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Strategic Cost Management in Private Medical Faculties: Integrating Activity-Based Costing with Lean Principles

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ABSTRACT

Objective: *This study aims to calculate the unit cost of medical education using Activity-Based Costing (ABC) and to evaluate opportunities for improving operational efficiency through Lean Management.* ***Method:*** *A mixed-method design with an explanatory sequential approach was employed. In the first phase, quantitative financial and operational data were analyzed using ABC to allocate costs based on the activities and resources consumed by students. The second phase involved qualitative analysis based on Lean Management principles to examine operational processes and identify opportunities for cost optimization.* ***Results:*** *The findings indicate that the educational unit cost per student in the undergraduate medical program of a private medical faculty was IDR 101,083,935.92. The integration of ABC and Lean Management provides a more systematic foundation for understanding cost behavior, controlling resource utilization, and improving the efficiency of educational operations. ABC strengthens cost transparency by linking expenditures to specific institutional activities, while Lean Management supports the evaluation and improvement of processes that do not contribute proportionately to educational value.* ***Novelty:*** *This study demonstrates that cost optimization should not be pursued merely through budget reduction, but through more accurate cost allocation and disciplined process improvement. The proposed integrated approach can assist medical faculties in developing more rational tuition policies without undermining service quality or institutional profitability. Ultimately, improved cost governance may broaden access to medical education by reducing financial barriers for academically qualified prospective students.*

INTRODUCTION

Higher education, particularly medical education, plays a fundamental role in developing a robust and sustainable healthcare system. Medical education institutions, including faculties of medicine, are responsible for preparing future physicians and other healthcare professionals to respond effectively to society's evolving health needs. Nevertheless, the substantial cost of delivering medical education often limits access, particularly for prospective students from lower-income backgrounds. These expenses arise from various operational requirements, including academic and administrative personnel, physical infrastructure, laboratory facilities, and medical technology [1], [2]. Consequently, effective cost optimization is essential not only for strengthening the financial sustainability of higher education institutions but also for expanding educational opportunities for academically qualified students. Through more efficient resource management, faculties of medicine can provide high-quality education at a more affordable cost while enabling a broader pool of capable individuals to pursue medical careers and contribute to public health services. In this context, educational costs encompass the total expenditure required to undertake higher education, including

tuition fees, accommodation, and transportation [3]. Understanding how education is financed and how institutional resources can be allocated efficiently remains a significant challenge for higher education managers. This issue is particularly relevant for private universities, which must continuously improve their internal cost-management processes. Such improvements are necessary to establish tuition fees that remain acceptable to the public while generating sufficient revenue to maintain educational quality, operational continuity, and institutional financial viability [4].

There are still many FK PTS that use a conventional system and do not have a basis in determining rates or do not have accurate calculations. Lack of understanding on how to calculate unit costs for FK students is one of the problems faced. Institutions also do not carry out efficient operational costs in a mature manner that can be used as a reference for cost control. The need for efficient strategies such as the implementation of Activity Based Costing and Lean Management to optimize operational costs. The formulation of the problem of this research is how to determine unit costs with the Activity Based Costing method and analyze the efficiency of operational costs with Lean Management in medical students of FK PTS. The problem-solving approach in the preparation of a cost-based rate determination strategy requires unit cost in higher education is the Activity Based Costing (ABC) unit cost calculation method, by calculating costs based on activities carried out and indirect costs which arises by activities in the educational process [5], [6], [7], [8]. The results of this analysis resulted in a more accurate calculation of the cost of production [9][10]. The requirements for the application of the ABC method fee are as follows: The Agency has a high indirect cost; The agency produces diverse products and services; and Agencies have high competition. The benefits of implementing activity-based costs are as follows: 1) help find inefficiencies in organizational processes; 2) help make better decisions; and 3) help manage costs (especially indirect costs) [11], [12], [13]. Higher education should also conduct analyses that can help find internal waste and inefficiency problems as well as alternative solutions to those problems [14]. Institutions need to make calculations and operational costs efficiency in order to withstand the increase in student rates for a certain period of time and can be used as one of the business strategies in facing competition. Cost efficiency can be achieved with the concept of the Lean Management approach, which includes a culture and business philosophy that eliminates waste. This can be achieved through consistent business process improvement and employee development and engaging in value-enhancing activities. The concept of Lean Management has many advantages in terms of operations and strategies [15], [16], [17], [18], [19]. Toyota introduced this concept on a larger scale in the 1950s. Lean management focuses on reducing what is considered waste in an organization [20]. The Lean management philosophy emphasizes problem-solving, business, processes, people, and partners, as well as the "4P model". The Lean Management Concept of the 4P Model is shown in Figure 1.

Figure 1. Lean business 4P concept model [21]

The five main principles of Lean Management are as follows: 1) Understanding consumer value, only what consumers consider important as value; 2) Value Analysis, after knowing what the consumer is interested in, the next step is to analyze the company's operations to find out what actually adds value. An action must be changed or removed from the process if it does not add value; 3) Concentrate on regulating sustainable flow through the supply chain or production rather than moving a lot of goods; 4)Attractive demand chain management to prevent the production of goods from going into stock, thereby reducing the amount of inventory; 5) Continuous improvement includes the removal of components that do not add value[22].

The state of the art in this study is that previous research explored information about the amount of costs Professional education operations show that the use of Activity Based Costing is able to display more detailed and comprehensive cost information [23]. Research was also conducted by Putri Rejeki, et al in calculating unit costs for FKG students at the professional level and showing a value greater than the tariff value that has been set so far [5]. Mulyana, et al. implemented Lean in higher education institutions and found the results of 46 inefficiencies in the teaching and education process [17]. The latest in this research will be applied to the integration of these two tools, which is to combine the two to achieve maximum financial management efficiency. ABC will find the activities that occur within the organization. Lean Management can identify activities that have added value and those that do not have added value to be eliminated, redesign the business, create a system of measuring n performance that supports sustainable development [24]. The purpose of this study is to determine the unit cost or unit cost of students using the Activity Based Costing method and analyze the efficiency of operational costs with Lean management in medical students of FK PTS. This research is expected to have a contribution to FK PTS, so that it will know the unit cost incurred to produce medical graduates, and can carry out maximum cost efficiency. For higher education institutions that will open medical faculties, this research will provide an overview of the costs and rates that will be set, as well as minimize operational costs.

RESEARCH METHOD

This research was conducted using a combined method by adopting an explanatory sequential model, which is a mixed method research design that combines quantitative and qualitative data analysis in two consecutive stages. In the first stage, quantitative data analysis is to determine unit cost using the Activity Based Costing method and followed by the collection and analysis of qualitative data for Lean Management analysis. At the stage of unit cost calculation, the data required includes the number of students, the type of activity at each student level, and the costs incurred include direct and indirect costs that accompany the activity. Then a fee will be charged to each activity and a unit cost will be obtained. Activity data will be obtained from the student's academic schedule. Then data will be dug up including the number of students, the number of educators and education staff, educational operational costs and indirect costs including maintenance, electricity, water and others. The data is then processed using the ABC method to find the unit cost. In the qualitative analysis for Lean management analysis, value stream mapping will be carried out related to value-added and non-value-added activities. Information will be obtained from in-depth interviews with students, education staff, lecturers and leaders of FK PTS institutions. Qualitative data will be obtained through in-depth interviews with selected informants through purposive sampling where the researcher selects certain informants who will help the research achieve its goals. [5] The data obtained from Activity Based Costing will be processed with value stream mapping for the initial step of Lean management applications to identify activities that do not add value. Starting with the creation of value stream mapping that will identify waste in the form of cost and time. After the existence of waste is known, appropriate repair proposals are then made to be able to carry out maximum cost efficiency.

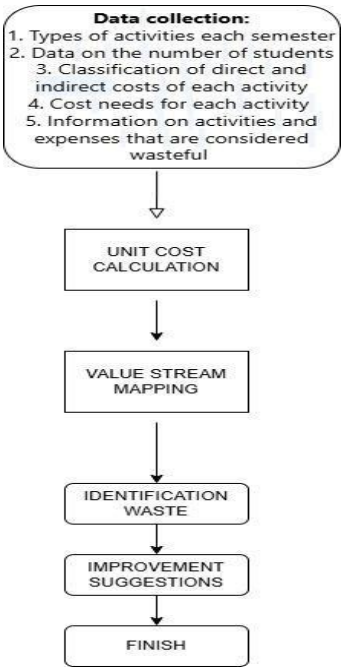

Figure 2. Research flow

RESULTS AND DISCUSSION

Application Activity Based Coasting

In the 2023–2024 academic year, the undergraduate medical program at a private medical faculty in Surabaya enrolled 866 students. Of this total, 250 students were in their first year, covering semesters 1 and 2; 221 students were in the second year, comprising semesters 3 and 4; 195 students were in the third year, covering semesters 5 and 6; and 200 students were enrolled in the final stage of the program, namely semester 7. In the initial stage, the calculation of activity-based unit costs begins with calculating the indirect costs (BTL) of each component. The burden of indirect fees has not been charged per student. Indirect costs (BTL) include Building BTL, Facility BTL, HR BTL, Consumables BTL (BHP) and General BTL. BTL Gedung gets a revenue of Rp. 1,427,718,750,- per year. BTL Sarana gets a revenue of Rp. 1,808,060,000,-per year, BTL HR gets a revenue of Rp. 9,544,343,470,- per year, BTL consumables (BHP) consists of expenses for the purchase of ATK for administrative and other supporting activities, a gets a result of Rp. 197,590,000,- per year and General BTL including electricity, telephone, water and Internet costs gets a result of Rp. 4,955,351,801,- per year. The total recapitulation of indirect costs (BTL) is Rp. 19,130,692,021, - per year.

Table 1. Indirect cost recapitulation.

No.	Cost Component	Quantity
1	Gedung	1.427.718.750
2	Facilities	1.808.060.000
3	SDM	9.544.343.470
4	Consumables	197.590.000
5	General	4.955.351.801
	Total Indirect Costs	**19.130.692.021**

After calculating indirect costs, the next process is the classification of activities from the entire semester. In this process, from semesters 1 to 7, data on 349 primary activities and 28 secondary activities were obtained. Then indirect costs are charged for secondary activities to primary activities and obtained The value of the cost driver or the value that causes costs consists of the hours of implementation of activities and the number of students. The result of this step will be obtained the value of the secondary activity charged to the primary activity for each student which will later be added to the direct cost burden.

Driver Cost = number of mhs x hours of activity

BTL per semester= (Cost Driver/Total Cost Driver) / Total BTL

Table 2. Results of secondary to primary activity BTL loading per semester

Semester	Btl (Rp.)
1	3.095.612,89
2	3.489.599,99

3	3.945.682,59
4	4.039.627,41
5	3.118.829,99
6	2.935.369,40
7	3.198.799,99

The next step is the calculation of direct costs (BL) which starts from calculating the direct cost of the building. In this stage, the value of each room used by each student in the learning process will be calculated. The value obtained in this stage is Rp. 2,744,200,000,- for all students, so that the burden per student is Rp. 3,168,822,-. Next is the HR BL, which will calculate the amount of lecturer honorarium charged by each student for an activity and the recapitulation will be shown in table 3.

Table 3. A summary of the direct cost burden of human resources per student

Semester	Load Per Student (Rp.)
1	5.015.200
2	4.952.800
3	4.848.912
4	4.762.035
5	5.320.667
6	5.335.795
7	5.119.000

Furthermore, the direct cost of consumables (BHP) obtained from calculating all the needs of consumable practicum materials and getting the cost of direct costs per student is Rp. 729,921, -. Then calculate the direct cost of the facilities or tools used in the learning process. The process was carried out in all rooms and the overall figure was obtained of Rp. 1,808,060,000,- so that the burden per student was Rp. 2,087,829,-. The recapitulation of direct costs will be shown in table 4.

Table 4. Direct Cost Recapitulation

SMT	Components (Per Student)				Total Direct Costs
	SDM	Building	BHP	Facilities	
	Rp.	Rp.	Rp.	Rp.	Rp.
1	5.015.200	3.168.822	729.921	2.087.829	11.001.772
2	4.952.800	3.168.822	729.921	2.087.829	10.939.372
3	4.848.912	3.168.822	729.921	2.087.829	10.835.485
4	4.762.035	3.168.822	729.921	2.087.829	10.748.607
5	5.320.667	3.168.822	729.921	2.087.829	11.307.239
6	5.335.795	3.168.822	729.921	2.087.829	11.322.367
7	5.119.000	3.168.822	729.921	2.087.829	11.105.572

After obtaining the direct cost figure per student, the process continues by adding direct costs with indirect costs that have previously been divided into the charging of secondary activities to primary activity. From this addition, the unit cost value during the medical undergraduate program was obtained of Rp. 101,083,935.92,-

Table 5. Recapitulation of Unit Cost Value

Semester	BTL (Rp.)	BL (Rp.)	Unit Cost (Rp.)
1	3.095.612,89	11.001.772	14.097.385,06
2	3.489.599,99	10.939.372	14.428.972,16
3	3.945.682,59	10.835.485	14.781.167,14
4	4.039.627,41	10.748.607	14.788.234,14
5	3.118.829,99	11.307.239	14.426.068,82
6	2.935.369,40	11.322.367	14.257.736,44
7	3.198.799,99	11.105.572	14.304.372,16
		Total Unit Cost	**101.083.935,92**

Implementation of Lean Management

Value stream mapping of the education operational financing management process begins with mapping the process that includes 5 major items, namely Facilities, Infrastructure (Buildings), Human Resources (HR), consumables (BHP) and general costs. The operational process begins with cost planning proposed by each department to be recapped and recalculated by the finance department, starting from the procurement and maintenance of infrastructure facilities, procurement of practicum materials and ATK consumables, the need for new personnel and the development of old personnel, as well as other supporting general needs such as electricity, telephone, water and internet. The calculation of all components that have been formulated by the finance department will be brought to the Rectorate so that it becomes a work program and budget (Prokera). After becoming a Prokera, the Faculty of Medicine can carry out educational operations in accordance with the figures that have been set in each budget item.

The waste identification process revealed five major sources of operational inefficiency, namely infrastructure, facilities, human resources, consumable materials, and utilities. These inefficiencies indicate that operational waste is not merely caused by high expenditure, but also by weaknesses in planning, asset utilization, maintenance, procurement, workforce allocation, and resource control. In the infrastructure component, particularly building management, inefficiency arises from fragmented maintenance practices that provide only temporary solutions. Because repairs are not undertaken comprehensively, similar damage frequently reappears and requires repeated expenditure. This condition increases long-term maintenance costs and reduces the economic value of the building. Waste is also associated with the underutilization of available rooms, as certain spaces remain insufficiently used despite continuing to generate maintenance, cleaning, and utility expenses. Waste in facilities is mainly related

to inappropriate procurement, improper utilization, and inadequate maintenance. Equipment is sometimes purchased without sufficiently considering technical specifications, functional requirements, and actual user needs. Consequently, some facilities cannot be used effectively or fail to support academic and administrative activities as intended. Inefficiency also occurs when equipment is operated without adherence to established standard operating procedures, thereby accelerating deterioration. The absence of routine and preventive maintenance further shortens the useful life of assets and increases the likelihood of recurring repair or replacement costs.

In the human resource component, waste is reflected in the inappropriate and unequal placement of academic and administrative personnel. An imbalance in workforce distribution may create excessive workloads in certain units while leaving personnel in other areas underutilized. Frequent absenteeism among some employees also disrupts operational continuity, reduces productivity, and transfers additional responsibilities to other staff members. These findings demonstrate that human resource inefficiency is influenced not only by staffing levels, but also by the quality of workforce planning, placement, workload allocation, attendance control, and performance management. Operational waste involving consumable materials is generated by excessive consumption, continued dependence on printed documents, inaccurate purchasing quantities, and improper storage. The extensive use of hard-copy documents increases paper, printing, and document-handling costs that could potentially be reduced through digitalization. Waste also occurs when consumables are purchased in quantities that exceed actual requirements or are not aligned with the expected period of use. As a result, items such as printer ink, laboratory materials, and reagents may expire, deteriorate, or become unusable before they are fully consumed. Inadequate storage procedures further increase the risk of damage and reduce the usability of purchased materials. The final source of waste concerns electricity, water, telephone, and internet services. Inefficiency in this category is associated with excessive consumption and the continued use of utilities outside working hours when they are no longer required. This pattern reflects limited monitoring, insufficient usage control, and a lack of institutional awareness regarding resource conservation. Therefore, reducing utility waste requires clearer operating standards, regular consumption monitoring, employee discipline, and the adoption of automated control systems where feasible.

The preceding Activity-Based Costing analysis identified human resources, buildings, and facilities as the three largest contributors to operational costs, with human resources representing the most substantial component. Accordingly, the subsequent waste analysis focuses specifically on inefficiencies associated with human resource management. The root causes of these inefficiencies were examined using a Fishbone Diagram based on the 5M1E framework. This analytical framework comprises six dimensions. First, Man refers to employee-related factors, including competence, skills, motivation, health conditions, discipline, and work behaviour. Second, Method concerns the procedures, work practices, policies, and administrative mechanisms applied within the institution, particularly those that may create delays, duplication, or inefficient task

execution. Third, Material refers to the resources and supporting materials used in carrying out work activities, including the possibility of excessive consumption, inappropriate allocation, or ineffective use. Fourth, Machine encompasses the tools, equipment, information systems, and technologies that support employees in completing their tasks. Fifth, Measurement relates to the mechanisms used to monitor and evaluate performance, including the accuracy, relevance, and effective utilization of performance data. Finally, Environment represents external and workplace-related conditions that may influence employee performance, such as the physical work setting, organizational climate, institutional policies, and government regulations. The application of the 5M1E Fishbone Diagram to identify the underlying causes of waste in the human resource cost component is presented in Figure 3.

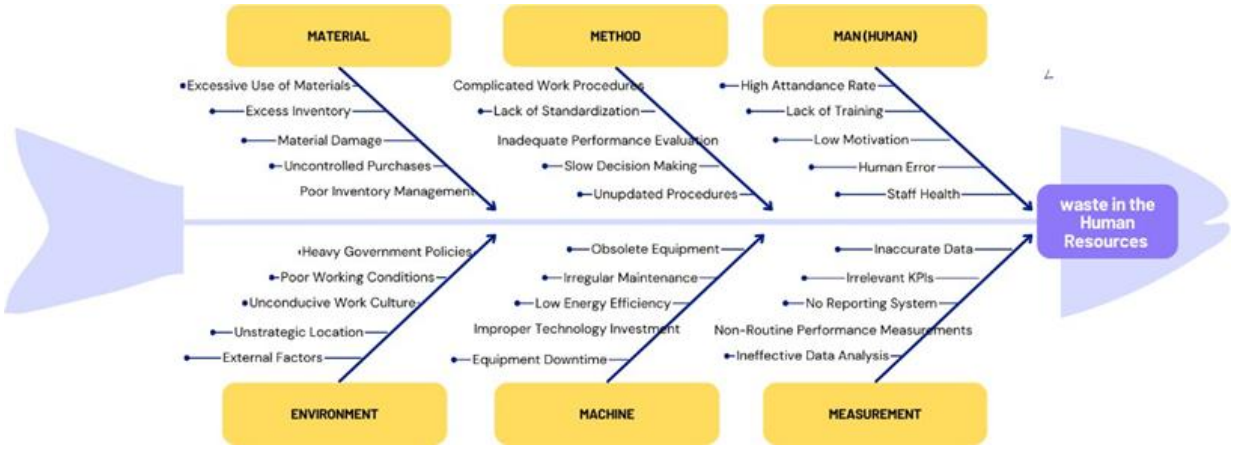

Figure 3. Diagram Fishbone Waste of Human Resources

The diagram above provides six analyses in each parameter of the Fishbone Diagram to identify the waste of human resource costs in medical schools. First is Man, poorly trained employees need more time to complete tasks, and increase operational costs. Less motivated staff showing lower productivity also leads to wasted costs. High absenteeism rates require replacement of labor or additional overtime costs. Mistakes made by staff can lead to cost and time losses to repair. Poor employee health requires more sick leave and increases in other operational costs. The second is the Method parameter, among the method parameters are complicated and inefficient work procedures that require more time and cost. The absence of standardization leads to inconsistency in work, which increases waste. The absence of a good evaluation system leads to an inability to identify and correct waste. Slow decision-making processes lead to delays and wasted costs. The use of outdated methods and procedures that are not in accordance with the latest technology and practices. The third is the Material parameters, including the inefficient use of materials causing an increase in costs, storing excessive material inventory causing cost waste. Damage to materials due to improper storage or use. Uncontrolled, unneeded or exceeding needs, inefficient inventory management leads to expired or spoiled materials. The fourth parameter is Machine, including the use of old and inefficient equipment increasing maintenance and repair costs, lack of routine

maintenance causing equipment to break down often and reducing productivity. Low energy efficiency such as energy-wasting equipment increases operational costs, improper, irrelevant or inefficient technology investments, equipment downtime or equipment downtime due to breakdowns or maintenance leads to wasted costs. The fifth parameter is Measurement. Among these parameters are inaccurate data, inaccurate data-driven decision-making leads to errors and wasted money. the use of irrelevant Key Performance Indicators (KPIs) leads to focusing on the wrong areas. The lack of a good reporting system leads to a lack of transparency and identification of problems, the absence of regular performance measurement leads to the inability to identify trends and waste. Lack of in-depth data analysis leads to suboptimal decision-making. The last parameter is the environment, including an uncomfortable work environment that reduces productivity and increases health costs. Regulations or policies that add to the burden of operational costs. work culture that is not conducive, does not support collaboration and efficiency, location that is Lack of strategic leads to high transportation and logistics costs, external factors such as natural disasters or unexpected regulatory changes.

The value of the human resources component has been adjusted to the salary index according to the good group of workers educators and education staff. Likewise, the teaching honor index, tutorial honor, practicum honor, and examiner honor, as a whole are in accordance with the provisions of the university leadership and cost drivers. As suggestions for improvement to improve cost efficiency in the HR component, namely: 1) ensuring that the recruitment and selection process is carried out carefully to get employees who suit the needs of the institution. 2) the use of technology to automate routine and administrative tasks, so that personnel can focus on more strategic work. 3) Periodic performance evaluations to identify areas that need to be improved and provide constructive feedback to employees. 4) Set specific, measurable, achievable, relevant and time-bound goals to ensure employees have a clear direction [26].

CONCLUSION

Fundamental Finding : The integration of Activity-Based Costing (ABC) and Lean Management provides a comprehensive approach to improving cost transparency and operational efficiency in private medical faculties. ABC enables institutions to determine educational costs based on the actual consumption of activities and resources, while Lean Management facilitates the systematic identification of inefficiencies within cost-management processes. The analysis established that the unit cost of the undergraduate medical program was IDR 101,083,935.92 per student. The Value Stream Mapping analysis further revealed that operational cost inefficiencies can be traced to activities that consume resources without generating proportional value. **Implication :** This figure provides an evidence-based reference for formulating tuition fees that are financially viable for the institution while remaining responsive to public affordability. In the human-resource component, cost efficiency should therefore be pursued through strategic workforce management rather than indiscriminate expenditure reduction.

Priority improvements include strengthening recruitment and selection procedures to ensure alignment between employee competencies and institutional requirements, automating repetitive administrative tasks, conducting periodic performance evaluations, and establishing specific, measurable, achievable, relevant, and time-bound performance targets. These measures can reduce unnecessary resource consumption while enabling personnel to concentrate on activities that contribute more directly to educational quality and institutional performance. The findings demonstrate that operational cost optimization should not be interpreted merely as an effort to minimize expenditure. Instead, it requires accurate cost allocation, the elimination of non-value-adding activities, and more disciplined resource utilization. Through the combined application of ABC and Lean Management, medical faculties can develop more rational tuition policies without compromising educational quality or institutional financial sustainability. Such an approach may ultimately contribute to broader access to medical education by reducing financial barriers for academically qualified prospective students. **Limitation :** Nevertheless, this study is limited by its focus on waste associated with cost components and does not examine inefficiencies across the complete range of student-related academic and administrative activities. Consequently, the results do not yet provide a comprehensive representation of waste throughout the entire medical education value stream. **Future Research :** Future research should extend the integration of ABC and Lean Management by mapping student activities from admission to graduation, identifying non-value-adding processes at each stage, and quantifying their effects on unit costs, service quality, processing time, and student experience. Such an extension would produce a more holistic framework for managing both cost efficiency and educational value in medical faculties.

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