, private universities rely on own funding sources which include tuition fees, endowments, gifts and trusts, and auxiliary enterprises and investments, with tuition fees being the main source, charged generally in conformance to market forces centered on full cost recovery. Although private universities are currently being funded by the national government on the basis of the number of government sponsored students admitted by them, the public universities still get a larger proportion of the same.

1.4 University Performance

Robbins (2002) defines performance as the aggregate outcome of all the activities and work processes of an organization. In higher education, effective performance measurement is key to ensuring that the strategies of the institutions are successfully implemented. This involves monitoring an institution's effectiveness in fulfilling its own predetermined goals together with stakeholder requirements. As a result, performance in higher education has typically been grouped into three broad categories (Howard, 2007) namely: Financial performance (including cost containment or reduction, increased revenue, financial surplus and level of endowment funding); operational performance (including teaching and student quality, research quality, programme efficiency, retention and graduation rates, and measures of market positioning), and organizational effectiveness (including web rankings, institutional reputation, graduate employability, student satisfaction, employer satisfaction and , and infrastructure such as buildings, learning spaces, library and Information and Communication Technology (ICT) facilities (Brodhag, 2013; Rossi & Rosli, 2013).

This study concentrated on financial as well as non-financial measures of performance. Financial performance was measured using the current ratio and operating cost recovery ratio. These indicators were

deemed appropriate given the financial crises facing most Kenyan universities today. Non-financial performance measure included web ranking and graduation rate. These indicators have been identified as critical performance measures of time and quality at strategic levels (Gibbs, 2010; Noreen & Hussain, 2019).

1.5 Research Problem

There is growing evidence in Kenya, that the quality of university education, which is a critical performance measure, has been declining (Kagondu & Marwa, 2017; Makokha & Mutisya, 2016). Complaints from employers are common that students' knowledge, skills and competencies that are critical to working in a fast changing technological environment are not adequately being addressed by the universities (Employers, 2018; Khainga & Mbithi, 2018). It is also public knowledge that most universities, particularly public, are sinking in financial crises, with cash flow problems, enormous liabilities and escalating debt levels (Mutai, 2019; Nganga, 2018; Owino & Wanzala, 2019).

Both the quality and financial problems have been attributed partly to the rapid growth in enrolments which occurred from 2012, but also on competition pressure. Authors argue that growth in enrolments, which saw both private and public universities grow to 74 by 2017, up from 58 in 2011, had occurred without commensurate expansion in resources, infrastructure and human capital, particularly in public universities (Gudo, 2014; Kyama, 2017), and in turn affected the quality of learning, teaching and research (Ogeto, 2015). With regard to competition, both private and public universities are increasingly competing among themselves and also regionally to offer students quality education, flexible programme offerings, and user-friendly, online student services. These led to quantitative growth in satellite campuses and colleges which in turn contributed to inefficiency in the use of resources and facilities, leaving a number of universities struggling with severe cash flow problems (Ligami, 2017; Nyangau, 2014).

In an effort to address the above challenges, the government, through a CUE directive in 2017, closed a number of satellite campuses and suspended further establishment of new ones. Similarly, a number of universities in the recent past had embarked on a raft of measures to cut down on costs including hiring freezes, work-force reductions, internal reorganizations and widespread cutbacks across their institutions (Igadwah, 2018; Kariuki, 2019; Wanzala, 2018). However, the impact has been minimal as most universities, particularly public, are still cash-strapped (Sunday, 2022). In view of the limited success of these interventions, this study proposed that Kenyan universities should focus on eliminating waste in their systems and processes and lean thinking could be a sustainable approach.

Literature indicates growing interest in lean thinking application in HEIs with improvements in cost, quality, efficiency, customer value and overall institutional performance. However, many studies are case studies on projects initiated by HEIs that either were in the process of implementation or had already implemented lean thinking (Behm, Deseck, Granza, & Hermansen, 2010; Comm & Mathaisel, 2005; Pedersen, Ziegler, & Holt, 2015; Radnor & Bucci, 2011). In addition, majority of cases reviewed were from the USA (Behm, et al., 2010; Pedersen, Ziegler, & Holt, 2015); UK (Douglas, Antony, & Douglas, 2015; Radnor & Bucci, 2011), and Asia (Alex, Lokesh, & Ravikumar, 2010; Rayate & Khairnar, 2018), where most HEIs are operating in intense competitive market environments, necessitating the need to adopt private sector management practices.

In Kenya, researches on lean thinking application in a university set-up are scarce. A number of studies on lean concepts have concentrated in the areas of manufacturing (Keitany & Riwo-Abudho, 2014; Wamalwa, Onkware, & Musiega, 2014); microfinance institutions (Madiavale, 2016), and areas of supply chain (Wachuma & Shalle, 2016) and procurement (Nyakagwa & Muthoni, 2014), and have reported significant cost savings, lead-time reductions, quality improvements and enhanced customer satisfaction. This study therefore attempted to bridge the above gaps by looking for answers to the broad research question: What is the influence of lean thinking on performance of chartered universities in Kenya?

2 LITERATURE REVIEW

2.1 Theoretical Literature

This study was underpinned by two management theories, namely: the Theory of Constraint (TOC) and Transformational Leadership Theory (TLT), with TOC as the anchoring theory. The TOC (Goldratt & Cox,

1984) views an organization from a systems perspective and posits that every complex system is a set of interrelated activities of which, at least one, will act as a constraint on the whole system and impede its achievement of the organizational goals. It posits that improvement in the overall throughput can only be achieved by improving the constraint. The constraint concept is similar to the view of waste in lean thinking. While Goldratt and Cox (1992) acknowledge that waste forms an integral part of most constraints, the lean methodology identifies waste as the main restriction to profitability (KPMG, 2012).

According to the Transformational Leadership Theory (TLT), the leader acts as an agent of change, influencing his followers to refocus the attainment of their personal aspirations to the concurrent realization of organizational and societal goals (Bass, 1995; Bennis, Neumann, & Birnbaum, 1989). It is anchored on empowerment and emphasizes organizational-wide transformation and change (Bass & Riggio, 2006; Muijs, 2011), which is supported by the “continuous improvement” principle in lean thinking. With the current changing organizational environment of higher education institutions which is characterized by stiff competition, advances in technology; ever increasing student numbers and steadily decreasing public financial support, the transformational leadership model is deemed relevant in enabling the institutions to develop appropriate solutions and adapt to change

2.2 Empirical Literature

2.2.1 Lean Thinking and Performance of Universities

Many studies have been carried out linking lean thinking directly to organizational performance. Douglas, Antony and Douglas (2015), supported by Comm and Mathaisel (2005) argue that the efficiency and effectiveness of any educational system rise from its ability to achieve its goals with the least cost and resources possible. Findings on the research by Comm and Mathaisel (2005) revealed that implementation of cost reductions or containment initiatives through the adoption of lean principles and tools brought about increased effectiveness and sustainability of HEIs in USA. In contrast, Radnor and Bucci (2011) in similar studies in UK universities and business schools, established little evidence relating to savings in cost, but identified positive results related to student and staff experiences in terms of improved communication; recruitment and training of staff; student admissions, maintenance procedures, financial data processing and in decision making. However, a study by Pedersen, Ziegler and Holt (2015) aimed at improving student’s learning experience while at the same time cutting costs on a project at a distance education division of Northern Arizona University (NAU), established significant cost savings in organizational operations through lean implementation. One of the projects (new student orientation) realized an annual cost savings of \$6,750.

Time is a significant determinant of performance in organizations and is increasingly being used as a management tool for achieving competitive advantage. Behm, et al. (2010) examined the level of success of the lean initiatives being implemented in the University of Michigan, USA. The study identified a number of improvements in efficiency especially in operations, with enormous process time reductions in Health Care (HC) system and Human Subject Incentive Program (HSIP), leading to enormous cost savings.

The above results were supported in later findings by Isaksson, Kuttainen and Garvare (2013) and Oktarian and Surjasa (2021) in their studies aimed at assessing how traditional university research and education were performing compared with cases where lean principles were applied in Sweden and in Indonesia respectively. In Sweden, findings revealed that the time lag between idea creation and research publication in most universities varied between 10 to 40 months against a benchmark of one to three months. This signified about 90 percent waste in the form of waiting. While the long summer holidays were viewed as representing waste within the educational process, the visionary benchmark was individualized and based on “one-piece-flow”. In Indonesia similarly, results indicated that the waste level in the form of waiting time was 90% longer than the benchmark time for both the education and research processes. By upgrading the processes through lean application, the time wasted reduced to as low as 10%.

The quality of higher education has become strategically important in national economic development and competitiveness. Gibbs (2010) argues that effective measures of education quality should focus on variables that relate to improvements in quality of the learning outcomes. Sillero (2013) in a project aimed at experimenting and evaluating the benefits of a Project-Based Learning (PBL) method to increase the learning

outcomes in the teaching-learning process at the Engineering Department of the University of Monterey (México), realized a 9 percent increase in the general satisfaction of students compared with previous cohorts.

A project similar to the above was carried out by Pusca and Northwood (2016) aimed at determining how application of lean principles could help in improving the quality of a course design in an engineering programme, focusing on the three core areas of course content, instructional methods and methods of assessment. Findings revealed significant improvements in students' engagement as a number of changes were implemented including the use of the flipped teaching, which created more time for the new content design, group work and practical examples, which in turn encouraged more active learning with hands-on experiences.

2.2.2 Lean Thinking, Leadership and University Performance

Lean thinking is a change initiative which requires strong commitment and support of leadership of an organization and cooperation of employees (Sinha & Mishra, 2013; Rainfsnider & Kurt, 2004). Rainfsnider and Kurt (2004) argue that for lean concepts to be successfully implemented in an organization, the need for change must be sponsored by top management (financially, in time, and in spirit) and transferred to the employees.

Flumerfelt and Banachowski (2011) assessed the leadership paradigms that were critical for improvements in HEIs based on universities in the State of Michigan. Findings indicated that scarce resource allocation; root-cause analysis of problems and supporting group dynamics, ranked highest among leadership paradigms of concern. On the other hand, the leadership paradigm that was both most highly associated and highly ranked was confronting ambiguity. Although this study underscored the significance of leadership in the success of the lean initiative, the leadership paradigms were not explicitly linked to performance. Simonyte, Adomaitiene and Ruzele (2022) in a similar study, aimed at identifying lean implementation experiences in HEIs worldwide, through a survey of 34 lean practitioners drawn from diverse higher education institutions, further confirmed that lean thinking brought about positive change in the studied institutions. In addition, strong leadership and top management commitment, besides good communication and teamwork, were cited as critical determinants in successful implementation of lean.

The results of the above studies supported findings by Larteb, et al. (2015) in their research focused on the moderation of effectiveness of lean leadership through national cultural values dimensions, and based on the response from lean leadership experiences in several multinational organizations in Morocco. The aim was to evaluate the status of lean leadership maturity in these organizations. Findings revealed a positive and significant influence of top level management on the success of lean manufacturing in organizations. Although the study was done in a manufacturing set-up and not in higher education environment, its findings reinforce the critical role of leadership in enhancing the effectiveness of lean thinking as a performance improvement strategy in organizations

3 RESEARCH METHODOLOGY

Cross-sectional survey research design was employed. The study population consisted of 49 chartered universities which included 31 public and 18 private universities. However, the study targeted those universities that had been awarded full charter by 2013, leading to a purposive sample of 34 (20 public and 14 private). In order to avoid the possibility of duplication of information, one respondent, the academic registrar, from each university, was selected, as their role provide a vital link between the executive and the core university mission of teaching.

Secondary data was obtained from various universities' records, websites and audited annual financial reports; CUE reports, together with Webometrics Ranking of World Universities and uniRank websites, over a period of five years, from 2016/2017 to 2020/2021 academic years. Five-year averages were taken for the current ratios, operating cost recovery ratios, graduation rates and web rankings so that time series data would match with cross-sectional data. Graduation rates were based on the first-time, full-time, 4-Year programme undergraduate enrolments from 2013/14 to 2017/18. The data gathered was analyzed in three stages in line with the three objectives. Stage one assessed the state of lean thinking in the chartered universities under study. In this stage, descriptive statistics including the mean, percentages, frequencies and standard deviation were used

to establish the basic characteristics of the data. Stage two involved test of hypothesis aimed at determining the effect of lean thinking in chartered universities in Kenya. In this stage the study applied simple linear regression analysis. Stage three also involved tests of hypothesis which aimed to assess the intervening effect of leadership on the relationship between lean thinking and analysis was done using multiple linear regression.

4 RESULTS AND DISCUSSIONS

Out of the 34 questionnaires distributed a total of 30 were correctly filled and returned, 18 from public and 12 from private universities. However, two private universities declined to provide financial data and were excluded on the basis of incomplete data. The study, therefore achieved a response rate of 90 percent for public, 71.4 percent for private universities and 82.8 percent overall.

4.1 Descriptive Analysis of Study Variables

4.1.1 State of Lean Thinking in Chartered Universities in Kenya

The study first assessed the respondents' level of awareness of the lean thinking concept in terms of their knowledge of the concept, personal workplace application and institutional-wide application of the concept. On each of these, the respondents were requested to give their views on the stated statements based on a scale of 1-5, described as: 1 (very low); 2 (low); 3 (moderate); 4 (high) and 5 (very high). The results were summarized in Table 1 below.

Table 1: Respondents' Awareness and Use of the Lean Thinking Concept

Characteristics	Rating	Sample Size	Frequency	Percent
Level of knowledge of the lean thinking concept	Very low	28	1	4
	Low	28	2	7
	Moderate	28	9	32
	High	28	13	46
	Very high	28	3	11
	Total			28
Level of use of lean application in day-to-day work	Very low	28	0	0
	Low	28	3	11
	Moderate	28	8	28
	High	28	15	54
	Very high	28	2	7
	Total			28
Level of institutional-wide application of lean thinking in the university	Very low	28	0	0
	Low	28	3	11
	Moderate	28	12	43
	High	28	9	32
	Very high	28	4	14
	Total			28

Source: Research Data (2022)

Results of Table 1 above indicated that most respondents agreed that their level of knowledge of the lean concept was high (46 percent); personal workplace application was high (54 percent), but institutional-wide application was only moderate (43 percent). This implied that on average, the concept of lean thinking was well known in the chartered universities under study, particularly at managerial levels.

The study further evaluated the level of application of lean principles and the practice of waste elimination in the chartered universities. Descriptive measures which were used to summarize the characteristics of the study variables included the mean and the standard deviation. A summary of the results was presented for public and private universities as shown Table 2 below.

Table 2: Summary of Lean Thinking Descriptive Analysis

Study Variable	Sub-Variables	Indicators	Sample Size	Mean	Standard Deviation
Lean thinking	Lean principles	Value	28	4.07	0.75
		Value stream	28	3.62	0.99
		System flow	28	3.67	0.88
		Customer pull	28	3.34	1.03
		Perfection (continuous improvement)	28	3.50	1.01
		Mean score for principles	28	3.64	0.93
	Waste elimination	People waste	28	3.29	1.03
		Asset waste	28	3.26	0.97
		Process waste	28	3.47	1.06
		Information waste	28	3.70	1.12
		Mean score for waste elimination	28	3.43	1.04
	Overall mean and standard deviation for lean thinking		28	3.55	0.98

Source: Research Data (2022)

Findings in Table 2 above showed that lean principles were being applied to a moderate extent in the chartered universities under study (aggregate mean score of 3.64, with low variability standard deviation of 0.93). On waste elimination, the results reflected an aggregate mean score 3.43 and a standard deviation of 1.04, indicating that according to the respondents, the lean practice of waste elimination was also being applied to a moderate extent in the chartered universities under study. Overall, the results indicated a moderate application of lean thinking in chartered universities in Kenya (aggregate mean score of 3.55 and less variability with a standard deviation of 0.98).

On individual lean principles, the “value” category, which entails the definition of value from customer perspective (for instance, what the customer wants, at what time, and at what price) and what resources and activities are absolutely necessary to create that value, was ranked highest (mean score of 4.07 and less variability standard deviation of 0.75). On the other hand, customer pull which entails understanding the customer demand and creating processes to respond accordingly, was rated lowest (mean score of 3.34 and standard deviation of 1.03).

On individual waste elimination practices, Table 2 further indicated that information waste which arises when available information is inadequate for purposes of supporting university processes, had the highest overall elimination mean score of 3.70 and a standard deviation of 1.12 (less variability). On the other hand, asset waste, which refers to the category of wastes that occur when the university does not use its resources (human, facilities, financial, and materials) in the most effective manner, had the lowest overall elimination mean score of 3.26 and a standard deviation of 0.97 (less variability). This meant that on average, asset waste was rampant in chartered universities under study, which could have contributed to the generally low performance in the universities.

4.1.2 Performance of Chartered Universities in Kenya

Performance was expressed in both financial (current and operating cost recovery ratios) and non-financial (graduation rate and web raking) terms. Since measurements for performance indicators involved both interval and ordinal scales, the resulting data were grouped and assigned weights on a scale of 1-5 in order to match with the questionnaire ratings and create uniformity in data analysis.

Operating cost ratio refers to the extent to which the university revenues are able to recover its operating costs. Data collected were categorized into scores ranging from “below 0.90” (very weak) to “1.20 and over” (very strong), and summarized in Table 3 below:

Table 3: Cost Recovery Ratio in Chartered Universities in Kenya

Operating Cost Recovery Ratio Weights	Cost Recovery Ratio Ranges	Sample Size	Number	Percent
1	Below 0.90	28	2	7
2	0.90 to 0.99	28	9	32
3	1.00 to 1.09	28	12	43
4	1.10 to 1.19	28	4	14
5	1.20 and Over	28	1	4
Total			28	100

Source: Research Data (2022)

Table 3 above indicated that 39 percent of the universities studied had operating their cost recovery ratios of less than 1, with 32 percent falling between 0.9 and 0.99, implying that these universities were operating at a deficit as their revenues were unable to recover their operating costs. In addition, 43 percent of the universities were just breaking even, with their operating cost recovery ratios falling within the “1.00-1.09” range. It was further noted that only 14 percent of the universities studied had an average operating cost ratio of between 1.10 and 1.19. According to Xiaocheng (2010) , operating cost recovery ratios for financially healthy universities should typically lie between 1.10 and 1. 15, implying that on average, only 18 percent (5 out of 28) of the universities studied were financially healthy.

Current ratio refers to the extent to which the university is capable of meeting its immediate financial commitments in its ordinary operations. According to Mulholland (2017), a current ratio of 1.5 or greater would, in general, indicate sufficient liquidity for an institution of higher learning, while a good current ratio for profit-oriented institution would typically be between 1.5 and 2.0. Data collected for current ratios were also categorized into scores ranging from “below 0.60” (very weak) to “1.80 and over” (very strong). A summary of the results were shown in Table 4 below.

Table 4 Current Ratios of Chartered Universities in Kenya

Current Ratio Weights	Current Ratio Ranges	Sample Size	Number	Percent
1	Below 0.60	28	1	4
2	0.60 to 0.99	28	11	39
3	1.00 to 1.39	28	12	43
4	1.40 to 1.79	28	3	10
5	1.80 and over	28	1	4
Total			28	100

Source: Research Data (2022)

Table 4 below.

Table 4 above shows that 43 percent of universities studied had their current ratios less than 1.00, with 39 percent falling between 0.6 and 0.99, implying that on average, these universities were unable to meet their immediate financial commitment in their ordinary operations.. In addition, 43

percent of the universities were breaking even, with their current ratios falling within the “1.00-1.39” range. It was further noted that only 10 percent of the universities studied had an average current ratio lying within 1.40 and above, implying that on average, only 10 percent of universities met the criteria for being in a sound liquidity position for an institution of higher learning as recommended by Mulholland (2017).

Graduation rate indicates a country’s capacity to supply future human resource with specific knowledge and skills (Mukhwana, et al., 2016). In the current study context, graduation rate refers to the percentage of first-time, first-year undergraduate students who graduate within the stipulated time for the programme. The study focused on the 4-Year undergraduate programme. A summary of the results for graduation rates were shown in Table 5 below:

Table 5 below indicated that 43 percent of studied universities had their average graduation rates within the “60 to 69 percent” range. Table 5 further showed that 35 percent (10 out of 28) of the universities had their average graduation rates falling within “70 percent and above” range, implying that on average, 70 percent and above, of these universities’ four-year bachelor’s degree students graduate within the stipulated timeframe for the programme.

Table 5 Graduation Rates for Chartered Universities in Kenya

Graduation Rate Weights	Graduation Rate Ranges	Sample Size	Number	Percent
1	Below 50	28	1	4
2	50 to 59	28	5	18
3	60 to 69	28	12	43
4	70 to 79	28	8	28
5	80 and over	28	2	7
Total			28	100

Source: Research Data (2022)

The combined analysis of the data collected revealed that the overall average graduation rate for the universities studied was 66 percent, implying that on average, 66 percent of these universities’ four- year undergraduate students had completed a bachelor’s degree at the same institution where they started within four years. These results were closely comparable with international figures although the number of universities covered under the current study was significantly small. According to the U.S. National Center for Education Statistics, the average college four-year undergraduate graduation rate (based on universities and colleges in 50 states) for the year 2020 was 64 percent. It was however noted that the top performing universities and colleges often maintained graduation rates above 90 percent. For example, Harvard had a graduation rate of 98 percent, while Yale University, a graduation rate of 97 percent. Stanford and Massachusetts each had graduation rates of 94 percent (National Centre for Education Statistics, 2021).

Web ranking refers to the extent to which the university exhibits quality of teaching, research and knowledge transfer, as reflected by the level of web presence. Web rankings were based on an average of 57 registered public and private universities in Kenya that had consistently taken part in the national rankings from 2017 to 2021. The findings were summarized in Table 6 below.

Table 6 Web Rankings for Chartered Universities in Kenya

Web Ranking Weights	Web Ranking Ranges	Sample Size	Number	Percent
5	1 to 9	28	5	18
4	10 to 19	28	6	21
3	20 to 29	28	10	36
2	30 to 39	28	4	14
1	40 and over	28	3	11
Total			28	100

Source: Research Data (2022)

Table 6 above indicated that 5 out of 28 (18 percent) of the universities under study ranked within positions “1 to 9” range, out of an average of 57 participating institutions in national rankings. In addition, 36 percent (10 out of 28) of the universities ranked between positions 20 to 29. These implied that from positions 1 to 29, which should be a benchmark for the 28 universities under study, 75 percent (21 out of 28) were included. These indicated that on average, most chartered universities studied perform better in terms of quality of teaching, research and knowledge transfer, as reflected by the level of web presence.

4.1.3 Leadership Descriptive Analysis

In this study, leadership was the intervening variable. It was assessed by asking the respondents to state, in their judgment, the extent to which university leadership exhibited the five categories of the specified lean leadership attributes based on a scale of 1 to 5 described as: 1(very small extent); 2(small extent); 3(moderate extent); 4(large extent) and 5(very large extent). The results were summarized in Table 7 below.

Results in Table 7 indicated an overall aggregate mean score of 3.70 and a standard deviation of 0.88, implying that in general, the respondents agreed that the lean leadership attributes evaluated were being exhibited to a fairly large extent in their institutions as the overall mean score of 3.70 was closer to 4 (“to a large extent”) on the instrument Likert scale. The policy development (Hoshin Kanri in Japanese) attribute, which emphasizes the ability of a leader to align goals at all levels of the organization with customer (or student) focus, was the highest rated with an overall mean score of 4.07 and a standard deviation of 0.88.

Table 7 Summary of Leadership Descriptive Analysis

Study Variable	Indicator	Sample	Mean	Standard Deviation
Leadership Attributes	Improvement Culture	28	3.76	0.83
	Employee Development (Qualification)	28	3.56	1.03
	Self-Development	28	3.74	0.76
	Hoshin Kanri (Policy Deployment)	28	4.07	0.88
	Gemba (Work Floor Management)	28	3.38	0.90
	Overall mean and standard deviation		3.70	0.88

Source: Research Data (2022)

The results in Table 7 further showed that improvement culture , which includes practices and behaviours of a leader that create a never-ending striving for perfection (mean score =3.76; standard deviation=0.83) was rated second, followed by self-development (mean score =3.74; standard deviation= 1.03), then employee development (mean score =3.56; standard deviation=0.83). Gemba (also known as work floor management or “Go see”), which requires a leader to personally visit the actual work place where value is being created for

informed decision-making purposes, was the least rated (mean score = 3.38; standard deviations = 0.90). This implies that university leaderships in Kenya hardly visit classrooms, workshops or laboratories, where teaching takes place.

4.2 Results of Regression Analysis

4.2.1 Lean Thinking and Performance of Chartered Universities in Kenya

In the second objective, the study sought to determine the effect of lean thinking on performance of public and private chartered universities in Kenya. The related null hypothesis (H_1) stated that there was no significant effect of lean thinking on performance of public and private chartered universities. Regression results were summarized in Table 8 below.

Table 8: Regression of Lean Thinking and University Performance

Model Summary ^b						
Model	R	R Square	Adjusted R Square			
1	.730 ^a	.533	.515			
a. Predictors: (Constant), Lean Thinking						
b. Dependent Variable: University Performance						
ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.262	1	4.262	29.714	.000 ^b
	Residual	3.729	26	.143		
	Total	7.991	27			
a. Dependent Variable: University Performance						
b. Predictors: (Constant), Lean Thinking						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.104	.577		-.180	.858
	Lean Thinking	1.007	.185	.730	5.451	.000
a. Dependent Variable: University Performance						

Source: Research Data (2022)

Table 8 above showed a coefficient of determination (R^2) of 0.533, implying that 53.3 percent of the total variation in performance of chartered universities was moderately explained by lean thinking. It also implied that other variables not included in the model accounted for the remaining 46.7 percent of the variation. In addition, the Analysis of Variance (ANOVA) results which were used to assess the model's overall and individual significance showed a p-value of 0.000, which was less than α -value of 0.05. This meant that the overall model was statistically significant, and the null hypothesis (H_1) was rejected and the study concluded that lean thinking had a significant effect on performance of chartered universities in Kenya.

On individual significance, lean thinking was found to be significant since its p-value of 0.000 was less than the recommended α -value (0.005), but the constant was not significant as the p-value (0.858) was more than α -value (0.05). The predictive linear equation was $P = 1.007LT$, where P was the composite index for university performance and LT was the composite index for lean thinking. The beta coefficient indicates that a unit increase in lean thinking, holding other factors constant, will increase, on average, performance of chartered universities in Kenya, by 1.007 units.

4.2.2 Lean Thinking, Leadership and Performance of Chartered Universities in Kenya

The third objective of this study was to determine the intervening effect of leadership on the relationship between lean thinking and performance of chartered universities in Kenya. The related hypothesis (H_2) was that there is no significant intervening effect of leadership on the relationship between lean thinking and

performance of chartered universities in Kenya. In order to test this hypothesis, Baron and Kenny's (1986) four-step approach was followed.

In the first step, there should be a relationship between the independent variable (lean thinking) and the dependent variable (university performance). A composite index for university performance was regressed on composite index for lean thinking to confirm that lean thinking was a significant predictor of performance of chartered universities in Kenya. From Table 8 above, the results indicated that lean thinking had a significant effect on performance of chartered universities.

In the second step, there should be a relationship between the independent variable (lean thinking) and the intervening variable (leadership) that is described as: $LS = \beta_0 + \beta_1 LT + \varepsilon$ where LS is leadership, and was regressed on LT (lean thinking). Table 9 below provides the summarized results on this relationship.

Table 9: Regression of Leadership and Lean Thinking

Model Summary ^b						
Model	R	R Square	Adjusted R Square			
1	.689 ^a	.475	.455			
a. Predictors: (Constant), Lean Thinking						
b. Dependent Variable: Leadership						
ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.226	1	3.226	23.497	.000 ^b
	Residual	3.570	26	.137		
	Total	6.796	27			
a. Dependent Variable: Leadership						
b. Predictors: (Constant), Lean Thinking						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.416	.565		.737	.468
	Lean Thinking	.876	.181	.689	4.847	.000
a. Dependent Variable: University Performance						

Source: Research Data (2022)

The third step requires that there should be a relationship between the intervening variable (leadership) and the dependent variable (university performance), and is expressed as $P = \beta_0 + \beta_1 LS + \varepsilon$, where P is university performance and is regressed against leadership (LS) and the results were summarized in Table 10 below.

Table 10 showed a coefficient of determination (R^2) of 0.756, implying that leadership significantly predicted 75.6 percent of university performance. In addition, ANOVA results indicated that the overall model was significant since the p-value of 0.000 was lower than α -value of 0.05. On individual significance, leadership was significant since the p-value (0.000) was below the α -value of 0.005, but the constant was not significant as the p-value (0.849) was more than α -value (0.05).

Table 10 Regression of Leadership and University Performance

Model Summary ^b						
Model	R	R Square	Adjusted R Square			
1	.870 ^a	.756	.747			
a. Predictors: (Constant), Leadership						
b. Dependent Variable: University Performance						
ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.044	1	6.044	80.699	.000 ^b
	Residual	1.947	26	.075		
	Total	7.991	27			
a. Dependent Variable: University Performance						
b. Predictors: (Constant), Leadership						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.064	.333		.193	.849
	Leadership	.943	.105	.870	8.983	.000
a. Dependent Variable: University Performance						

Source: Research Data (2022)

Since the above three tests were fulfilled in accordance with Baron and Kenny (1986)'s recommendations, the study conducted a multiple regression analysis in the fourth step to assess the intervening effect of leadership (LS) on the relationship between lean thinking (LT) and university performance (P), which is expressed as $P = \beta_0 + \beta_1 LT + \beta_2 LS + \epsilon$. In step four, P was regressed on LT and LS to test the related hypothesis that there is no significant intervening effect of leadership on the relationship between lean thinking and performance of chartered universities in Kenya, and the results shown in Table 11 below.

Table 11: Regression of Leadership on Lean Thinking and University Performance

Model Summary ^b						
Model	R	R Square	Adjusted R Square			
1	.888 ^a	.789	.772			
a. Predictors: (Constant), Leadership, Lean Thinking						
b. Dependent Variable: University Performance						
ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.305	2	3.153	46.753	.000 ^b
	Residual	1.686	25	.067		
	Total	7.991	27			
a. Dependent Variable: Overall Performance						
b. Predictors: (Constant), Leadership, Lean Thinking						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized ;	t	Sig.
		B	Std. Error	\Coefficients Beta		
1	(Constant)	-.419	.400		-1.047	.305
	Lean Thinking	.344	.175	.250	1.969	.060
	Leadership	.757	.137	.698	5.505	.000
a. Dependent Variable: Overall Performance						

Source: Research Data (2022)

Results in Table 11 above showed strong explanatory power ($R^2 = 0.789$) indicating that both lean thinking and leadership explained 78.9 percent of the total variation in performance of chartered universities in Kenya. This implied that 22.1 percent of the variation was explained by variables other than those examined in this study. In addition, ANOVA results indicated that the overall model was significant since

the p-value (0.000) was lower than the recommended α -value (0.05). Regarding individual significance, leadership was significant since the p-value (0.000) was also lower than the recommended α -value (0.05), while lean thinking and the constant were not, since their p-values were more than α -value of 0.05.

In accordance with the Baron and Kenny (1986) recommendations, since the effect of leadership remained significant after controlling for lean thinking, and the strength of the coefficient of the previously significant lean thinking in step one is now greatly reduced in absolute size (from 0.730 to 0.250) but different from zero, partial intervening effect is supported. The null hypothesis (H_2) was rejected and the study concluded that leadership had significant partial intervening effect on the relationship between lean thinking and performance of chartered universities in Kenya. The resulting prediction equation was $P = 0.757LS$, which implied that if leadership increased by a unit, performance of chartered universities would, on average, go up by 0.757 units, holding all other factors constant

5 SUMMARY, CONCLUSIONS AND IMPLICATIONS

5.1 Summary

The study sought to explore the current state of application of lean thinking in chartered universities in Kenya; determine the relationship between lean thinking and performance of these institutions, and evaluate the possible intervening effect of leadership on this relationship. The first objective was evaluated by first assessing the respondents' awareness and use of the lean thinking concept, and secondly by assessing the level of application of lean principles and the extent of waste elimination in the university processes. The results indicated that overall, the concept of lean thinking was well known in chartered universities in Kenya but institutional-wide application was moderate in the studied universities.

The second objective which aimed to determine the relationship between lean thinking and performance of chartered universities in Kenya was investigated using linear regression analysis. Results indicated that lean thinking had a positive on performance of these universities, with lean thinking explaining 53.3 percent of the total variation in performance of the institutions.

The third objective which sought to establish the possible intervening effect of leadership on the relationship between lean thinking and performance of chartered universities in Kenya was evaluated using multiple linear regression analysis. Results indicated that leadership had a partial and positive intervening effect on the relationship between lean thinking and performance of chartered universities in Kenya. It was also noted that when leadership was included in the model, the variance explained in organizational performance increased from 53.3 percent to 78.4 percent.

5.2 Conclusions

The study concludes that the concept of lean thinking is not new to chartered universities in Kenya, particularly at managerial levels, as reflected by respondents' high levels of knowledge of the concept, and high levels of lean application in their day-to-day work. However, institutional-wide application of the lean thinking concept is only moderate as could be judged by the level of application of the lean principles and the lean practice of waste elimination.

The study also concludes that lean thinking positively influences university performance. It is further concluded that leadership has a significant partial intervening effect on the relationship between lean thinking and university performance. Based on these, the study affirms that the influence of lean thinking on university performance could be enhanced by strong commitment and support of leadership.

5.3 Implications

The main contribution to knowledge is that the study proves with prior empirical analysis and theoretical foundation that lean thinking has a positive and direct effect on university performance. In addition, the current study expands the existing literature by considering leadership as an intervening variable, which is supported in literature by findings of earlier researchers. In addition, the results of the study make contributions to theory by establishing the relationships among the study variables.

First the study took the position that implementation of lean thinking improves university performance. Based on the TOC, waste is an integral part of most constraints that impede the achievement of the organizational goal of making money (Goldratt & Cox, 1984). Lean thinking on the other hand identifies waste as the main restriction to profitability (KPMG, 2012). The study results are also consistent with the arguments of transformational leadership theory, which is anchored on empowerment and emphasizes organizational-wide transformation and change. The study therefore adds to the theoretical development by integrating TOC and TLT with lean thinking and how it achieves improvement in organizational performance.

The findings of the current study also have policy and managerial practice implications. Policy makers particularly in the Ministry of Education, Science and Technology in Kenya will be able to formulate policies focused on efficiency, waste elimination and customer value, thus saving on the constrained public budget while enhancing stakeholder satisfaction.

The study found out that as the level of application of lean thinking increases, university performance will also increase. On the basis of this finding, the study recommends that managements of public and private chartered universities and similar institutions in Kenya undertake a holistic implementation of lean thinking in order to improve their overall performances

5.4 Suggestions for Further Research

The current study assessed lean thinking application at strategic levels by using academic registrars of the universities as the key respondents. Since lean thinking is about creating value to the customers (who are primarily the students), it is recommended that a similar study be carried out involving students and lecturers. This would add to the current study by capturing the effectiveness of lean thinking application at operational levels.

The current study also assessed the existence of waste in university systems and processes within the narrow confines of the questionnaire items. A detailed study should be carried out on waste identification and elimination in Kenyan universities, highlighting the nature and causes of these wastes to facilitate their removal, leading to improvement in overall university performance.

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