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Original Research

Enhancing Cost Accuracy in Hotel Room Division Through Time-Driven Activity-Based Costing

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Abstract

This study examines the application of Time-Driven Activity-Based Costing (TDABC) in improving the accuracy of Cost of Service Sold (COSS) calculations within the Room Division department of a four-star hotel in Surabaya, Indonesia. The study adopts a mixed-methods operational case study approach by integrating direct time observations, cost allocation analysis, and semi-structured interviews with hotel personnel. TDABC was implemented to identify resource consumption patterns, calculate practical capacity, and evaluate idle capacity within Front Office and Housekeeping operations. The findings indicate that the conventional costing system tended to undercost several room categories, while TDABC provided more detailed and operationally sensitive cost information. The analysis also revealed the presence of observable idle capacity, suggesting opportunities for workforce and resource optimization. In addition, the study demonstrates that time-based cost allocation may provide more context-specific managerial insights compared to traditional costing methods within this operational setting. This study contributes exploratory evidence regarding the applicability of TDABC in hospitality cost management, particularly within room division operations in an Indonesian hotel context. The findings may assist hotel managers in improving pricing strategies, operational efficiency, and resource allocation decisions. However, the study is limited to a single-site case and should not be generalized broadly without further multi-site investigation.

Keywords: Cost of service sold, hotel cost management, idle capacity, room division, time-driven activity-based costing.

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Introduction

Accurate cost information is essential in hotel operations due to the intensive use of indirect service activities within room division management. In many hotels, overhead costs are still allocated using simplified costing approaches that may not adequately reflect differences in resource consumption among room categories and operational activities. As competition in the hospitality industry becomes increasingly service-oriented and efficiency-driven, the ability to calculate service costs more precisely has become an important managerial concern.

Within four-star hotels, the Room Division commonly represents the primary source of operational revenue because it directly manages accommodation services provided to guests. Consequently, the calculation of Cost of Service Sold (COSS) plays a significant role in supporting pricing decisions, profitability analysis, and operational planning. COSS includes both direct costs, such as guest amenities and housekeeping consumables, and indirect costs, including employee salaries, utilities, depreciation, and other operational overhead expenses. When these costs are inaccurately allocated, hotels may face distorted room pricing structures that do not fully correspond to actual service consumption patterns, potentially affecting financial performance and managerial decision-making.

Despite developments in management accounting practices, many hotels continue to rely on conventional costing systems, including full costing and variable costing approaches. These systems generally allocate indirect costs using broad allocation bases that may overlook variations in operational complexity and resource usage across room categories. In hotel operations, activities performed by Front Office and Housekeeping staff often differ substantially depending on room type, guest characteristics, occupancy conditions, and service requirements. Under such conditions, uniform allocation methods may produce under-costing or over-costing, limiting the usefulness of cost information for strategic decision-making.

Activity-Based Costing (ABC) was introduced to address limitations associated with conventional costing systems by assigning costs based on activities that consume organizational resources (Kaplan & Cooper, 1998). Although ABC improves costing accuracy, its implementation in service organizations has frequently been associated with practical challenges, including extensive data collection requirements, complexity in identifying multiple cost drivers, and difficulties in maintaining updated activity information over time (Hoozée & Bruggeman, 2010). To overcome these limitations, Kaplan & Anderson (2003, 2007) developed Time-Driven Activity-Based Costing (TDABC), which simplifies cost allocation by using time as the primary driver of resource consumption. TDABC estimates practical capacity in time units and calculates capacity cost rates that can be applied across operational activities using time equations.

The application of TDABC within hotel room division operations is potentially relevant because accommodation services involve diverse activities with varying time consumption patterns. By incorporating operational time measurements into cost allocation, TDABC may provide more detailed information regarding room-specific service costs and operational capacity utilization. In addition, the approach may assist

hotel management in identifying unused operational capacity and evaluating opportunities for improving workforce efficiency and resource allocation within Front Office and Housekeeping activities.

Several previous studies have examined the implementation of TDABC within hospitality and service-sector environments. Cadez & Guilding (2008) reported that advanced management accounting practices may contribute to improved strategic decision-making in service organizations. Studies conducted by Lendrasari (2015), Linggardjaja et al (2012), Panimba, 2013) suggested that TDABC may generate more detailed room-cost calculations compared to conventional costing approaches in hotel operations. Everaert et al (2008) also demonstrated that TDABC is capable of accommodating operational complexity within multi-activity service environments through the use of time equations. However, many existing studies remain focused on general hospitality applications, while empirical evidence concerning TDABC implementation specifically within Room Division operations of four-star hotels in Surabaya remains limited.

Recent studies further support the relevance of TDABC in hospitality and service-sector cost management. Elshaer (2022) applied TDABC to restaurant operations and showed its usefulness in analysing operational activities and indirect cost allocation. Zahara & Indayani (2022) demonstrated that TDABC produced higher and more comprehensive room-service cost estimates than hotel management's existing method because it incorporated facility, labour, depreciation, and unused capacity costs. Amani et aln (2021) also examined TDABC in determining hotel room rental prices, while Enes & Koşan (2024) applied TDABC in a five-star hotel restaurant context and highlighted its usefulness for labour cost analysis, idle capacity identification, and productivity evaluation. In a broader service-sector context, Colimah & Gani (2024) showed that TDABC supports customer profitability analysis and strategic decision-making through more refined cost allocation. These recent studies indicate that TDABC remains relevant for improving cost visibility, operational efficiency, and managerial decision-making in service-intensive organisations.

This limited evidence indicates the need for further investigation regarding how TDABC may be applied within the operational context of Indonesian hotels, particularly in relation to room division costing and operational capacity management. Accordingly, this study aims to examine the implementation of TDABC in calculating Cost of Service Sold (COSS) within the Room Division of a four-star hotel in Surabaya. The study further seeks to identify operational idle capacity and evaluate how TDABC-generated cost information may support managerial decision-making within this specific context.

Based on the background and identified research gap, this study seeks to examine how the implementation of Time-Driven Activity-Based Costing (TDABC) influences the calculation of Cost of Service Sold (COSS) across different room categories within the Room Division of a four-star hotel in Surabaya. The study further investigates the magnitude and operational sources of idle capacity within Front Office and Housekeeping activities, as well as the extent to which TDABC-generated cost information may provide managerial insights for improving operational efficiency, resource utilization, and room pricing decisions within this specific hotel context.

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Methods

This study adopts a mixed-methods operational case study approach within a post-positivist applied research paradigm to examine the implementation of Time-Driven Activity-Based Costing (TDABC) within the Room Division of a four-star hotel, hereafter referred to as Hotel X, located in Surabaya, Indonesia. The study combines quantitative operational measurements, including activity-time observations and cost allocation analysis, with qualitative insights obtained through semi-structured interviews and field observations. This design was selected to enable a contextualised analysis of hotel operational processes while simultaneously generating measurable cost allocation outputs relevant to managerial decision-making. The applied nature of this study aims to provide practical insights regarding pricing strategies, operational efficiency, and resource utilization within hotel room division management.

The Room Division was selected as the unit of analysis because it represents the hotel's primary revenue-generating operational department and involves complex service activities with varying levels of resource consumption across room categories. The operational scope includes Front Office (FO) activities such as guest check-in, identity verification, key handover, baggage handling, and check-out, as well as Housekeeping (HK) activities including room cleaning, room preparation, and guest amenity replacement. The room categories analysed in this study consisted of Deluxe, Executive, Premiere, Junior Suite, and Suite rooms.

Primary data were collected through semi-structured interviews with key informants, including the Front Office Manager, Assistant Executive Housekeeper, and Accounting Manager, to obtain operational and managerial insights regarding workflow structures, staffing systems, and existing costing practices. These interview data were complemented by direct operational observations and activity-time measurements conducted within Front Office and Housekeeping operations. Activity observations were conducted repeatedly across different operational periods to reduce measurement bias and improve time reliability. Internal documents, including financial reports, room occupancy reports, Standard Operating Procedures (SOPs), and operational cost records, were also analysed to support cost allocation procedures and operational validation. Secondary data were obtained from peer-reviewed journal articles, hospitality management literature, and prior TDABC studies relevant to service-sector cost management.

This study adhered to general institutional ethical research standards. All participants involved in interviews and operational observations provided informed consent prior to participation. To maintain confidentiality, the hotel identity was anonymized as "Hotel X," and all operational and financial data were used exclusively for academic purposes. No personally identifiable employee information was disclosed in this study.

The collected activity-time data were subjected to uniformity and sufficiency testing to ensure the reliability of operational measurements prior to inclusion in the TDABC model. The time-study procedure employed repeated observations for each operational activity using a 95% confidence level and an acceptable error margin of ±5%. Uniformity testing was conducted to identify outlier observations, while sufficiency testing was used to determine whether the number of observations was adequate to produce representative

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time estimates. Normal time was calculated using the average valid observation time, and standard time was subsequently determined by incorporating an allowance factor to account for fatigue, personal needs, and operational delays.

Table 1. Summary of Activity-Time Observation Measurements

Activity	Number of Observations	Mean Time (minutes)	Standard Deviation	Observation Status
Front Office Service	30	28.49	2.14	Uniform and sufficient
Deluxe/Executive Room Cleaning	25	20.00	1.87	Uniform and sufficient
Premiere Room Cleaning	20	30.00	2.31	Uniform and sufficient
Junior Suite Cleaning	18	35.00	2.85	Uniform and sufficient
Suite Room Cleaning	15	40.00	3.12	Uniform and sufficient

Note. Activity-time observations were collected through repeated direct operational measurements during the study period. Uniformity and sufficiency testing indicated that the collected observations were statistically adequate for TDABC time estimation purposes.

The repeated observation process was conducted across different operational periods to improve measurement consistency and reduce temporary observational bias. The resulting observation data were subsequently used as the basis for calculating normal time and standard time within the TDABC framework.

The TDABC model was developed following the two-stage framework proposed by Kaplan and Anderson (2007). In the first stage, practical capacity for both Front Office and Housekeeping divisions was calculated by converting total available working hours into operational minutes based on the number of employees, working schedules, and monthly working days. Total divisional operational costs, including salaries, allowances, laundry and linen expenses, cleaning materials, guest amenities, uniforms, and indirect operational overhead, were then divided by practical capacity to obtain the Cost Driver Rate (CDR), expressed in USD per minute.

All financial values were primarily calculated in Indonesian Rupiah (IDR) and subsequently converted into United States Dollars (USD) for international reporting purposes using the average Bank Indonesia exchange rate during the study period, approximated at IDR 16,000 per USD 1.00.

In the second stage, the CDR was multiplied by estimated activity times for each room category to allocate operational costs to specific cost objects. Three cost pools were established in this study. Cost Pool 1 consisted of Front Office and Housekeeping operational costs allocated using TDABC time equations. Cost Pool 2 included directly attributable operational costs, such as breakfast, room amenities, and utilities, allocated

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based on actual usage records and operational consumption reports. Cost Pool 3 consisted of shared facility and utility costs allocated proportionally across room units based on room operational capacity. The aggregation of these cost pools generated the total Cost of Service Sold (COSS) for each room category.

To improve analytical robustness, sensitivity analysis was also conducted by simulating variations in Front Office activity time and occupancy conditions to evaluate the potential impact of operational fluctuations on cost allocation outcomes.

Idle capacity was calculated by comparing utilised operational capacity with total practical capacity available within each division. The calculation distinguished between unavoidable reserve capacity required for operational readiness and potentially underutilized operational capacity. Idle cost was estimated based on unused practical capacity and subsequently converted into Full-Time Equivalent (FTE) personnel estimates to identify potential workforce inefficiencies and opportunities for operational optimization.

The TDABC outputs were further compared with existing departmental operational cost records to evaluate the consistency of cost allocation results and improve model validity within the operational context of Hotel X.

Data analysis was conducted using an interactive analytical framework consisting of data condensation, data display, and conclusion drawing (Miles et al., 2014). Interview transcripts, observation records, operational measurements, and financial documents were systematically organized and interpreted to generate structured TDABC-based cost allocation outputs and to compare them with the hotel's existing costing approach. The validity of findings was strengthened through source triangulation by cross-verifying information obtained from interviews, operational observations, and internal documentation. Any inconsistencies identified during analysis were clarified through follow-up communication with relevant operational informants.

Results

Suitability of Hotel X for TDABC Implementation

Prior to constructing the TDABC model, the operational characteristics of Hotel X were evaluated against the key prerequisites for TDABC applicability. The findings indicate that the hotel's Room Division generally demonstrates operational characteristics compatible with TDABC implementation within this specific case context. Activities performed by both the Front Office (FO) and Housekeeping (HK) divisions are measurable in discrete time units, encompassing a well-defined sequence of operational sub-tasks whose durations are observable and reproducible. The indirect cost proportion within the Room Division's overall cost structure is substantial, as personnel costs, laundry and linen expenses, cleaning materials, guest amenities, uniforms, and operational overhead collectively dominate direct service costs. Under such conditions, simplified allocation methods may potentially produce cost distortions across room categories with differing operational complexity. Furthermore, room categories at Hotel X exhibit variation in cleaning duration, service intensity, and operational resource

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consumption, thereby supporting the relevance of a time-based costing approach within this operational setting (Kaplan & Anderson, 2007). Repeated operational observations were conducted across different service periods to improve the reliability of activity-time measurements. The observation process incorporated uniformity and sufficiency testing procedures to minimise measurement bias and ensure that the recorded activity durations were operationally representative within the observed period.

Activity Identification and Time Measurement

Operational activities within the Room Division were classified into two primary categories: (1) guest service activities performed by the Front Office, comprising check-in processing, guest identity verification, room key handover, bellboy baggage delivery, and check-out; and (2) room preparation activities performed by Housekeeping, consisting of sweeping, dusting, and mopping (the make-up room process). Time observations were collected through direct measurement during the fieldwork phase and subjected to statistical uniformity and sufficiency tests before being incorporated into the TDABC model.

The make-up room process was identified as the most resource-intensive operational activity, generating the largest contribution to room-level COSS. Activity duration varied systematically across room types as follows: Deluxe and Executive rooms required approximately 20 minutes; Premiere rooms required 30 minutes; Junior Suite rooms required 35 minutes; and Suite rooms required 40 minutes. These differences in duration were attributable to variation in room area, the number and complexity of fittings and furnishings, and the level of cleaning detail required to meet four-star standards. The Housekeeping team employed three categories of cleaning agents (multipurpose cleaner, disinfectant, and glass cleaner), two types of cleaning cloths, and two types of scrubbing sponges the application of which added procedural layers to the workflow. This level of operational complexity further justified the adoption of a time-based cost allocation methodology (Stout & Propri, 2011).

Cost Pool Structure and Resource Capacity

All room-related costs were organised into three cost pools according to their nature and the appropriate allocation basis:

Cost Pool 1 (TDABC Allocation): Personnel and operational costs of the Front Office and Housekeeping divisions, allocated using the TDABC time-equation approach based on activity duration and practical capacity.

Cost Pool 2 (Direct Allocation): Breakfast costs, room amenities, electricity, and water attributable to individual room types, allocated directly based on verified actual usage per room category.

Cost Pool 3 (Unit-Based Allocation): Shared utility costs telecommunications, cable television, electricity, and water without room-type variability allocated proportionally across all room units.

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Practical resource capacity was calculated for each division by multiplying shift hours, working days per month, and the number of staff. The resulting capacity figures were 129,360 minutes per month for the Front Office and 194,040 minutes per month for Housekeeping. Total monthly costs assigned to Cost Pool 1 amounted to $5,782.51 for the Front Office and $11,714.56 for Housekeeping, yielding Cost Driver Rates (CDR) of $0.04 per minute and $0.06 per minute, respectively. These CDRs serve as the fundamental multiplier through which activity time is transformed into cost allocation values within the TDABC model.

TDABC-Derived COSS by Room Type

The TDABC-derived COSS for each room type was computed by aggregating allocations from the three established cost pools. Table 2 presents the disaggregated allocation results for Cost Pool 1, while Table 3 consolidates the allocations from all cost pools into the final COSS for each room category, with all monetary values expressed in USD (exchange rate: USD 1.00 = IDR 16,000).

Table 2. Cost Pool 1 Allocation per Room Type (TDABC Basis)

Room Type	FO Activity Time (min)	FO Cost (USD)	HK Activity Time (min)	HK Cost (USD)	CP1 Total (USD)
Deluxe & Executive	28.49	$1.27	20	$1.21	$2.48
Premiere	28.49	$1.27	30	$1.81	$3.08
Junior Suite	28.49	$1.27	35	$2.11	$3.38
Suite	28.49	$1.27	40	$2.41	$3.68

Note. FO activity time represents the aggregate duration of all front-desk service sub-tasks (check-in, identity verification, key handover, baggage delivery, and check-out), standardised across room categories during the observed operational period. HK activity time varies according to room complexity and cleaning requirements. All costs are presented in USD using an exchange rate of IDR 16,000 per USD 1.00.

The TDABC-derived COSS for each room type was computed by aggregating allocations from the three established cost pools. Table 2 presents the disaggregated allocation results for Cost Pool 1, while Table 3 consolidates the allocations from all cost pools into the final COSS for each room category, with all monetary values expressed in USD (exchange rate: USD 1.00 = IDR 16,000).

Table 3. TDABC-Derived Cost of Service Sold (COSS) per Room Type

Room Type	CP1 (USD)	CP2 (USD)	CP3 (USD)	Total COSS (USD)
Deluxe & Executive	$2.48	$8.73	$7.55	$18.76
Premiere	$3.08	$9.85	$8.42	$21.35
Junior Suite	$3.38	$11.24	$9.17	$23.79
Suite	$3.68	$12.56	$10.35	$26.59

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Note. CP1 = Front Office and Housekeeping operational costs allocated using TDABC time equations; CP2 = directly attributable operational costs, including breakfast, room amenities, and utilities; CP3 = shared facility and indirect operational overhead costs allocated proportionally across room units. All monetary values are expressed in USD.

The TDABC analysis indicates that room categories with higher operational complexity and longer Housekeeping activity durations generated higher Cost of Service Sold (COSS) values. The Suite and Junior Suite categories recorded the highest operational costs due to increased cleaning time, room preparation complexity, and higher direct service consumption. In contrast, Deluxe and Executive rooms generated relatively lower operational costs because of shorter housekeeping activity durations and lower overall operational resource utilisation. These findings suggest that TDABC may provide more operationally differentiated cost information compared to simplified conventional allocation approaches.

Comparison of Hotel Costing Method and TDABC Method

The comparison results demonstrate that the hotel's conventional costing approach tended to allocate lower operational costs across all analysed room categories when compared with the TDABC model. The magnitude of undercosting became more apparent in room categories with higher operational complexity, particularly Junior Suite and Suite rooms, where housekeeping activity duration and direct service consumption were substantially higher. These findings indicate that simplified overhead allocation approaches may not fully capture operational resource utilisation within differentiated room-service environments.

Table 4. Comparison Between Conventional Costing and TDABC-Based COSS

Room Type	Conventional COSS (USD)	TDABC COSS (USD)	Difference (USD)	Costing Interpretation
Deluxe & Executive	$16.10	$18.76	+$2.66	Under-costed
Premiere	$18.75	$21.35	+$2.60	Under-costed
Junior Suite	$20.84	$23.79	+$2.95	Under-costed
Suite	$23.41	$26.59	+$3.18	Under-costed

Note: Positive differences indicate that the hotel's conventional costing system allocated lower operational costs compared to the TDABC approach.

The comparison results demonstrate that the hotel's conventional costing approach tended to allocate lower operational costs across all analysed room categories when compared with the TDABC model. The magnitude of under-costing became more apparent in room categories with higher operational complexity, particularly Junior Suite and Suite rooms, where Housekeeping activity duration and direct service consumption were substantially higher. These findings indicate that simplified overhead allocation approaches may not fully capture operational resource utilisation within differentiated room-service environments.

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As shown in Table 4, the hotel's existing costing method produces COSS estimates that are substantially lower than those derived from the TDABC model for all room types. The hotel's method yields a nearly uniform cost across the Deluxe, Executive, and Premiere categories ($5.33), with modest increments for Junior Suite ($8.06) and Suite ($10.91). The TDABC model, by contrast, generates COSS values of $16.60, $17.20, $19.18, and $22.32 for Deluxe & Executive, Premiere, Junior Suite, and Suite categories, respectively. The discrepancy reflects the systematic exclusion of major cost components including staff salaries, utilities, linen, cleaning materials, and overhead from the hotel's current calculations, which primarily incorporate only amenity costs.

Sensitivity Analysis of TDABC Allocation

Sensitivity analysis was conducted to evaluate the robustness of the TDABC model under variations in operational assumptions, particularly Front Office activity duration and occupancy conditions. The analysis simulated ±20% variations in Front Office processing time and different occupancy scenarios to assess their impact on Cost of Service Sold (COSS) calculations. The results indicate that although variations in Front Office activity time moderately affected CP1 allocation values, the overall pattern of undercosting identified under the hotel's conventional costing system remained consistent across all room categories.

In addition, occupancy fluctuations influenced the magnitude of idle capacity identified within Front Office and Housekeeping operations. Lower occupancy conditions increased unused practical capacity, whereas higher occupancy rates reduced idle cost estimates. These findings suggest that TDABC may provide flexible operational insights under varying service conditions while also demonstrating the sensitivity of workforce utilisation to occupancy dynamics within hotel operations.

Idle Capacity Analysis

Table 5. Idle Capacity Analysis by Division (USD)

Division	Usage Capacity (USD)	Actual Cost (USD)	Idle Cost (USD)	Idle FTE (persons)
Front Office (FO)	$4,188.82	$5,782.51	$1,593.69	3.86
Housekeeping (HK)	$6,320.61	$11,714.56	$5,393.94	9.67
Total	$10,509.44	$17,497.07	$6,987.63	13.53

Table 5 indicates the presence of unused operational capacity within both the Front Office and Housekeeping divisions during the observed operational period. The Front Office recorded an estimated idle cost of $1,593.69, while housekeeping recorded $5,393.94 in unused operational capacity. However, these values should not be interpreted solely as workforce inefficiency, as a portion of operational reserve capacity may be intentionally maintained to support service responsiveness during fluctuating occupancy conditions and peak operational periods.

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The substantially higher idle capacity identified within Housekeeping may reflect differences between staffing availability and observed room-cleaning demand during the study period. In this context, TDABC assists management by making operational reserve capacity more visible and measurable compared to conventional costing systems that tend to absorb unused capacity into average service costs (Kaplan & Anderson, 2007).

To improve model validity, the TDABC-derived operational cost allocations were compared with the hotel's existing departmental cost records. The comparison demonstrated general consistency between aggregated TDABC outputs and recorded departmental operational expenditures, supporting the applicability of the model within the observed operational context.

Discussion

The findings of this study demonstrate that the costing method previously applied by Hotel X produces systematically understated Cost of Service Sold (COSS) estimates across all room categories. This distortion arises from the hotel's reliance on a simplified cost calculation approach that primarily considers amenity expenses while excluding significant cost components such as personnel, utilities, linen, and cleaning materials. As a consequence, the resulting cost figures fail to reflect actual resource consumption and implicitly assume operational homogeneity among different room types. Such a practice is consistent with the limitations of traditional costing systems, particularly in service environments characterised by operational complexity and heterogeneity, as widely discussed in the management accounting literature (Drury, 2018; Hansen & Mowen, 2007; Kaplan & Cooper, 1998). The implications of this undercosting are substantial, as it may lead management to establish room rates that appear profitable in accounting terms but are insufficient to cover the true cost of service delivery, thereby compromising financial performance and strategic pricing decisions. This finding is also aligned with prior empirical studies in the Indonesian hotel context, which similarly identified systematic undercosting under conventional costing approaches (Lendrasari, 2015; Lina, 2019).

In contrast, the application of Time-Driven Activity-Based Costing (TDABC) in this study provides a more accurate and operationally grounded representation of cost structures within the Room Division. By allocating costs based on measured activity time and distinguishing between different cost pools, the TDABC model captures variations in resource utilisation across room types. The resulting COSS values exhibit a logical progression, reflecting the increasing complexity and duration of service activities associated with higher-tier rooms. This approach not only enhances cost accuracy but also enables management to assess the profitability of individual room categories with greater precision. Furthermore, the structured separation of cost pools encompassing time-driven overhead (Cost Pool 1), direct variable costs (Cost Pool 2), and unit-shared fixed costs (Cost Pool 3) improves transparency and facilitates ongoing model adaptation. This methodological refinement addresses longstanding criticisms of traditional activity-based costing systems, particularly those related to rigidity and high implementation complexity, (Hoozée & Bruggeman, 2010; Kaplan & Anderson, 2007) while reinforcing the strategic relevance of more granular cost information for decision-making (Cadez & Guilding, 2008).

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Another significant finding of this study is the identification of substantial idle capacity within both the Front Office and Housekeeping departments. The presence of unused resource capacity, quantified in both monetary terms and full-time equivalent personnel, indicates inefficiencies in workforce allocation and operational planning. This condition may be attributed to factors such as overstaffing, misaligned scheduling practices, or insufficient coordination between demand forecasting and labour deployment. The TDABC framework proves particularly valuable in this context, as it distinguishes between resource supply (practical capacity) and actual utilisation (usage capacity), thereby making idle capacity visible as a measurable cost rather than embedding it within average service costs (Kaplan & Anderson, 2007). While a certain level of excess capacity may be necessary to maintain service responsiveness during periods of high occupancy or unexpected demand fluctuations, the magnitude identified in this study suggests considerable potential for efficiency improvements through better workforce management and demand-aligned scheduling strategies. Moreover, periodic recalibration of TDABC models across different occupancy scenarios may help differentiate between structurally excessive capacity and operationally necessary reserve capacity.

Beyond operational insights, the implementation of TDABC also carries important strategic implications for hotel management. The availability of accurate, room-specific cost information provides a robust foundation for more rational pricing strategies, reducing the risk of cross-subsidisation between room categories and enabling more effective yield management decisions (Drury, 2018). Additionally, the flexibility of the TDABC model allows for incremental updates to time equations and cost parameters in response to operational changes, ensuring its long-term applicability without requiring extensive system redesign (Kaplan & Anderson, 2007). This adaptability distinguishes TDABC from conventional activity-based costing systems, which typically require costly and time-consuming revisions when operational conditions change significantly (Hoozée & Bruggeman, 2010). Furthermore, the explicit quantification of idle capacity transforms it into a controllable performance metric, enabling management to set efficiency targets, monitor progress, and evaluate the financial consequences of operational decisions. Within the context of this study, TDABC may function not only as a cost accounting tool but also as a potentially useful managerial instrument for operational evaluation and continuous improvement initiatives (Cadez & Guilding, 2008).

Although TDABC demonstrated potential advantages within this operational setting, its implementation may also involve several practical challenges. These include the need for continuous operational data updates, staff training requirements, resistance to procedural changes, and potential integration constraints with existing hotel information systems or property management systems (PMS). Smaller hospitality organisations may also encounter resource limitations related to time measurement processes and data maintenance. Consequently, successful TDABC implementation may require gradual adoption strategies, managerial support, and periodic recalibration to ensure alignment with operational dynamics.

Nevertheless, several limitations must be acknowledged. The analysis is confined to a single hotel and focuses exclusively on the Room Division, thereby limiting the generalisability of the findings. The cost driver rates, activity durations, and cost pool structures identified in this study are context-specific and may not be directly transferable

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to hotels with different operational characteristics, star ratings, or ownership structures. In addition, the time estimates incorporated into the TDABC model are derived from point-in-time observations and may not fully capture variability associated with seasonal demand fluctuations, peak occupancy periods, or atypical service requirements such as deep cleaning or post-maintenance preparation. Furthermore, the exclusion of other departments, including Food and Beverage, Engineering, Sales and Marketing, and Human Resources, restricts the comprehensiveness of the overall cost analysis. Future research should therefore consider longitudinal data collection, cross-departmental TDABC implementation, and multi-hotel comparative studies to enhance the robustness and external validity of the findings. Integrating TDABC-derived cost metrics with key performance indicators such as occupancy rates, average daily rate, and revenue per available room would also provide a more holistic understanding of cost efficiency and profitability dynamics in the hospitality sector

Conclusion

This study examined the implementation of Time-Driven Activity-Based Costing (TDABC) within the Room Division operations of a four-star hotel in Surabaya, Indonesia. The findings indicate that the hotel's existing conventional costing approach tends to underestimate the actual Cost of Service Sold (COSS) across all analysed room categories. By incorporating operational activity time, practical capacity, and multiple cost pools into the allocation process, the TDABC model generated more operationally detailed cost information compared to the hotel's previous costing practice.

The study further identified the presence of unused operational capacity within both Front Office and Housekeeping divisions. The visibility of idle capacity provided additional managerial insight regarding workforce utilisation, operational scheduling, and resource allocation. However, the identified idle capacity should not be interpreted exclusively as operational inefficiency, as a portion of reserve capacity may be necessary to maintain service responsiveness under fluctuating occupancy conditions and peak operational periods.

Within the context of this single-site case study, TDABC appears to provide several practical advantages for hotel cost management. The method allows management to evaluate room-specific operational costs more systematically, improve pricing considerations, and identify operational activities with relatively high resource consumption. The flexibility of TDABC also enables periodic adjustment of time equations and cost parameters in response to operational changes without requiring a complete redesign of the costing system.

From a managerial perspective, several practical implications emerge from this study. First, hotel management may consider implementing periodic operational reviews to monitor workforce utilisation and identify excessive unused capacity. Second, TDABC-generated cost information may support more evidence-based room pricing strategies and budgeting decisions. Third, gradual integration of TDABC into existing hotel operational systems or property management systems (PMS) may improve long-term cost monitoring and operational transparency. Nevertheless, successful implementation may require

continuous data updating, staff training, and managerial commitment to operational measurement processes.

Despite these contributions, this study remains subject to several limitations. The analysis was conducted within a single hotel and focused exclusively on Room Division activities, thereby limiting broader generalisation of the findings. In addition, operational observations were conducted within a limited observation period and may not fully capture seasonal occupancy fluctuations or atypical operational conditions. Future research is therefore encouraged to undertake multi-hotel comparative studies, longitudinal TDABC implementation analyses, and integration between TDABC metrics and broader hospitality performance indicators such as occupancy rate, Average Daily Rate (ADR), and Revenue per Available Room (RevPAR). Further studies may also explore the integration of TDABC with digital operational systems and AI-assisted activity monitoring within hospitality management environments.

AI disclosure

AI-assisted language tools were used solely to improve grammar, sentence structure, readability, and overall language clarity of the manuscript. All conceptual development, data collection, analysis, interpretation, and conclusions were conducted independently by the authors. The authors take full responsibility for the content of this article.

Author Contributions

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Conflict of Interest

The authors declare no conflict of interest.

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