

Improving the accounting of production costs and sales of products (Works, Services) in Budget Organizations: Evidence from Higher Education

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Abstract

This study develops an integrated framework for improving cost and sales accounting in financially autonomous higher education institutions engaged in commercial activities. Using comparative analysis, a university case study, and regulatory review, it identifies a gap between formal compliance and substantive accounting accuracy. The proposed framework includes a five-attribute cost classification, activity-based overhead allocation, performance-obligation-based revenue recognition, and integrated cost–revenue subaccounts. The model supports segment-level marginal income analysis and reveals hidden cross-subsidization of loss-making activities, thereby strengthening financial transparency and institutional sustainability.

Keywords: Cost accounting; Prime cost; Overhead allocation; Revenue recognition; Performance obligation; Activity segment; Marginal income; Public sector accounting; Higher education; IPSAS

1. Introduction

The financing models of higher education systems worldwide have undergone a fundamental transformation over the past two decades. The relative share of direct state funding has declined, while the share of institutionally generated income — derived from the commercialization of research, the provision of fee-based services, and contractual cooperation with industry — has grown steadily (OECD, 2024; UNESCO, 2023). This shift, often analysed through the lens of the “new public management” paradigm (Hood, 1991), places the internal accounting system at the centre of institutional financial governance: universities that once operated as pure spending units are increasingly required to determine the cost, price, and profitability of the goods and services they produce.

In the Republic of Uzbekistan, this global tendency has been reinforced by a sequence of reforms granting financial autonomy to state higher education institutions, including the right to independently determine income and expenditure parameters (Presidential Resolution PQ-61, 2021). The institutional relevance of accurate cost accounting is not merely managerial but is embedded in law. Under Article 60 of the Budget Code of the Republic of Uzbekistan, the income transferred to a budget organization’s development fund is defined as the positive difference between the proceeds from the sale of goods (works, services) and the costs of their production (Budget Code, 2013). Consequently, any distortion in cost measurement directly translates into a misstatement of the amount allocated to the development fund, transforming a technical accounting question into a matter of budgetary discipline.

Despite this heightened relevance, the accounting practice of higher education institutions in transition economies exhibits a persistent tension. On the one hand, the accounting system formally satisfies regulatory requirements; on the other hand, it fails to generate the segment-level cost and profitability information required for autonomous decision-making. This tension is aggravated by three structural features of budget organizations that are absent in the commercial sector: estimate-based (smeta) financing, the parallel movement of budgetary and extrabudgetary funds,

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and the primacy of non-commercial objectives. Existing cost accounting theory, developed predominantly for profit-oriented firms, does not adequately accommodate these features.

This study addresses the following research questions: (RQ1) How can the foundational concepts of cost and sales accounting be reformulated to reflect the specificity of budget organizations? (RQ2) What are the concrete methodological gaps in the regulatory framework, and how do they manifest in practice? (RQ3) What integrated methodological solutions can simultaneously improve cost accounting, sales accounting, and the determination of financial results by activity segments? Accordingly, the aim of the study is to develop an integrated methodological framework for improving the accounting of production costs and sales of products (works, services) in budget organizations, empirically grounded in the practice of a higher education institution.

The study contributes to the public sector accounting literature in four ways. First, it advances author's definitions of cost and sales adapted to budget organizations. Second, it extends the traditional cost classification with a financing-source attribute. Third, it develops an integrated cost-and-revenue accounting model that operationalizes segment reporting in a budgetary context. Fourth, and most importantly, it demonstrates that treating cost and sales accounting as a single interdependent system — rather than as separate domains — reveals analytical phenomena, such as the hidden cross-subsidization of loss-making segments, that remain invisible under the prevailing fragmented approach.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature and identifies the research gap. Section 3 describes the research design and methods. Section 4 presents the findings across the theoretical, empirical, and constructive levels. Section 5 discusses the results in relation to prior research and outlines implications. Section 6 concludes and identifies avenues for further research.

2. Literature Review

2.1. Theoretical foundations of cost accounting

The conceptual foundations of cost accounting have been shaped by several complementary schools of thought. The managerial-emphasis tradition defines cost as a resource sacrificed to attain a specific objective and treats the cost accounting system as an information infrastructure supporting managerial decisions (Horngren, Datar & Rajan, 2021). Drury (2020) develops the principle of “different costs for different purposes”, distinguishing three functions of a cost system — cost determination, planning and control, and decision support. The strategic-management perspective interprets cost accounting as an instrument for implementing organizational strategy (Hansen & Mowen, 2017), while the activity-based costing (ABC) framework (Kaplan & Cooper, 1998) reconceptualizes overhead allocation by tracing costs to activities through cost drivers, thereby substantially improving accuracy in service-intensive settings.

These approaches, although developed primarily for the commercial sector, provide the analytical vocabulary for the present study. However, their transfer to budget organizations is not straightforward. The agency-theoretic perspective (Jensen & Meckling, 1976) is particularly instructive here: in a budget organization granted financial autonomy, the information asymmetry between the funding principal (the state) and the managing agent (the university) can only be mitigated by a reliable cost accounting system. Where such a system is absent, the expansion of autonomy risks reducing, rather than enhancing, the efficiency of public resource use.

A further theoretical consideration concerns the nature of prime cost in a non-commercial setting. In commercial enterprises, prime cost feeds directly into profit determination and, ultimately, into shareholder value. In a budget organization, by contrast, prime cost enters a legally prescribed mechanism: under the Budget Code, only the positive difference between sales proceeds and production costs may be transferred to the development fund. Consequently, an error in cost measurement does not merely distort a performance indicator but alters the volume of resources lawfully available to the organization. This institutional feature elevates the accuracy of cost accounting from a managerial preference to a compliance requirement, a distinction insufficiently theorized in the mainstream cost accounting literature and central to the present study.

2.2. Revenue recognition in the public sector

The moment of revenue recognition is among the most debated issues in accounting theory, resolved at the intersection of legal, economic, and technical criteria (Sokolov, 2000). In contemporary international practice these criteria are generalized within the concept of performance obligations. IFRS 15 introduced a five-step revenue recognition model for the commercial sector (IASB, 2014), and this approach has been transposed to the public sector by IPSAS 47 “Revenue”, which supersedes IPSAS 9 and IPSAS 11 and regulates the income of both exchange and non-exchange

transactions on a unified basis (IPSASB, 2023). For service transactions, the percentage-of-completion method enables the phased recognition of revenue in proportion to the stage of completion, a principle of direct relevance to multi-year research contracts.

The application of performance-obligation logic to public sector research contracts raises a conceptual question that has received limited attention: whether the stages of a multi-year research project constitute distinct performance obligations or a single integrated obligation. The resolution of this question determines whether revenue is recognized progressively or only upon final completion, and thereby directly affects the inter-period distribution of the financial result. IPSAS 47 offers criteria for this determination — chiefly, whether each stage delivers a distinct benefit that the customer can use independently — but their operationalization in the specific context of higher education research contracts remains underexplored, a gap this study addresses through its adapted five-step model.

2.3. Public sector accounting reform in transition economies

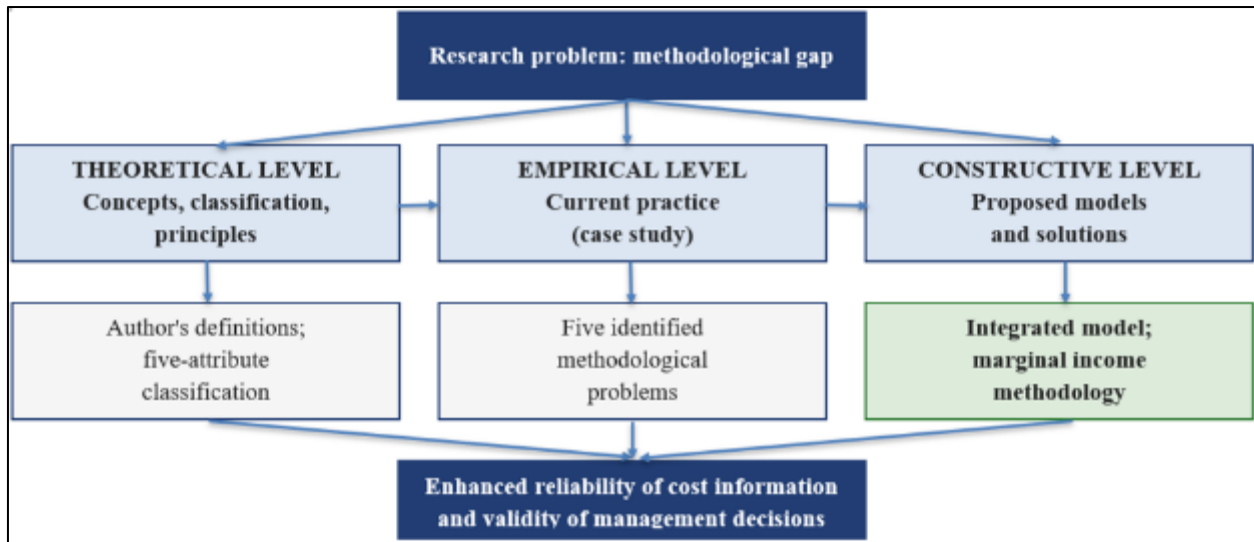
The reform of public sector accounting in transition economies has been widely documented as a gradual migration from cash-based to accrual-based accounting (IFAC, 2021). In the context of Uzbekistan, a distinct stream of research has examined the accounting of extrabudgetary funds. Ostonokulov (2021) developed a comprehensive methodology for accounting and reporting extrabudgetary funds of budget organizations, establishing the foundations for recognizing and segregating extrabudgetary income by funds. Khodjaye (2023) substantiated internal audit mechanisms for extrabudgetary funds in higher education institutions, identifying weaknesses in the control over sales proceeds as a principal source of financial risk. Buzrukxonov (2022) analysed the improvement of higher education financing mechanisms under the transition to an innovation economy.

2.4. Research gap

The literature review reveals that the general theory of cost accounting is well developed, that international standards provide a mature framework for overhead allocation and revenue recognition, and that the accounting of extrabudgetary funds in transition economies has received substantial attention. Nevertheless, three gaps remain. First, existing cost definitions are not adapted to the dual-source financing environment characteristic of budget organizations. Second, the specific production and commercial activities of higher education institutions — contractual research, software development, expert services, and publishing — have not been examined as an integrated accounting object spanning from cost accumulation to segment-level financial results. Third, and most consequentially, cost accounting and sales accounting have been treated as separate domains, precluding the analysis of phenomena that emerge only at their intersection. The present study is designed to address these gaps.

2.5. Theoretical framework

The study is anchored in three complementary theoretical perspectives that jointly inform the design of the proposed accounting model (Figure 1). Agency theory (Jensen & Meckling, 1976) frames the accounting system as a mechanism for reducing the information asymmetry between the state as principal and the autonomous university as agent. The new public management paradigm (Hood, 1991) justifies the transfer of private-sector accounting techniques — notably segment reporting and activity-based costing — into the public sector as a condition for realizing the efficiency gains expected from financial autonomy. Activity-based costing (Kaplan & Cooper, 1998) supplies the operational logic for tracing overhead costs to cost objects through drivers. The synthesis of these perspectives yields the central proposition of the study: that in a budget organization, the accounting of costs and the accounting of sales must be designed as a single integrated system, because it is only at their intersection that the information required to mitigate agency problems and to support autonomous decision-making becomes available.



Source: developed by the author.

Figure 1 Conceptual framework of the study (developed by the authors)

3. Research Design and Methods

The study adopts a three-level research design that mirrors the logical structure of the research questions, moving from theoretical reconceptualization through empirical diagnosis to constructive model-building. This design is appropriate for a study that seeks not only to describe an accounting phenomenon but also to develop and justify normative solutions. The first level reconceptualizes the foundational concepts and classification through comparative and abstract-logical analysis; the second level diagnoses accounting practice empirically through a purposively selected case; the third level constructs and justifies normative models through modeling and account-correspondence analysis, drawing on the ABC methodology and the requirements of IPSAS 9, 18, and 47.

At the theoretical level, a comparative analysis of the definitions of cost, prime cost, calculation, and sales was conducted. Thirteen author positions were compared against three criteria: the object of the approach, the scope of the definition, and the degree to which the specificity of budget organizations is reflected. The systematization of these approaches into a limited number of directions followed the logic of qualitative content analysis, with the classification categories derived inductively from the corpus of definitions.

At the empirical level, a qualitative single-case study was employed. The case organization is the Tashkent University of Information Technologies named after Muhammad al-Khwarizmi (hereafter TUIT), selected through purposive sampling for three reasons: (i) it is included in the list of state universities granted financial autonomy, which maximizes the relevance of cost accounting; (ii) it publishes financial statements disaggregated by budgetary and contract funds, providing an accessible evidence base; and (iii) as the leading institution in the information and communication technology domain, it undertakes a heterogeneous portfolio of production and commercial activities, enabling the examination of the most complex accounting situations. Data were drawn from publicly available financial statements, subaccount turnovers, and organizational documents. The analysis proceeded through monographic observation, comparison of the institution's practice with regulatory requirements, and content analysis of accounting-policy documents.

At the constructive level, the identified problems were addressed through modelling. The overhead allocation model was grounded in the ABC methodology, the revenue recognition model in the performance-obligation concept, and the integrated model in segment-reporting requirements. Each model was substantiated through account correspondence and, where relevant, calculation formulas. The content analysis of the regulatory framework encompassed the Budget Code, the Law on Accounting, Resolution No. 54 of the Cabinet of Ministers, national budget accounting standards Nos. 2, 3, and 4, Instruction No. 2169, and the international standards IPSAS 9, 12, 18, and 47, which were compared both with one another and against international requirements.

4. Results

4.1. Reconceptualization of foundational concepts

The comparative analysis produced a systematization of cost definitions into six approach directions: resource-objective (Horngren et al., 2021), control-methodological (Drury, 2020), strategic (Hansen & Mowen, 2017), financial-statement-elements, management-analytical, and calculation-based. The analysis confirmed that these definitions are complementary rather than contradictory, yet none accommodates the specificity of budget organizations. To address this, the study advances the following author's definition: *in a budget organization, the production costs of a product (work, service) are the monetary expression of the material, labour, and financial resources consumed in the process of producing goods, performing works, and rendering services, which — in contrast to the organization's core, budget-financed activity — are recognized as a separate accounting object matched with the corresponding income and participate in the formation of the financial result.* The definition's principal novelty is that it incorporates the requirement to segregate production costs from core-activity costs directly into the concept itself.

Correspondingly, sales in a budget organization are defined as *the transfer to the customer of control over the economic benefit created as a result of the full or partial fulfilment of a performance obligation within the framework of the organization's production and commercial activities, reflected in accounting through the recognition of revenue, the write-off of the prime cost of the sold product, and the formation of the development fund income.* This definition links sales to the fulfilment of a performance obligation rather than to the signing of a document, and — crucially — recognizes partial fulfilment as sales, thereby providing the theoretical basis for step-by-step revenue recognition in multi-year contracts.

4.2. A five-attribute cost classification

The study extends the four cost classification attributes conventionally applied in the literature — by economic elements, by the method of inclusion in prime cost, by dependence on production volume, and by relation to the reporting period — with a fifth attribute specific to budget organizations: classification by financing source (costs incurred from budgetary funds versus costs incurred from extrabudgetary funds). Although immaterial for commercial firms, this attribute is decisive in a budget organization. Costs incurred from budgetary funds are controlled within the discipline of the estimate, whereas production costs incurred from extrabudgetary funds are managed through the mechanism of cost calculation and financial result. Preventing the commingling of the two flows constitutes the fundamental methodological requirement for organizing accounting in this domain.

4.3. Empirical diagnosis: the case of TUIT

The case organization, the Tashkent University of Information Technologies named after Muhammad al-Khwarizmi (TUIT), was purposively selected on three grounds: it is included in the list of state higher education institutions granted financial autonomy, which intensifies the demands placed on its accounting system; it publishes its financial statements separately for budgetary and contract funds, providing an open information base; and, as the leading institution in the information and communication technology field, it conducts a diverse range of production and commercial activities encompassing intellectual products (software, research outputs), material products (publications), and services (professional development, expert evaluation), thereby enabling the examination of the most complex accounting situations. The institutional context is further characterized by a developed material base — including seventeen laboratories established in 2023–2024 in cooperation with industry partners and international financing — which constitutes the material foundation of the contractual research activity whose accounting is analysed here.

The empirical analysis classified the university's production and commercial activities into three groups — research-production, educational-service, and auxiliary production. A central finding is that the costs of all three groups are accumulated in a single subaccount, "Costs of goods (works, services)", in an undifferentiated manner, which sharply limits the determination of the actual prime cost and profitability of each activity type. Table 1 summarizes the five methodological problems identified through the case analysis, together with their consequences for accounting and management.

Table 1 Methodological problems identified in the case organization and their consequences

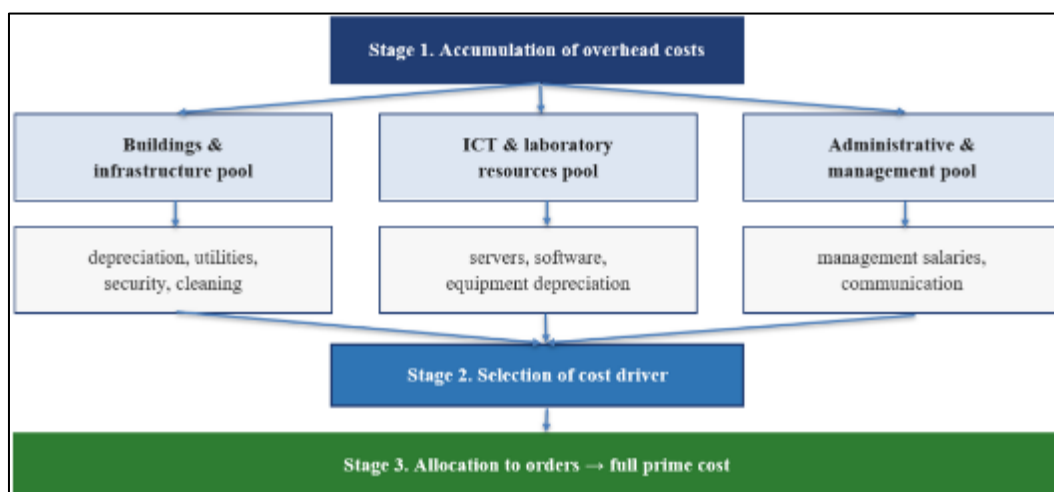
No.	Identified problem	Consequence for accounting and management
1	Analytical accounting by activity type is not maintained; all costs are accumulated in a single subaccount	The profitability of each product and service type is unknown; the profitability of individual contracts cannot be assessed
2	Overhead allocation relies on three scientifically unfounded approaches (conditional percentage, proportion to wages, or non-allocation)	Prime cost is distorted, both understated and overstated; the amount transferred to the development fund is misdetermined
3	Teaching-staff wages are allocated between budgetary and extrabudgetary activities by administrative decision rather than by timesheet	Given the dominant share of labour in prime cost, this impedes the objective formation of cost
4	Revenue from long-term research contracts is recognized once, upon full completion	The matching principle is violated; the financial result is distorted across reporting periods
5	Analytical accounting of advances and receivables is insufficient; receivables are not grouped by ageing	Advances are sometimes recognized directly as revenue; overdue receivables are not identified in time

Source: developed by the author based on the case analysis.

A key interpretive result is that these problems do not constitute an unordered set but form an interconnected chain. Because costs are not accounted for by activity type, revenues cannot be so accounted for either, rendering the determination of segment-level financial results impossible. The unfounded allocation of overhead distorts prime cost, which in turn distorts the financial result and, ultimately, the amount transferred to the development fund under Article 60 of the Budget Code. The incorrect moment of revenue recognition for long-term contracts distorts the financial result across periods. This chain of interdependence implies that the problems must be addressed systemically rather than in isolation — a conclusion that motivates the integrated approach developed below. The study characterizes the overall condition as a “formal compliance – substantive non-compliance” contradiction: the accounting system satisfies the letter of the regulations while failing to meet the substance of management needs.

4.4. A three-stage overhead allocation model

To resolve the second problem, the study develops a three-stage overhead allocation model grounded in the ABC methodology (Figure 2). At the first stage, all overhead costs are grouped into three homogeneous cost pools; at the second stage, a cost driver is selected for each pool; at the third stage, overhead is allocated to orders through a rate per driver unit.



Source: developed by the author.

Figure 2 Three-stage overhead cost allocation model. Source: developed by the authors based on the ABC methodology

The allocation rate and the amount allocated to a given order are determined by the following formulas:

$$S_i = U_i / D_i \quad (1), \quad U_{ij} = S_i \times d_{ij} \quad (2)$$

where S_i is the allocation rate for the i -th cost pool; U_i is the overhead accumulated in the i -th pool; D_i is the total volume of the i -th driver; U_{ij} is the overhead allocated to the j -th order; and d_{ij} is the volume of the i -th driver consumed by the j -th order. In a budget organization, overhead is first allocated between budgetary and extrabudgetary activities and only then, within the extrabudgetary portion, among individual orders. The recommended pools and drivers are presented in Table 2.

Table 2 Recommended overhead cost pools and cost drivers

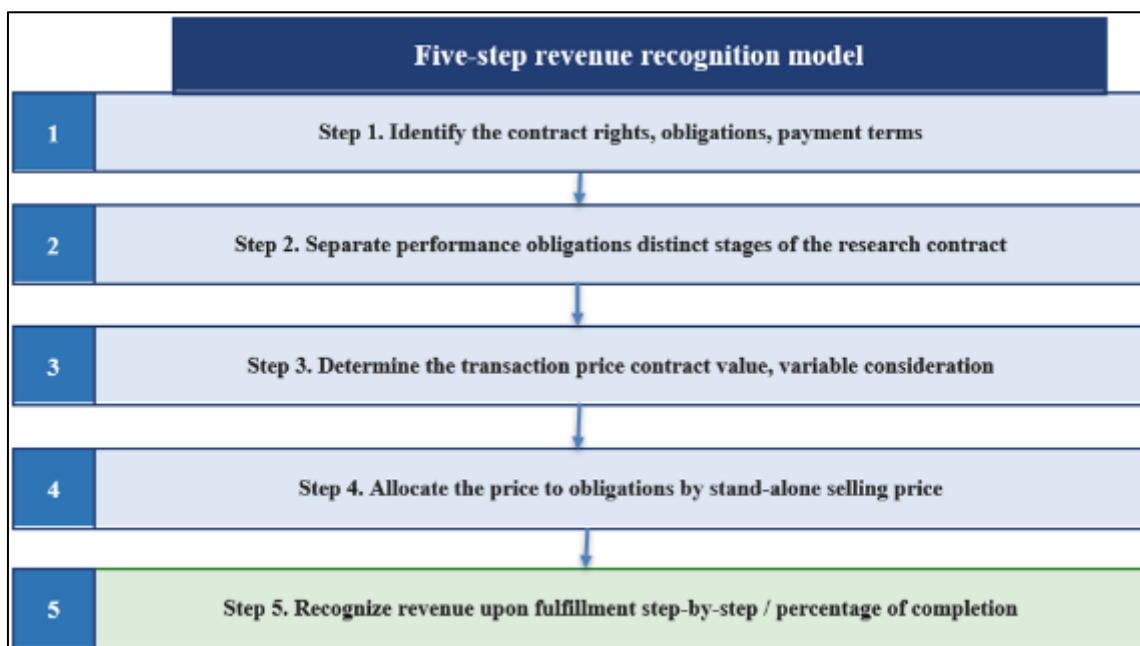
Cost pool	Recommended cost driver	Driver unit
Buildings and infrastructure (depreciation, utilities, security)	Area used	square metre
ICT and laboratory resources	Volume of computing resources used	machine-hour
Administrative and management	Direct labour time	person-hour

Source: developed by the author.

Expressed through formulas (1)–(2), the allocation becomes a transparent and verifiable procedure: any auditor or supervisory body can independently reconstruct it. This transparency is particularly important because national regulation requires that income-generating activity not impair the volume or quality of work performed at the expense of budgetary funds — a requirement whose fulfilment can now be verified through calculation rather than assertion.

4.5. A five-step revenue recognition model

To resolve the revenue recognition problem, the study adapts the five-step model of IFRS 15 and IPSAS 47 to the practice of budget organizations (Figure 3). The decisive step for a higher education institution is the second — the separation of performance obligations. A research contract typically comprises several stages that yield independent results; where each has stand-alone value for the customer, it is recognized as a separate performance obligation, and revenue is recognized on a step-by-step basis in proportion to completion.



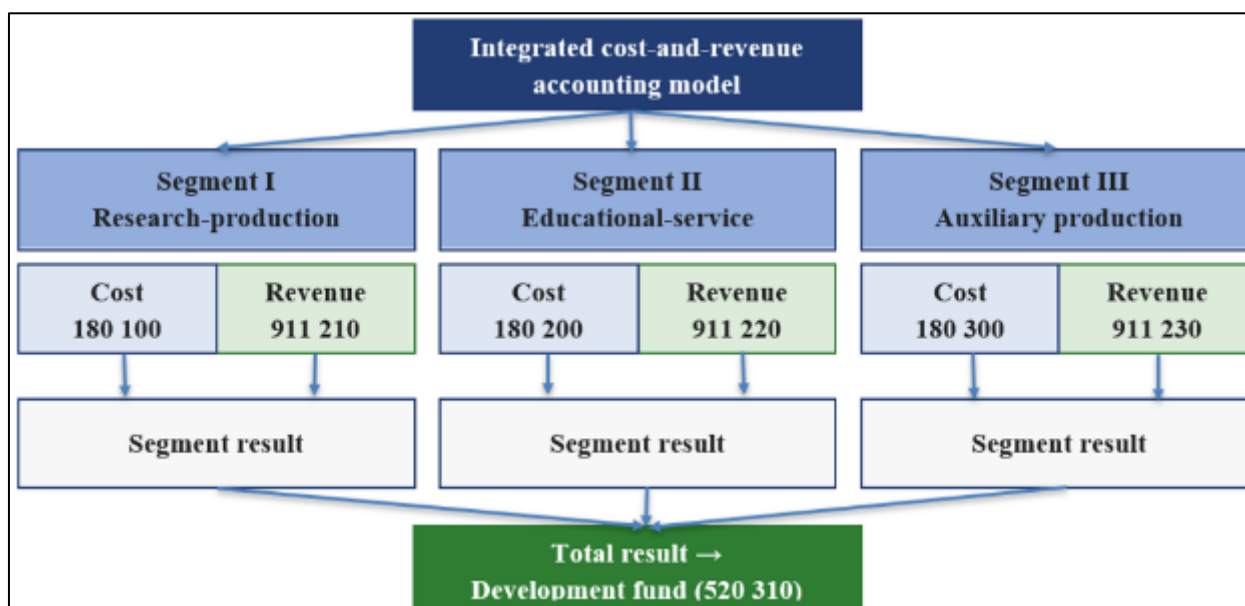
Source: developed by the author based on IFRS 15 and IPSAS 47.

Figure 3 Five-step revenue recognition model adapted to budget organizations

The practical implementation of the model requires two organizational conditions. First, the stages of work and the share of each stage in the contract value must be specified in the contract; the study proposes including this as a mandatory annex to the standard contract form. Second, an interim acceptance certificate must be signed with the customer at the completion of each stage. A related solution concerns advances: in accordance with IPSAS 9, revenue is not recognized when an advance is received, since the obligation has not yet been fulfilled; advances are therefore recorded in a separate liability subaccount and transferred to revenue only upon performance.

4.6. The integrated cost-and-revenue accounting model

The proposed solutions converge into a single integrated accounting model (Figure 4). For each activity group, three subaccounts — costs, revenues, and period costs — are maintained in parallel using identical analytical dimensions, and the segment result is formed at their intersection. Each revenue subaccount forms a pair with the corresponding cost subaccount (180 100 with 911 210, 180 200 with 911 220, 180 300 with 911 230), enabling the direct comparison of revenue and prime cost for each activity group.



Source: developed by the author.

Figure 4 Integrated cost-and-revenue accounting model.

The model complies with the segment-reporting requirements of IPSAS 18 and, more importantly, enables multistage marginal income analysis. This analysis reveals the hidden cross-subsidization of loss-making segments by profitable ones — a phenomenon that the prevailing accounting practice cannot detect because it determines only the gross or final result.

The managerial significance of the model is best illustrated by the decision to close a loss-making segment. If a segment shows a loss at the level of the final result but its stage-2 marginal income (segment contribution) is positive — that is, it covers all of its direct costs and contributes to university-wide expenses — then closing it would worsen the institution's overall result. The prevailing accounting system cannot reveal this nuance because it aggregates all costs into a single result. The integrated model thus converts an invisible risk into an explicit, quantifiable decision criterion.

5. Discussion

The findings both extend and refine the existing body of knowledge. With respect to RQ1, the author's definitions build on the tradition of segregating extrabudgetary funds (Ostonokulov, 2021; Khodjayev, 2023) but advance beyond it by embedding the segregation requirement into the concept of cost itself and by grounding the definition of sales in the performance-obligation logic of IFRS 15 and IPSAS 47. This conceptual move addresses a limitation of prior definitions, which — being oriented toward the commercial sector — treated sales as a document-driven event rather than as the fulfilment of an obligation.

With respect to RQ2, the identification of a “formal compliance – substantive non-compliance” contradiction contributes to the public sector accounting literature a diagnostic construct that captures a condition frequently observed but rarely named. The demonstration that the identified problems form an interdependent chain, rather than a set of isolated deficiencies, has methodological implications: it implies that piecemeal reforms targeting individual problems are unlikely to succeed, and that an integrated redesign is required. This resonates with the agency-theoretic argument (Jensen & Meckling, 1976) that the value of an accounting system lies in its capacity to reduce information asymmetry as a whole, not in the accuracy of any single component.

With respect to RQ3, the integrated model and the multistage marginal income methodology jointly operationalize a solution to the cross-subsidization problem. From the standpoint of the “new public management” paradigm (Hood, 1991), the model represents the accounting infrastructure without which the delegation of financial autonomy cannot deliver its intended efficiency gains. The adaptation of the ABC methodology (Kaplan & Cooper, 1998) to a dual-source financing environment — through a two-tier allocation that first separates budgetary from extrabudgetary activities and then distributes overhead among orders — constitutes a context-specific theoretical contribution.

The study has practical and policy implications. For practitioners, it provides a concrete analytical structure, allocation formulas, and a revenue recognition procedure that can be implemented without additional financial resources. For policymakers, it identifies the specific regulatory instruments through which each methodological gap can be closed: the introduction of mandatory analytical dimensions in the unified chart of accounts, the specification of overhead allocation bases in the relevant standard, the incorporation of the percentage-of-completion method for long-term contracts, and the approval of a model accounting-policy structure for budget organizations. The proposed solutions are universal in character and applicable to all budget organizations that form a development fund under the Budget Code, extending the relevance of the findings beyond the higher education sector.

Several limitations should be acknowledged. First, the empirical evidence derives from a single case organization; while purposively selected to maximize analytical relevance, the generalizability of the diagnostic findings to organizations with different activity profiles requires further validation. Second, the quantitative tables are presented as methodological templates, since the actual figures are the object of separate institution-specific analysis. Third, the study focuses on the design of the models rather than on their longitudinal implementation and impact assessment, which remain to be investigated.

Beyond these specific contributions, the study carries a broader theoretical implication for the accounting literature on hybrid organizations — entities that pursue non-commercial missions while engaging in market activities. The “formal compliance – substantive non-compliance” construct identified here may characterize a wider class of such organizations, in which accounting systems inherited from a purely budgetary tradition are formally retained even as the organization’s economic substance shifts toward market engagement. The integrated model proposed in this study offers a template for resolving this tension: rather than replacing the budgetary accounting architecture, it augments it with the analytical dimensions and account pairings necessary to render market activity transparent. This incremental, augmentation-based approach to accounting reform may prove more feasible in transition economies than wholesale adoption of commercial accounting systems, and thus merits further comparative investigation.

6. Conclusion

This study developed an integrated methodological framework for improving the accounting of production costs and sales of products (works, services) in budget organizations, empirically grounded in the practice of a higher education institution. Four principal conclusions emerge. First, the foundational concepts of cost and sales were reformulated to reflect the specificity of budget organizations, with the segregation of financing sources and the fulfilment of performance obligations embedded in the definitions themselves. Second, the traditional cost classification was extended with a financing-source attribute, providing the methodological basis for preventing the commingling of budgetary and extrabudgetary flows. Third, the empirical diagnosis revealed a “formal compliance – substantive non-compliance” contradiction and demonstrated that the identified methodological problems form an interdependent chain requiring a systemic rather than a piecemeal response.

Fourth, and most significantly, the study proposed an integrated cost-and-revenue accounting model in which paired subaccounts and a multistage marginal income methodology reveal the hidden cross-subsidization of loss-making segments and prevent erroneous management decisions. Unlike prior research that treats cost accounting and sales accounting as separate domains, this study advances them as a single interdependent system, thereby uncovering analytical phenomena that remain invisible under the prevailing fragmented approach. The theoretical contribution lies

in this integration; the practical contribution lies in a set of implementable, resource-neutral solutions directly linked to the budgetary development-fund mechanism.

Future research could pursue three directions: the longitudinal assessment of the models' implementation and their measurable effect on the reliability of the development-fund calculation; the extension of the framework to other types of budget organizations with distinct activity profiles; and the integration of the proposed analytical structures with digital and artificial-intelligence-based accounting tools, which would enable the real-time monitoring of segment-level results.

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