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Enhancing Efficiency in Local Governments: A Comprehensive Cost Accounting Model for Optimized Service Management

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Abstract:

Purpose: *The purpose of this article is to present a valuation model for public services in the local government sector. The model aims to identify the total cost of services by implementing cost accounting practices commonly used in the private sector.*
Design/Methodology/Approach: *The research is conceptual in nature. A critical and in-depth literature review method was used to evaluate the existing practices in public service valuation and to address some of their limitations. A model concept has been proposed to complement the currently used solutions.*
Findings: *The model includes a catalog of services for which the total cost has been calculated using the proposed algorithm. The concept is based on the consideration of both direct and indirect costs, including departmental costs and overhead costs. In the proposed approach, indirect costs are allocated using a work-time key, with a two-stage allocation process that reduces inadequate divisions, which is particularly valuable in organizations with highly diversified operations. The algorithm takes into account the scenarios of service delivery within a single department as well as across multiple departments.*
Practical Implications: *Public funds should be spent purposefully and economically, making their control crucial in this context. Additionally, for decision-makers in local governments, information on the costs of service delivery is key for evaluating efficiency and optimizing costs, and, in the longer term, for freeing up additional financial resources. The practice of valuation also contributes to building the managerial maturity of the unit and can serve as a foundation for benchmarking cooperation.*
Originality/Value: *This article fills a gap in the literature by proposing an advanced public service valuation model specifically tailored to the local government sector. This approach may prove to be a significant step, particularly in efforts to identify the unit costs of services.*

Keywords: *Public service, cost accounting, local government, total cost of the service, service valuation.*

JEL Codes*: H41, H72, R5.*

Paper type: *Research article.*

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1. Introduction

The local government sector is of particular importance in meeting the needs of local communities and, consequently, directly impacts the quality of life of citizens. One of its fundamental tasks is the provision of public services across a very broad spectrum of activities. These include areas such as education, infrastructure provision, health protection, environmental protection, and many others, depending on the regulations in force in a given country.

Local government leaders usually face a significant challenge because the needs are very wide-ranging and diversified, while the resources available to meet them are limited. Therefore, providing public services is inseparably linked to making decisions about how to allocate financial resources.

In making these choices, it is necessary to consider both projects that will bring financial benefits and those of a social nature. Moreover, it should be noted that choosing one direction usually determines the limitation of achieving other benefits, particularly social ones. Therefore, effective and optimal use of public funds is crucial. This issue is significant from both the society's and the public administration's perspective.

In assessing the effectiveness of public service delivery, the adoption of indicators that can illustrate the directions of resource allocation is crucial. One way to do this is through the valuation of public services, which can improve the decision-making process and has the potential to intensify social participation.

Such a systematic approach is particularly important in the context of dynamically changing community needs, the necessity of maintaining financial balance, and ensuring a fair distribution of resources among the services provided. Additionally, it can contribute to increasing the transparency of local government sector management.

The article aims to develop a concept for a public service valuation model in the local government sector that would address the previously defined challenges. This goal was set based on an existing gap in the scientific literature. This gap has exploratory potential due to the importance of the presented issue and the still insufficient number of proposed solutions in the area of public service valuation within the context of the local government sector.

The models and approaches defined so far usually focus on general financial and socio-economic issues. They are particularly adapted for private organizations, where strong competitive phenomena occur because this approach is believed to contribute to increasing financial efficiency. On the other hand, in the public sector, the strongest motivating factor for optimizing the costs of service delivery is state regulations, which do not always emphasize these issues sufficiently due to other

priorities in action implementation, attempts to reduce bureaucracy, constraints resulting from current systems, or negative factors such as the limitation of transparency in public spending.

Therefore, it can be assumed that achieving the proposed scientific goal would close the identified significant knowledge gap, providing an interesting contribution to the development of management science.

The following part of the article will conduct a critical review of the scientific literature on the role and significance of local government, with particular emphasis on the concept of public services provided by local government, and present the existing attempts at public service valuation in the public sector. Based on the gathered knowledge, a public service valuation model will be proposed, along with directions for its implementation, expansion, and improvement.

2. Review of Literature

2.1 The Role of Local Government

Local government is responsible for managing tasks related to the specific needs of communities residing in particular geographical areas, such as cities, towns, and municipalities. It is a form of administration that operates at a level below the national, most often below central or federal government.

Local government units play a very important role, especially in the context of providing public services, implementing policies, and representing the interests of smaller local communities. Additionally, they are often pointed out as a key link in the mechanism of promoting participation in developmental and political activities (Olagunju, 2019).

Local government performs various functions and duties essential for maintaining the well-being and development level of communities. Depending on the system in which a given local government operates, its scope of responsibility may vary, but generally, the functions of local governments can be divided into three main areas (Ozohu-Suleiman and Paul, 2016).

The first area includes those responsibilities for which local governments are fully accountable. These actions aim to provide basic public goods, such as infrastructure, health protection, and security (Strojny, 2020). Their activities also focus on responding to emerging social problems, such as natural disasters, social security, and preventing social exclusion (Koko, 2022). The next area is the shared responsibility area with higher-level authorities.

These activities involve cooperation with state or federal authorities. This is particularly important when the scope of emerging problems has a broader scale and

requires joint measures, such as financial resources, competencies, and knowledge. The last area involves responsibilities where higher-level authorities occasionally assign the execution of specific actions to local authorities. This area especially requires adaptability and flexibility, so units can adjust to the dynamically changing environment and tackle additional responsibilities.

Local governments play a crucial role in ensuring transparency in decentralization and effectively providing services (Chowdhury and Al-Hossienie, 2012). At this level, it is particularly possible to implement social participation, meaning the active involvement of citizens in decision-making processes (Igbokwe, 2024). This phenomenon is a key element of democratic governance. Participation can take various forms, from public consultations and referendums to attendance at meetings and engagement in resource allocation (Malemane and Nel, 2021).

In this context, it is essential for citizens to have access to comprehensive information about the activities of local government units. It is important that the mechanisms used are inclusive and accessible to all social groups.

This is particularly significant because citizen participation enables more accurate decisions that meet the actual expectations and needs of residents and can lead to a mental revolution among officials (Wiratama, Suharto, and Nurhaeni, 2022). All of this contributes to increasing the acceptance and effectiveness of implemented policies and to boosting trust in local authorities.

This approach aligns with the concept of New Public Governance, which assumes cooperation and co-management with citizens and other stakeholders on equal terms. Unlike traditional and hierarchical structures, New Public Governance involves creating cooperation networks to better utilize the resources and competencies of various entities and adopt more innovative approaches to problem-solving.

This concept implies a shift from hierarchical organizations to horizontal, multi-entity relational arrangements and a complex, collegial, and consultative decision-making model. The foundations of New Public Governance are decentralization towards local governments and civil societies to create strong social partnerships (Sriram *et al.,* 2019). The most important manifestation of its implementation is the reduction of role and power, focusing instead on networking and diverse mutual cooperation.

In the area of providing citizens with necessary information, adopting the New Public Management approach can also have positive effects. It involves adapting private sector management techniques to the public sector to increase efficiency, effectiveness, and accountability (Denhardt and Denhardt, 2000). This approach mainly focuses on outcomes, their measurement, and market-oriented reforms (Dickinson, 2016). In this context, using data-driven practices to improve data acquisition and processing is crucial (Puttick *et al.,* 2022).

There is a noticeable trend where local governments increasingly decide to reorient their current management practices, adapting them to the principles of New Public Management (Kabus *et al.,* 2018). The application of New Public Management continuously evolves, emphasizing collaborative management, improving practices and procedures, and managing strategic knowledge. These processes are vital for delivering public value that meets local needs and priorities.

2.2 The Concept of Public Service

Public services form the foundation of local government operations, generating public value. They address the needs of local communities by providing essential support and infrastructure necessary for residents' daily lives. Often equated with public goods, their primary aim is to improve the quality of life for the local community members (Hourie, Malul, and Bar-El, 2015).

Various definitions suggest that public services can be viewed as goods and services delivered to the local community according to their individual needs, which citizens can access either universally or selectively at no cost. An inherent part of the definition of a service is also the benefit it brings to its users (Farnham and Horton, 1996). It is important to note that citizens should influence the type and scope of the services provided, making social participation essential in shaping the service portfolio.

According to the author, Farnham and Horton’s definition should be expanded, as not all services are entirely free. For example, water supply, sanitation, and public transport are services that may require citizens to incur additional costs. Moreover, even services considered free are indirectly funded by local communities through taxes and fees.

Some services classified as public goods in an economic sense have characteristics of private goods because the marginal cost of providing these services to additional users is positive. Examples include education, recreation, and cultural activities.

When the market cannot provide these services at an adequate level due to insufficient economic benefits, local governments undertake their provision to achieve social or environmental benefits (Akutagawa and Mun, 2005). This differentiates public services from private ones. Justification for providing these services includes both financial and economic analyses that encompass social benefits.

Public services play a crucial role in shaping the quality of life in local communities and significantly influence their development and well-being. Local government also facilitates effective engagement of the society in civic matters, which can directly contribute to economic growth and minimize the exclusion of individuals from the

decision-making process, fostering collaboration between citizens and officials (Sikander, 2015).

Moreover, the quality of services delivered can impact the competitiveness among different local governments by acting as a stimulant in decisions regarding allocation or relocation within the territory of a particular unit, thereby enhancing the attractiveness of a given location. Additionally, service quality can affect the outcomes of municipal elections.

While public services contribute to increasing the value for local communities, they can also have a negative impact on community well-being since they are mainly financed through local taxes. Therefore, it is crucial to monitor the impact of each service on residents' well-being to ensure that the benefits outweigh the costs incurred by them. Only through such analysis can an optimal level of resource allocation for individual services be determined (Hourie, Malul, and Bar-El, 2015).

Services can be provided by local government employees or through contracts with external suppliers from the private or public sector (Levin and Tadelis, 2010). This flexibility allows for effectively meeting the needs of local communities and efficiently delivering services.

However, systems where public services are outsourced pose the risk of reducing local authorities' control and influence over service delivery. While there is a drive for decentralization linked to delegation, there is also a reluctance to limit strict financial control. This situation can motivate local authorities to seek their own resources.

Challenges also include possessing technical competencies, the ability to quickly respond to citizens' needs, and financial capabilities (Taamneh *et al.*, 2020), which largely stem from optimal asset management. Local governments require financial independence to ensure the continuous provision of high-quality services (Samuel *et al.*, 2021; Shiddiqy *et al.*, 2022). In systems where budget revenues are variable and costs are challenging to predict, there is a risk of not maintaining budgetary balance.

Another emphasized aspect is adapting services to technological developments (Sinaga *et al.*, 2022). Introducing innovations in response to rapid scientific and technological advancements can improve service accessibility, quality, and response speed (Wahi, 2023), ultimately achieving intended goals and meeting citizens' evolving needs.

Another challenge in service management from a system perspective is the lack of a clear classification catalog (Serohina, 2020; Stewart and Chakraborty, 2011; Salwin and Kraslawski, 2020). The literature suggests classification based on service provider, service recipient, service groups (e.g., payment forms, service spheres), or service types (Chausovska, 2017).

Fereidoon *et al.* (2018) emphasize that classifying services based on functionality can provide an integrated and valuable set of information about public services. The public sector can use this classification for budget allocation, policy formation, and effectiveness monitoring.

To gain a comprehensive view of public services, the first step is to create a complete catalog of public services. Subsequently, services should be classified and grouped into categories (Fereidoon *et al.*, 2018). One example of a catalog created following this concept is the classification developed under the Public Services Monitoring System by the Związek Powiatów Polskich (2023), presented in Table 1.

Table 1. *Classification of public areas and services provided by local government*

Local taxes and fees	The dimension and collection of tax on property
	The dimension and collection of tax on means of transport
	The dimension and collection of agricultural tax
	The dimension and collection of forest tax
	The dimension and collection of the market fee
	The dimension and collection of local tax
	The dimension and collection of the resort fee
	The dimension and collection of the advertising fee
	The dimension and collection the fee for dog ownership
Property management	Renting flats by local government units
	Management of the real estate of local government units
	Management of real estate owned by the State Treasury
Road sector and transport	Sharing the road network
	Public collective transport
	Providing access to pedestrian and bicycle routes
	Providing public bicycles
	Providing railway stations and stops
	School and kindergarten transport
Environmental protection	Water supply
	Wastewater discharge and treatment
	Municipal waste management
	Nature protection that is the responsibility of the commune
Investments and construction	Issue of a decision regarding a building permit and construction notification
	Development of a local spatial development plan
	Issue of a decision on development conditions and on establishing the location of a public purpose investment
	Issue of a decision regarding the use permit and notification of construction completion
	Realization of construction investments by local government units
Geodesy and cartography	Keeping and sharing data from the land and building register
	Keeping and sharing data from the records of towns, streets and addresses
	Keeping and sharing data from the real estate price register
	Maintaining and sharing standard cartographic studies: cadastral maps and

	basic maps
	Handling of reported geodetic works
Education	Pre-school education
	Education of children and youth in primary schools
	Education of youth in general secondary schools
	Education of young in technical schools
	Education of young people in vocational schools
	Education in schools for adults
	Special education
	Support by psychological and pedagogical counseling centers
Local social policy	Support for job creation and entrepreneurship development
	Professional development and support for competences and qualifications
	Provision of services in the field of job placement and vocational counseling
	Support for some entities of the social economy
Culture and recreation	Supporting the development of reading
	Organizing the offer of cultural events
	Protection of cultural heritage
	Providing tangible cultural heritage
	Providing recreational and sports infrastructure
	Supporting recreational and sports activity of residents

Source: *Own elaboration based on Związek Powiatów Polskich, 2023.*

Adopting a single classification suitable for all systems is impossible because the scope of responsibilities varies between countries. However, the main service groups will largely overlap as the topic is inherently linked to the individual needs of smaller communities. The proposed structure can serve as a starting point for defining a similar structure suitable for a given system.

This approach allows for analyzing adopted solutions to develop new policies and standards, identifying discrepancies between the current and target service states. This element is fundamental for redesigning services and changing their delivery methods to better meet citizens' desires (Fereidoon *et al.*, 2018).

This approach enables the use of evidence-based policy, focusing on critically reflecting on the value and quality of public interventions in the context of both implementation and resulting outcomes (Związek Powiatów Polskich, 2023).

2.3 Applied Practices in Public Service Valuation

Valuation of services is a fundamental aspect of financial management. In implementing such practice, Pessoa and Pimenta (2016) recommend initially conducting a pilot in various departments with diverse characteristics to develop the necessary systems and procedures. Subsequently, field studies should be carried out to better understand the specificity and context of these units. Based on this, it will

be possible to develop a service profile for planning and management purposes. Only in the next step is it recommended to define accounting practices that will enable the acquisition of necessary cost data for cost accounting purposes.

The main reason for using this approach in enterprises is to increase market competitiveness, optimize margin levels, and overall cost control (Zhang, 2024). Cost accounting is based on the systematic recording, analysis, and control of production and operational costs. It includes a thorough identification of where costs occur to determine key cost-driving factors, which in the long run allows for control and management of these factors (Li, 2022).

By detailed monitoring and accounting of costs for individual products and services, cost accounting leads to expense minimization, resource optimization, and profitability improvement (Victorino and Ramesh, 2022). Additionally, this practice supports budgeting processes and the creation of strategic plans, contributing to the forecasting of future expenses and identifying potential savings (Alhabeeb *et al.*, 2022).

Cost accounting also poses many challenges as it requires detailed information exchange within organizations, meeting specific reporting requirements, and implementing control procedures at various management levels (Thong, 2020). In the long term, if the applied solutions do not accurately reflect the actual state, they can lead to wrong decisions, and a lack of immediate effectiveness in achieving results leads to difficulties in tool implementation and staff resistance (Reyhanoglu, 2004).

The aspect of using cost accounting in local government is also often studied in the literature. The International Federation of Accountants (IFAC) refers to six key functions realized with the help of this solution: budgeting, performance measurement, cost control, setting prices and fees, program evaluation, and supporting economic decisions (Carvalho *et al.*, 2012).

The application of this practice is often assessed as increasing the efficiency and effectiveness of local government activities (Szolno, 2024). It is emphasized that the implementation of accrual accounting and cost accounting is becoming an increasingly common phenomenon in local governments to improve accounting systems (Ridder, 2005).

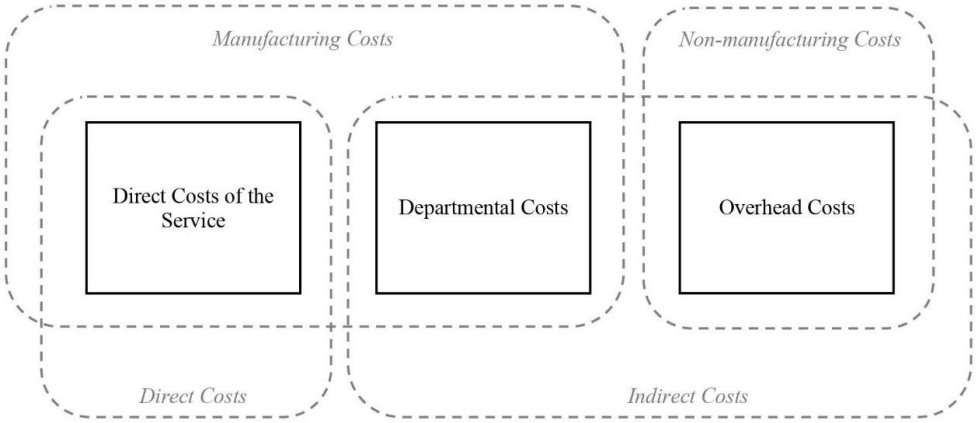
Although activities related to increasing accountability through accounting tools and compliance with accounting standards play a very important role in financial management (Prasetya, 2024), due to the lack of adequate financial resources, personnel, knowledge, or technological limitations, this practice is not a priority for many local governments.

In the context of service valuation, market valuation practices or alternative methods such as willingness to accept compensation (WTA) and willingness to pay (WTP) (Stejskal, 2019) can be applied. Non-market valuation methods can reflect generated social benefits, but only market valuation provides adequate information about the actual costs incurred. From the perspective of cost accounting, the division of direct and indirect costs is particularly important.

Direct costs include direct materials used in the production of products and services, direct wages with insurance contributions, and other direct costs such as external services and other special costs. Indirect costs, on the other hand, include departmental costs and overhead costs.

For departmental costs, typical administrative service costs include department maintenance costs and general administrative departmental costs, while for technical services, machine and equipment costs and transportation costs may also be included. Overhead costs include salaries with contributions for management and other administrative staff, costs of management and general unit activities, office costs, and general plant transportation maintenance costs. The last group of costs is also considered non-manufacturing costs (Temrowska, 2019). This relationship is illustrated in Figure 1.

Figure 1. *Types of costs affecting the valuation of public services*



Source: *Own elaboration.*

From the perspective of public service valuation, identifying direct costs is a simple process as long as such information is collected within accounting systems. The difficulty may lie in the allocation of indirect costs, which are also essential for service delivery.

The literature suggests adopting various allocation keys, including the sum of direct costs, direct wages, working time, value or volume of materials used, machine and equipment working time, volume, or weight of products (Czubakowska, 2015). Due

to the often intangible nature and diversification of public services, allocation keys based on materials, products, or machines may not be feasible.

The key based on the sum of direct costs is usually applied in units where the share of individual direct costs is equal. Direct wages are used when production is time-consuming, and labor costs dominate the total costs, while working time is particularly recommended when there is wage diversity among employees.

Based on this, it can be concluded that the last two allocation keys may be best suited to the specificity of local government units, but according to the author, when it is difficult to assess wage diversity, the working time key may be a safer choice.

An initiative aimed at creating a concept for valuing public services in local government units was also undertaken in Poland, resulting in a methodology that allocated indirect costs to services provided by local government units using the working time key (Rokita, 2023).

However, this solution required many simplifications due to system construction and limitations in additional employee involvement. The concept was an important milestone in the area of determining public service costs, but its main limitations were the inclusion of all employee salaries with benefits in the group of indirect costs.

The methodology also assumed summing all departmental and overhead costs and making only one allocation using one allocation key. Additionally, due to the cash approach in financial reporting, depreciation was omitted in terms of costs. The proposed approach has great potential but requires the elimination of described limitations.

3. Research Methodology

It is accepted that the aim of the article is proposing a valuation model of public services in the local government sector. Based on the defined goal of the article, the main research problem fitting into the subject matter was identified, which can be presented with the following question: *RP: How can public services be valued in the local government sector?* The research is conceptual in nature, and therefore, detailed research questions were posed, while hypotheses were not defined.

The research problem is presented as follows:

- How to classify public services provided by local government?
- What type of costs should be considered in the valuation of public services provided by local government?
- What allocation key should be considered when dividing indirect costs in the valuation of public services provided by local government?

The defined research problem allows for the determination of the basic assumptions of the research process. It is accepted that the research will be conceptual in nature. This means that the research will include an evaluation of practices in the valuation of public services and will propose a model concept that could improve the currently applied solutions.

An attempt was made to develop a conceptual model by applying the method of a critical and in-depth literature review, which on one hand, summarizes the state of knowledge on the subject, helping to define specific research questions (Rowley and Slack, 2004), and on the other, allows for determining the significance and originality of the research topic (Gomez-Luna *et al.*, 2014).

The method involves a systematic way of gathering and synthesizing previously conducted research (Baumeister and Leary, 1997; Tranfield, Denyer, and Smart, 2003). Webster and Watson (2002) emphasize that a literature review creates a systematic and solid foundation for deepening issues and enabling the development of theory. This is particularly important when it is necessary to evaluate the literature on a specific topic area to verify the current state of knowledge.

The aim of this method is to review the literature focused on conceptualization manifested in an intellectually disciplined process of applying, analyzing, synthesizing, and evaluating (Garrod, 2023). Synder (2019) notes that this research method has never been as significant as it is today. This is due to not only the gaps in current knowledge but also the difficulty in finding and processing it due to the multitude of scientific articles.

Therefore, the current knowledge in the area of developed solutions for the valuation of public services will be collected and systematized, and based on this, an attempt will be made to propose a systemic solution that could be used for the systematic implementation of this approach in the public sector.

The scientific problem was defined based on a nationwide project implemented by the Ministry of Interior and Administration, the Central Statistical Office, the Association of Polish Cities, and the Association of Polish Counties. These institutions implemented a project entitled Public Services Monitoring System (Jak dobrze zarządzać..., 2022).

The author was member of a team of experts from the Association of Polish Cities in the group conducting the in-depth study. The main goal of the project was to provide local government units, entrepreneurs, and society with information necessary for a comprehensive evaluation of services provided at the local level. In the long term, the goal is to optimize the provision of services for which public administration is responsible, based on integrated, high-quality data.

The project was supposed to result in providing indicators of the performance of individual services in individual local government units, as well as the ability to compare them. The indicators concerned quantity, quality, availability, and efficiency. In the last group of indicators, it was also decided to include information about total and unit costs of services. However, this aspect generated significant problems because the Polish financial reporting system in local government units in the form of the budget is mainly constructed in a subjective direction, making it challenging to extract information about financial streams for individual services.

Additionally, the budget is planned and created using the cash method rather than the accrual method, which generates problems with obtaining information about costs that are not expenditures, such as depreciation. Therefore, all costs related to capital expenditures are omitted. The counting method resulting from the system's imperfections required many simplifications and approximations, namely, all employee salaries and related costs were treated as indirect costs.

For the allocation of indirect costs to calculation objects (public services covered by Public Services Monitoring System), only one allocation key based on working time was used. This method proved sufficient in organizational units that primarily dealt with administrative matters, but in organizations with a highly diversified operational specificity, these simplifications could generate significant distortions of the actual situation.

The concept presented in this study is based on the KCU methodology developed within the Public Services Monitoring System project; however, its creation did not need to consider the limitations resulting from applicable legal and technical-organizational conditions.

4. Results

The public service valuation model involves identifying the direct costs of individual services and subsequently allocating the remaining indirect costs to these services. The catalog of services defined by the Polish Public Services Monitoring System has been adopted, which identified 9 main service areas and then divided them into 50 detailed services. This is not a complete and comprehensive catalog, but it covers the basic activities that respond to the needs of local communities.

To calculate the total cost of individual services, all organizational units (departments) that create public value need to be identified, and then the place of realization of each service should be assigned. It may turn out that some services will be more complex and will be provided by several departments. There may also be cases where no services are assigned to certain departments because they perform tasks related to management or internal unit support, and therefore all costs associated with these departments will be classified as non-productive costs. The process of linking services with departments is illustrated in Figure 2.

Figure 2 *Scheme for identifying cost centers of public services provided by local government*

Source: *Own elaboration.*

Next, the data that the unit must obtain to apply the total service cost valuation model is presented. After identifying which services are provided and where they are generated, it is necessary to gather information on the time that individual employees spend on providing specific services, auxiliary activities for individual departments, and activities related to general management processes.

This information is crucial for allocating indirect costs using the work time allocation key. Subsequently, direct costs of individual services need to be identified, remaining departmental costs not directly related to service provision should be determined, and the total value of costs generated within non-productive processes should be identified. The structure of the information necessary to calculate the total cost of a service is presented in Table 2.

Table 2. *Data necessary to estimate the total cost of the service in accordance with the proposed model*

	Structure of the local government unit										
Department	Department m				…	Department…				Other	
Service/ proces	Service n	Service …	Other			Service …	Service …	Other		Non-manufacturing processes	
Time allocated for service/ process	$\mathbf{t_{sn}}$	$\mathbf{t_{s...}}$	$\mathbf{t_{dm}}$	Total time in the department m $\mathbf{tt_{dm}}$		$\mathbf{t_{s...}}$	$\mathbf{t_{s...}}$	$\mathbf{t_{d...}}$	Total time in the department ... $\mathbf{tt_{d...}}$	$\mathbf{t_{po}}$	Total time in the local government unit **tt**
Costs	DC_{sn}	$DC_{s...}$	IC_{dm}			$DC_{s...}$	$DC_{s...}$	$IC_{d...}$		IC_{po}	

Source: *Own elaboration.*

In calculating the total cost of the service, two cases should be considered, namely the situation where the service is implemented by a single department and the situation where two or more organizational units implement the service. Considering these two cases is important from the perspective of algorithm design.

The first part presents the concept of a model for pricing public services when the service is implemented within a single organizational unit. It is assumed that the service will be denoted by symbol 'n' and the department by symbol 'm'.

Identifying the costs of the service requires consideration of two cost groups: direct costs of the service, which can be directly assigned to the service object, and indirect costs. This has been illustrated using the formula below.

$$TC_{sn} = DC_{sn} + IC_{sn} \qquad (1) + (2)$$

Where:
TC_{sn} – total cost of service 'n'
DC_{sn} – direct cost of service 'n'
IC_{sn} – indirect costs of service 'n'

Below is a characterization of both direct and indirect costs.

As part of identifying the direct cost of the service, all costs that can unequivocally be attributed solely to that service must be considered. Direct costs include the consumption of direct materials, wages along with derivative employee benefits, and other direct expenses. In cases where employees allocate their working time to multiple services, the wages associated with their activities should be proportionally allocated according to their recorded working time.

$$(1) \quad DC_{sn} = DM_{sn} + DW_{sn} + ODC_{sn}$$

Where:
DC_{sn} – direct cost of service 'n'
DM_{sn} – direct materials used in the provision of the service ‘n’
DW_{sn} – direct wages along with derivatives associated with the service ‘n’
ODC_{sn} – other direct costs associated with the service ‘n’

Indirect costs are divided into departmental costs and general administration costs. Double allocation of indirect costs mitigates the effects of oversimplification, as costs specific to each department are allocated solely to the services provided there. This is particularly crucial when considering departments that handle administrative services versus those with different specificities.

In administrative departments, the main cost group consists of direct wages, whereas in other departments, departmental indirect costs represent a significantly larger value. Therefore, it is crucial to avoid aggregating and subsequently allocating these costs, for instance, to administrative services. Doing so could lead to significant distortion of the results.

$$(2) \qquad IC_{sn} = IC_{dmsn} + IC_{posn} \qquad (2a) + (2b)$$

Where:
IC_{dmsn} – departmental indirect costs allocated to service ‘n’
IC_{posn} – indirect costs related to non-manufacturing processes (overhead cost) allocated to service ‘n’

To identify the indirect departmental costs allocated to service 'n', all costs generated by the department that have not been assigned to the direct costs of any service must

be determined. Then, the proportion of these costs that should be allocated to service 'n' must be established. Additionally, the proportion between the work time devoted to the implementation of service 'n' and the time devoted to all other services performed in department 'm' should be determined.

$$(2a) \qquad IC_{dmsn} = IC_{dm} * \frac{t_{sn}}{tt_{dm} - t_{dm}}$$

Where:
IC_{dm} – departmental costs of department ‘m’
t_{sn} – work time dedicated to the completion of service ‘n’
tt_{dm} – total work time in department ‘m’
t_{dm} – work time in department ‘m’ not dedicated to the direct completion of services

Next, the overhead costs should be allocated to service 'n'. For this purpose, the following formula should be used. General management costs should be considered in relation to the work time performed in department 'm', where service 'n' is implemented, to the total work time in the entire unit, minus the work time devoted to processes related to non-manufacturing processes. In this way, the costs will be allocated to the department, but it is still necessary to allocate them to the service, which will be done analogously to determining the indirect departmental costs allocated to service 'n'.

$$(2b) \qquad IC_{posn} = IC_{po} * \frac{tt_{dm}}{tt - t_{po}} * \frac{t_{sn}}{tt_{dm} - t_{dm}}$$

Where:
IC_{po} – indirect costs related to process overhead
tt – total work time in the entire unit
t_{po} – work time dedicated to the completion of non-manufacturing processes.

The method of allocating indirect costs is also graphically illustrated in Figure 3. To establish a single formula for determining the total cost of service 'n' performed in one department 'm', the initial formula will again be considered:

$$TC_{sn} = DC_{sn} + IC_{sn}$$

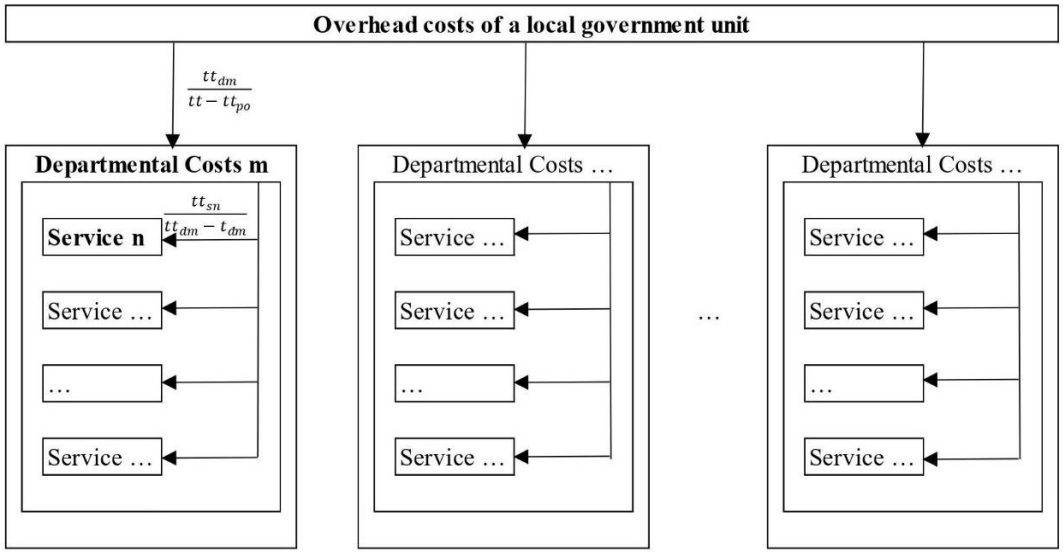
Then, using all its expansions, the final formula can be obtained.

$$TC_{sn} = DM_{sn} + DW_{sn} + ODC_{sn} + \frac{t_{sn}}{tt_{dm} - t_{dm}} * (IC_{dm} + IC_{po} * \frac{tt_{dm}}{tt - t_{po}})$$

The second part presents the concept of a public service valuation model when the service is implemented in two or more organizational units. It is assumed that the

service will be designated by the symbol 'n', and it will be performed in various departments designated by the symbol 'i', which occur 'x' times.

Figure 3. *Scheme of settling indirect costs for a public service when the service is provided by only one department*



Source: *Own elaboration.*

Similar to the previous case, the total cost of the service will include both direct costs and indirect costs.

$$TC_{sn} = DC_{sn} + IC_{sn} \qquad (1) + (2)$$

The method of calculating direct costs (1) will be analogous to the situation when the service is provided by only one department. In this case, it is also necessary to identify all costs associated with direct materials, direct wages, and other costs that can be clearly attributed to the service, regardless of the organizational unit in which they arise. In turn, to count the departmental costs of service 'n', they should be allocated to the service in individual departments according to the work time key, and then all values should be summed up.

$$(2a) \qquad IC_{dsn} = \sum_{i=1}^{x} (IC_{di} * \frac{t_{disn}}{tt_{di} - t_{di}})$$

Where:
IC_{di} – departmental costs of department 'i' (repeated x times)
t_{disn} – work time dedicated to the completion of service 'n' in department 'i' (repeated x times)
tt_{di} – total work time in department 'i' (repeated x times)

t_{di} – work time in department ‘i’ (repeated x times) not dedicated to the direct completion of services.

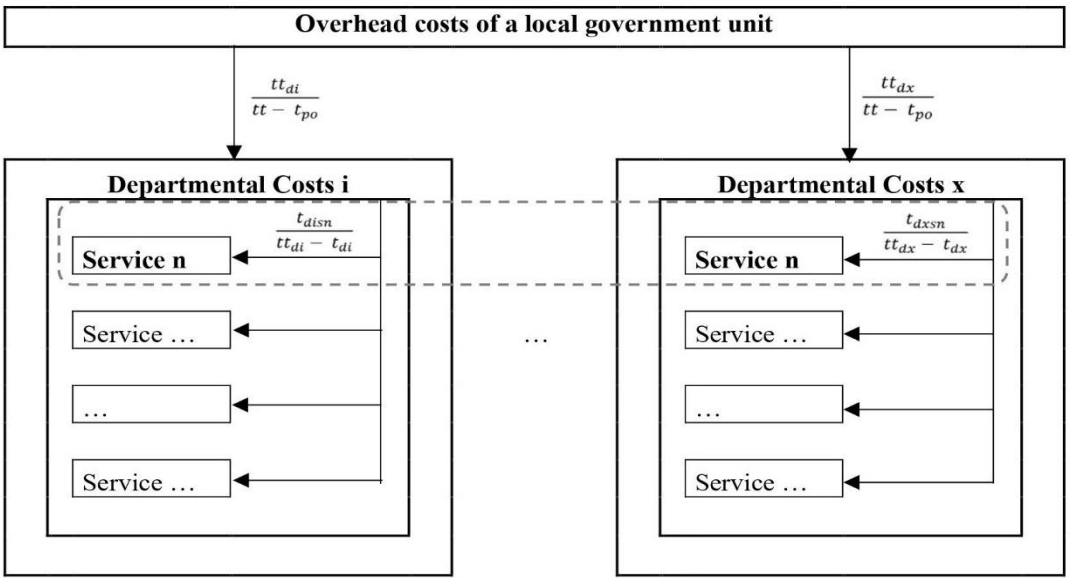
Next, to determine the overhead costs attributable to service 'n', they should be allocated to service 'n' in individual departments according to the work time key, and then all values should be summed up. For this purpose, the following formula should be used.

$$(2b) \qquad IC_{posn} = \sum_{i=1}^{x} (IC_{po} * \frac{tt_{di}}{tt - t_{po}} * \frac{t_{disn}}{tt_{di} - t_{di}})$$

Where:
IC_{po} – indirect costs related to process overhead
tt – total work time in the entire unit
t_{po} – work time dedicated to the completion of non-manufacturing processes
t_{disn} – work time dedicated to the completion of service ‘n’ in department ‘i’ (repeated x times)
tt_{di} – cał total work time in department ‘i’ (repeated x times)
t_{di} – work time in department ‘i’ (repeated x times) not dedicated to the direct completion of services.

The method of allocating indirect costs is also graphically illustrated in Figure 4.

Figure 4. *Scheme of settling indirect costs for a public service when the service is provided by at least two departments*



Source: *Own elaboration.*

To establish a single formula for determining the total cost of service 'n' performed in one department 'm', the initial formula will again be considered:

$$TC_{sn} = DC_{sn} + IC_{sn}$$

Then, using all its expansions, the final formula can be obtained.

$$TC_{sn} = DM_{sn} + DW_{sn} + ODC_{sn} + \sum_{i=1}^{x}(IC_{di} * \frac{t_{disn}}{tt_{di} - t_{di}}) + \sum_{i=1}^{x}(IC_{po} * \frac{tt_{di}}{tt - t_{po}} * \frac{t_{disn}}{tt_{di} - t_{di}})$$

The two concepts in Figure 4 of the service valuation model, depending on the place of service origin, can help in determining the cost of providing the service in local government units.

5. Conclusions

However, it should be noted that presenting the total costs of services, i.e., showing the aggregated expenditures for producing various types of services, is valuable information for an entity with a highly diversified portfolio of services. It enables analysis and identification of the financial streams allocated to individual services and allows observation of their cost-effectiveness.

Moreover, presenting the structure of total costs facilitates conducting benchmarking comparisons. In this case, due to the lack of value presentation in the form of indicators, the preferred choice of a comparative unit would be one with a similar profile, such as a similar population size or budget.

However, the analysis should not stop there because such information has significant potential and can serve as the basis for calculating the unit cost of the service. In this case, however, it is essential to identify the service products. This is a complex task, as deciding on the catalog of public service products is not straightforward. For example, in the "Road Network Provision" service, activities such as laying new pavement, repairs, and snow removal can also be distinguished.

It is also possible to delve into even higher levels of detail, such as procedures, but in both cases, separate records of direct costs assigned to individual products would be necessary. Considering such a scenario also raises additional questions, namely, which level of detail is optimal, providing the most detailed management information at relatively low information acquisition costs. Furthermore, it is also necessary to consider the allocation of indirect costs to unfinished service products.

Another issue requiring discussion is the method of acquiring information. It is important to consider that budgetary and financial-accounting solutions in different countries may impose limitations on recording specific types of costs.

Also, non-financial data from payroll systems may not be collected or may be treated as sensitive data, posing additional challenges in processing them. Therefore, it is necessary to implement solutions that take into account the specifics of the approaches used in individual countries.

The final aspect is the necessity of verifying the presented model. This process will enable assessing the feasibility of implementing the model, with particular attention to the specifics of the solutions applied in different countries.

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