INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH AND INNOVATIVE STUDIES
IJSRIS journal
ISSN: 2820-7157
Advancing Knowledge, Inspiring Innovation
www.ijsrisjournal.com
INDEXED JOURNAL
PEER REVIEWED Rigorous & Transparent
DOI: CROSSREF Member
OPEN ACCESS For Global Visibility
BI-MONTHLY Timely Publication
WIDE READERSHIP High Impact & Visibility
AUTHOR FRIENDLY Fast | Supportive | Reliable

RECEIVED 19 June 2026
ACCEPTED 10 July 2026
PUBLISHED 1 August 2026
Pages from: 312 to 333
August 2026 | Volume 5 | Number 4

Empirical analysis of management control and performance in the context of the delegation of public water services in eastern Kasai

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ABSTRACT

The issue of the delegation of public water services in the context of Eastern Kasai addresses the question of ensuring sustainable access to drinking water for the population. Its implementation and success will depend on the reliable management control mechanisms put in place to steer management and monitor performance indicators. Management control has become essential and constitutes a strategic tool for regulating and guiding the approach by monitoring the technical, financial and social performance of operators through instruments such as dashboards, performance indicators and audits. Management control enables the effectiveness of delegation contracts to be measured and assessed after a specific period.

The aim of this study is to assess the contribution of management control to the performance of public water service delegation contracts through the indicators calculated and measured. This research adopts a post-positivist approach, aiming, on the one hand, to observe, measure and explain the relationship between management control and performance within the context of public water service delegation, and, on the other hand, to understand and interpret the theories developed by scholars in the field of management control as they relate to public water service delegation.

Keywords: Empirical analysis, management control, performance, and public service delegation.

Introduction

The Democratic Republic of the Congo possesses considerable potential, with over 50 per cent of Africa's freshwater reserves, according to the World Bank's 2025 report. According to UNICEF's 2025 report, only 43 per cent of the population has access to drinking water. Although the Democratic Republic of the Congo has vast water resources, access in urban areas is limited to 40 per cent and in rural areas to 6 per cent (Mayi Ya Congo magazine, 2024, citing the Ministry of Water Resources and Electricity).

Indeed, this situation is currently one of the major challenges facing the Sustainable Development Goals, particularly in sub-Saharan African countries where rapid population growth is hampered by inadequate water infrastructure. This reality also affects Kasaï Oriental, the capital of Kasaï Oriental province, specifically the territory of MIABI. Law No. 015/026 of 31 December 2015 on water (LRE) and the 2018 Law on Public-Private Partnerships (PPP) provide encouraging regulatory frameworks to address this situation through the delegation of the public water service (DSPE). The delegation of the management of the public water service involves a process whereby the management of water infrastructure is transferred to operators with experience in the water sector. (Mayi ya Congo magazine, 2024, reference made to the Ministry of Water Resources and Electricity).

Furthermore, to improve access to drinking water in rural areas, various water supply systems have been set up in certain rural localities in Kasai Oriental as part of the PRISE Project (Project to Strengthen Water Infrastructure and Services), which is financially supported by the African Development Bank. These facilities include water towers, water distribution systems and public fountains, designed to provide a sustainable supply of drinking water to thousands of households. Nevertheless, the post-project phase has encountered structural difficulties, notably a lack of long-term financial resources to maintain the equipment, manage fuel supplies, carry out infrastructure maintenance and pay staff. The water supply system has gradually ceased to operate continuously in several locations.

However, in order to overcome this challenge, the Province of Kasaï Oriental invoked Law No. 15/026 of 31 December 2015 on water reform and opted for the alternative approach of managing drinking water services through public service delegation—entrusting it to companies with expertise in this field. This strategy has resulted in the delegation of the management of certain drinking water supply networks to private operators, such as Hydro Service Congolais SARL, which is responsible for supervising the MIABI Drinking Water Supply System (AEP), under the authority of the provincial authority.

Furthermore, it should be noted that delegation means that the local authority entrusts the management of a service to a delegatee, who is paid through the provision of the service to users. In the era of globalisation, the management of organisations is undergoing a complete transformation: there is a shift from the traditional model towards a more evolved approach, as demonstrated by the delegation of public services (LHALOUI Fatima EZZAHRA, 2025). Concessionary companies must maintain their efficiency in order to continue supplying water to the population. This therefore gives rise to the need for management control to establish management tools and implement the agreed strategy. In the age of artificial intelligence, management control plays a decisive role in performance by integrating management control tools and reinventing managerial decision-making processes. This highlights the revolution in management practices brought about by artificial intelligence. The evolution of management control within the context of public water service delegation represents progress in the field of management. According to (EL HADDOURY MOHAMED A. et al. 2026), it is an interdisciplinary, methodical function focused on overall performance. Through digitalisation and reorganisation, combined with traditional methods and financial management, there is a marked increase in analytical capabilities as well as an enhancement of aspects of organisational performance (EL HADDOURY MOHAMED A. et al. 2025). Optimising the efficiency of public service delegation in the water sector relies on the robust management control mechanisms put in place by the regulatory authority, thereby consolidating the stability of the delegation sector (Séraphin NGONDO N., 2026).

Thus, certain studies on public service delegation in the water sector in other countries indicate that results remain mixed and highlight the importance of control and governance

mechanisms in ensuring service performance. It is against this backdrop that the main research question of the study is formulated as follows: To what extent can management control improve performance in a public water service concession contract in Kasaï Oriental? The following sub-questions stem from the main research question:

- How can management control improve performance within the framework of the public water service concession?
- What management tools have been put in place within the framework of public water service concessions?
- How does management control enhance transparency and accountability between the concessionaire and the delegating authority?

The overall objective is to analyse the relationship between management control and performance in the public water service concession of AEP MIABI in Kasaï Oriental.

Specifically, this study aims to:

- Explain the contribution of management control to the performance of the public water service concession;
- . Examine the management tools put in place within the framework of the public water service concession (budget, performance indicators, reports and dashboards, etc.);
- Explain how management control enhances transparency and accountability between the concessionaire and the delegating authority.

In light of the questions raised and the objectives set, our study formulates two types of hypotheses: main and specific.

❖ **Main hypothesis**

H0: The improvement of performance indicators within the framework of the public water service concession in Kasaï-Oriental depends on an effective management control system being put in place within the governance process.

❖ **Specific hypotheses**

H01: Management control improves the performance contract within the framework of the public water service delegation.

This hypothesis is supported by the principles of New Public Management, conceptualised by Christopher Hood (1991), who emphasises the importance of management tools derived from the private sector in improving the efficiency of public services.

H02: The management tools implemented within the framework of the public water service delegation are: the scorecard, performance indicators, reporting, management accounting and budgeting. This hypothesis is supported by the theory developed by Robert N. Anthony (1965), who argues that organisations must rely on formal tools to plan, monitor and evaluate their activities.

H03: Management control enhances transparency and accountability through the implementation of a mechanism for monitoring performance indicators, reporting and the use of management tools. This hypothesis is supported by Bovens (2007), who developed the theory of accountability (formalised), which involves making reporting mandatory to ensure transparency within the framework of the contract.

❖ Operationalisation of the hypotheses

Table 1. Operationalisation of hypotheses.

Hypotheses	Independent variable	Intermediate variable	Dependent variable	Indicators
H1: Management control has a positive influence on the performance of the public water service concession	Level of implementation of management control (existence of procedures, tools, monitoring)	Quality of strategic steering and alignment of objectives between the concessionaire and the authority	Performance of the public water service	Effectiveness (achievement of objectives), efficiency (cost/resources), quality of service (continuity, accessibility), user satisfaction
H2: Management tools structure the governance of the concession	Existence and use of tools (budget, scorecard, indicators, management accounting, reporting)	Quality of the information produced and improved decision-making	Organisational performance of the delegatee	Frequency of tool usage, relevance of indicators, quality of reports, speed of decision-making
H3: The Monitoring and reporting mechanisms enhance transparency and accountability	Existence of mechanisms for control, monitoring of indicators, reporting and follow-up)	Reduction in information asymmetry and improved communication	Transparency and accountability	Frequency of audits, accessibility of reports, clarity of information, level of trust between the parties

Source: adapted by the author from theories (agency theory, stakeholder theory, etc.)

❖ Contribution of the research

This study builds on the theoretical section we previously published on the same subject. Its distinctive feature lies in evaluating and measuring the relationship between the study variables, supported by appropriate tests.

I. Literature review

I.1. Theoretical Framework

This study is underpinned by transaction cost theory, agency theory, stakeholder theory and hybrid governance theory; these theories are summarised in the table below:

Table 2. Summary table of key theories.

Year	Theory	Description	Author(s)
1937	Transaction costs	The choice between a market and an organisation depends on transaction costs.	Ronald Coase
1984	Stakeholders	Taking into account the interests of all stakeholders (the state, users, employees).	R. Edward Freeman
1995	Agency theory	Governance mechanisms to limit conflicts between stakeholders.	Fama & Jensen
2003	Hybrid governance	DSP as an intermediate form between the market and hierarchy.	Ménard & Saussier

Source: adapted by the author from the theories.

I.2. Empirical framework

Management control has now established itself as a key tool in the management of public service delegation contracts, particularly in strategic sectors such as water. The literature highlights its pivotal role in improving organisational performance, transparency and the governance of public services. Several recent studies converge on a positive view of management control. For instance, (Mohammed AK Dim et al., 2025) show that, in the Moroccan context characterised by legislative and regulatory reforms, management control constitutes an essential lever for steering performance in the public sector. In the same vein, (Filiberto Fele and José M. Maestre, 2025) emphasise that this framework promotes the strategic alignment of local stakeholders around results-oriented objectives. This approach is reinforced by the work of (Benzerara and Boudjelal, 2021), who emphasise the role of administrative control in ensuring compliance with contractual obligations in public service delegations. According to these authors, the implementation of monitoring

and evaluation mechanisms helps to ensure that the actions of service providers comply with contractual objectives. In this context, management control is not limited to a supervisory function, but becomes a genuine regulatory tool.

Furthermore, the shift towards digitalised management systems represents a major transformation of management control. (Simona Fioretto et al., 2024) demonstrate that the integration of key performance indicators (KPIs) and data-driven tools significantly improves decision-making and organisational efficiency. When structured and digitised, management accounting thus becomes a strategic lever for value creation. Similarly, (Mohamed El Bourk et al., 2025) highlight that these tools help to enhance the transparency and quality of public services within local authorities.

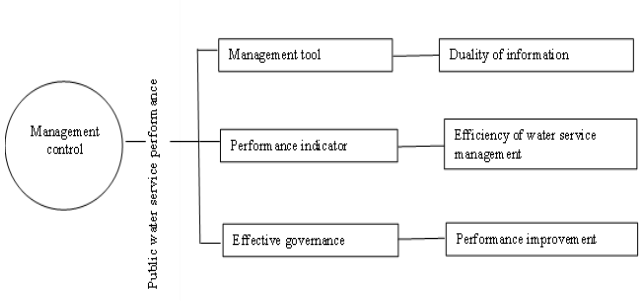
In the same vein, (Soldini, 2021) considers that management control enables dynamic monitoring of operators' performance, facilitating the adjustment of public decisions. It thus helps to strengthen managers' accountability and improve the quality of service provided to users.

However, this largely favourable view of management control in public service delegations is the subject of debate in the literature. Some authors adopt a critical stance by questioning the systematic effectiveness of delegation, particularly in the water sector. According to (Franceys and Gerlach, 2008), delegation does not automatically guarantee an improvement in performance. In their view, outcomes depend heavily on the quality of the control system, the institutional framework and the ability of public authorities to regulate private operators.

In the same vein, (Labie & Hall, 2007) emphasise that public-private partnerships produce mixed results depending on the economic and institutional contexts. They stress that the involvement of the private sector does not necessarily lead to greater efficiency or equitable access to services. This research highlights a fundamental contradiction: the performance of service concessions depends less on the management model (public or private) than on the robustness of oversight and regulatory mechanisms.

Despite these contributions, the literature has significant limitations. On the one hand, it remains largely focused on European contexts or on technical approaches, which limits its explanatory power in African contexts characterised by specific institutional and financial constraints. On the other hand, management control is often approached from a strictly instrumental perspective (indicators, dashboards, audits), without an in-depth analysis of its strategic role in public service delegations. This study therefore aims to fill a twofold gap in the literature: on the one hand, a lack of contextualised analyses in African countries; and on the other, an insufficient link between theoretical approaches to management control and their application to public service delegation models.

Conceptual model:



Source: author, developed from the theories.

II. Epistemological and methodological approach

II. 1. Epistemological approach

The nature of the reality of the subject matter adopts a pragmatic epistemological stance with a mixed orientation (positivist and interpretivist) .

- Justification for this approach

Why positivism?

In the context of the delegation of the public water service in Kasaï-Oriental, the positivist approach has been adopted insofar as the research aims to analyse and measure the effect of management control mechanisms on the performance of the public water service delegation, specifically within the MIABI water supply system, and the approach specifies the following:

1) Management control utilises measurable tools, notably:

- The budget
- Performance indicator
- Dashboard
- Management accounting

2) Performance can be quantifiable. E.g.: number of subscribers served, turnover generated, volume of water produced, volume of water sold, etc.

Why interpretativism?

In the context of this work, the reality observed will focus on the application of management tools.

E.g.: whether or not the budget is used, whether or not the dashboard is used, whether or not performance indicators are used.

II.2. Methodological approach

Statistical methods are more commonly used in economics and management sciences. They are also employed in this study due to their quantitative approach, which enables the collection and processing of numerical data in the form of tables or graphs, so as to present the results relating to economic phenomena.

- **Qualitative approach**

Qualitative data consists of descriptive information. In particular, it provides insight into explanatory factors, causes and motivations. It thus sheds light on the process, the 'how' and 'why' of a particular behaviour. Within the context of our work, this approach will serve to:

- Understand how management control actually operates within the public water service concession through the drinking water supply system;
- Verify whether or not management tools are being used within the framework of the public water service delegation;
- Analysing monitoring practices at the level of the Provincial Authority and the regulatory and supervisory body in the water sector;
- Identify the difficulties and limitations of the delegation. As part of our study, we will use interviews and observation.

- **Quantitative approach**

The quantitative approach is rooted in a strictly positivist or empiricist perspective, inspired by the natural sciences, and aims to test hypotheses by identifying correlations between variables. It draws a distinction between facts and interpretations. The use of both types of methods promotes interdisciplinarity.

The choice of data collection method depends on the type of data to be gathered, namely quantitative or qualitative data providing descriptive information; that is, data which shed light on processes, on the 'how' and the 'why'. In our study, this involves:

- Measuring the performance of the drinking water service by comparing user satisfaction before and after the delegation;
- Assessing performance indicators between the period before and after delegation (increase in turnover, increase in profit margin, increase in staff salaries, number of days with access to drinking water);
- Assessing the rate of access to drinking water before and after delegation.

In principle, quantitative data consists of information presented in numerical form, as figures or quantities that can be counted and measured. The research methods used for this purpose include: content analysis, questionnaires, the use of graphical representations, the use of attitude scales, and statistics from certain secondary sources such as census data, civil registry records, and various documents and reports. The method employed involves cataloguing, analysing and categorising all significant elements of a communication (information, messages, written texts, speeches, facial expressions, films, etc.). It aims to ensure the objectivity of its results and to produce measurable assessments

III. Empirical Analysis

This analysis involves comparing the theoretical propositions of management control and performance with actual data collected in the field. It will focus primarily on:

- ✓ Descriptive analysis;
- ✓ Reliability analysis using Cronbach's alpha;
- ✓ Correlation analysis;
- ✓ Hypothesis testing.

III.1. Sampling

Table 3. Distribution of respondents by neighbourhood.

	CALCULATION OF THE SAMPLE BY STRATA							
No.	**SUBDIVISION**	**MEN**	**WOMEN**	**BOYS**	**GIRLS**	**TOTAL**	**%**	**CHARM**
1	CENTRAL DISTRICT I	2,289	2,990	4,051	4,267	13,597	0.08	33
2	CENTRAL DISTRICT II	2,213	3,272	3,864	4,685	14,034	0.09	34
3	SHOPPING DISTRICT	2,223	2,333	2,944	3,008	10,508	0.07	25
4	DINANGA MUKUNZA NEIGHBOURHOOD	1,364	1,670	1,286	2,308	6,628	0.04	16
5	KANKALA DISTRICT	1,914	1,692	1,768	2,262	7,636	0.05	17
6	KABAMBA MUKOLE NEIGHBOURHOOD	2,907	2,175	2,595	2,860	10,537	0.07	25
7	KANTUNDU DISTRICT	2,074	2,539	2,663	3,186	10,462	0.07	25
8	KAZABA DISTRICT	1,814	1982	2,063	2,305	8,164	0.05	20
9	LUKUNZA DISTRICT	2,249	3,097	2,525	3,524	11,395	0.07	27
10	MUDIBA DISTRICT	1,139	1,605	1,204	1,252	5,200	0.03	12
11	NKONGA DISTRICT	2,120	2,571	2,873	3,343	10,907	0.07	26
12	NYIKINYIKI DISTRICT	2,012	2,471	2,089	3,151	9,723	0.06	23
13	TSHITOLO I NEIGHBOURHOOD	2,150	2,803	3,025	4,007	12,655	0.08	30
14	TSHITOLO II NEIGHBOURHOOD	2,030	3,026	2,750	4,450	12,256	0.08	29
15	TSHINTENTA DISTRICT	1,680	2,538	2,528	3,078	9,825	0.06	24
16	TSHINYAMA DISTRICT	3513	1,152	1,996	2,456	6,554	0.04	16
	TOTAL	**31,330**	**37,916**	**40,294**	**50,742**	**160,081**	1	**383**

Source: Population Office, MIABI rural commune

- **Sample size calculation**

The sample size depends on the confidence level and the margin of error required, as well as the variability of the target population. There are mathematical formulas for calculating the optimal sample size based on these parameters.

Formula:

$$\mathbf{n = Z^2 \times p\ (1 - p)\ e2}$$

Where:

n = minimum sample size;

Z = the value of the normal distribution corresponding to the confidence level;

p = estimated proportion of the population possessing the characteristic under study;

e = acceptable margin of error.

Hence, the calculated sample size is as follows:

$$\frac{1{,}96^2 x 0{,}5(1 - 0{,}5)}{0{,}052} = 383$$

Where:

Z = 1.96;

P = 0.5;

e = 0.05.

For our study, we will use proportional allocation, given that each neighbourhood constitutes a stratum with a weight within the overall sample. We will have:

$$\boldsymbol{Ni = \frac{Ni.n}{N}}$$

Where:

Ni: population of the neighbourhood;

ni: sample size for the neighbourhood;

N: Population;

n: total sample size.

- **Models and equations used in the study**

Economic model

In this study, the quantitative analysis is based on an economic model designed to examine the influence of management control mechanisms on performance. This approach enables an analytical link to be established between management control variables and the performance indicators observed in the field.

Thus, the economic basis of the model rests on the idea that strengthening management control improves the efficiency of performance.

The general economic model can be formulated as follows:

$$Performance_t = f(Controle\_de\_gestion_t, \varepsilon_t)$$

Where:

- $Performance_t$ represents the level of performance observed in period t ;
- $Controle\_de\_gestion_t$ denotes the set of control mechanisms in place;
- ε_t represents the unobserved factors influencing performance.

The construction of the control index can be expressed as follows:

$$Indice\_de\_controle_t = \frac{Z(CT_t) + Z(FCT_t) + Z(RS_t) + Z(RT_t) + Z(RA_t) + Z(AF_t)}{6}$$

Where:

- CT_t: technical controls;
- FCT_t: frequency of on-site controls;
- RS_t: follow-up meetings;
- RT_t: reports submitted;
- RA_t: reports analysed;
- AF_t: financial audits;
- $Z(.)$: standardised variable.

Econometric model

The econometric analysis is based primarily on simple linear regression models, which enable the effect of management control on various performance indicators for the public water service to be assessed. Two main models were estimated in this study.

$$Taux\_de\_recouvrement_t = \beta_0 + \beta_1 Indice\_de\_controle_t + \varepsilon_t$$

Where:

- $Taux\_de\_recouvrement_t$ represents the monthly bill collection rate;
- $\beta_0$is the model constant;
- β_1 measures the effect of management control on collection;
- $\varepsilon_t$represents the error term.

The second model analyses the effect of management control on the volume of water sold:

$$ln(Volume\_eau\_vendu_t) = \beta_0 + \beta_1 Indice\_de\_controle_t + \varepsilon_t$$

In this model:

- $ln(Volume\_eau\_vendu_t)$ represents the natural logarithm of the volume of water sold;
- $\beta_1$measures the influence of management control on the operational performance of the service.

The use of logarithmic transformation makes it possible to:

- Reduce the effect of large discrepancies between values;
- Improve the stability of the variances;

- Facilitate the economic interpretation of the estimated coefficients.

Section 1. Results of the qualitative analysis

Following interviews with the 10 individuals most closely involved in the water service delegation process, including 5 from the provincial authority (the delegating body) and 5 from the concessionaire (Hydro Service Congolais). The qualitative analysis software NVivo was used, and the following sections present the key findings, beginning with an overview of the themes or nodes created, followed by their sub-nodes, and concluding with a presentation of the salient results by theme.

1.1. Presentation of the themes of analysis

Table 4. Overview of the thematic structure of the qualitative analysis carried out.

Main themes	Associated sub-themes
Control and performance	Performance improvement; service continuity; service efficiency; decision-making; service quality; performance monitoring
Monitoring tools	dashboards; budget; performance indicators; technical and financial reports; management accounting
Transparency and accountability	Information asymmetry; reporting; transparency
Challenges facing the control system	Financial constraints; technical constraints; reporting difficulties; inadequate tools
Prospects for improvement	Recommendations for improvement

Source: Author, based on qualitative analyses of interviews using NVivo 15

1.2. Findings by theme

The qualitative analysis of interviews conducted with staff from the delegating authority and the concessionaire identified several key themes relating to management control within the framework of the delegation of the public water service in Kasaï Oriental. The results presented below are structured around the main themes emerging from the coding process carried out using NVivo.

1.3. Management control and performance in the public water service delegation

Table 5. The main sub-themes identified in this category.

Sub-themes	Number of references
Performance monitoring	12
Performance improvement	9
Service continuity	5
Decision-making	4
Efficiency of service	2
Quality of service	2

Source: analysis data

This table shows that monitoring indicators and improving performance are the aspects most frequently mentioned by respondents. This reflects the importance attached to the regular monitoring of activities and the evaluation of results within the framework of the delegation of public water services.

Table 6. Overview of management control tools.

Management control tools	Number of references
Monitoring mechanism (internal audit)	19
Technical and financial reports	17
Performance indicators	14
Dashboards	9
	9

Source: analysis data

This table shows that the monitoring mechanism (internal audit) and technical and financial reports are the tools most frequently mentioned by respondents. Dashboards and performance indicators also appear to be important tools for monitoring activities and operational performance.

Graphically, the diagram below illustrates the frequency of each tool mentioned by respondents:

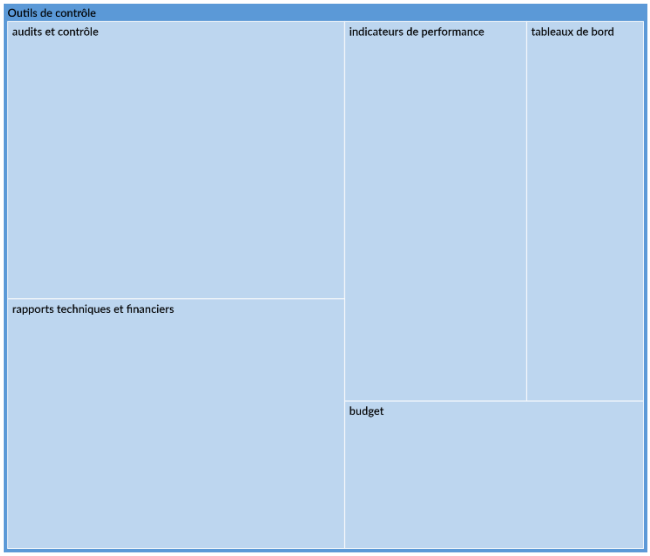


Figure 1. Hierarchical frequency diagram of words.

Source: author, based on qualitative analyses of interviews using NVivo 15

Looking at the hierarchical diagram above, it is clear that mechanisms for monitoring indicators (audits and control mechanisms) predominate in the respondents' comments, followed by the analysis of technical and financial reports.

1.4. Transparency and accountability

The findings from the interviews show that reporting and information-sharing mechanisms help to enhance transparency between the delegating organisation and the organisation to which the task is delegated.

Table 7. Main sub-themes identified in this category.

Sub-themes	Number of references
Transparency	8
Reporting	6
Information asymmetry	4

Source: qualitative analysis data

Looking at the table above, it is clear that transparency is the aspect most frequently mentioned compared with the others.

Table 8. Difficulties encountered.

Difficulties identified	Number of references
Technical constraints	7
Inadequate tools	7
Reporting difficulties	6
Financial constraints	3

A review of this table shows that technical constraints and inadequate tools are the main difficulties cited by respondents.

1.5. Prospects for improvement

Respondents also made several recommendations aimed at improving the management control system within the framework of the delegation of public water services. The main recommendations concern increasing the digitalisation of monitoring tools, improving technical infrastructure, building the capacity of staff involved in performance monitoring, strengthening performance monitoring mechanisms, and modernising reporting systems.

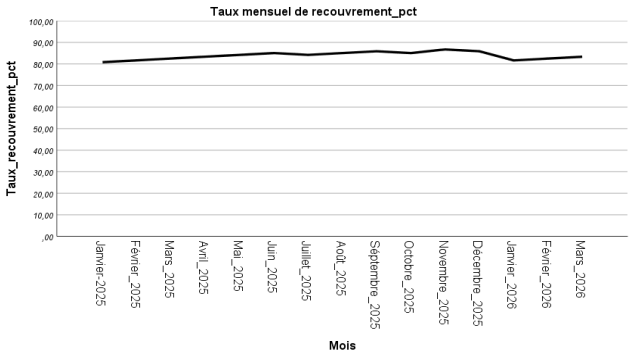
Section II. Results of the quantitative analysis

Based on the actual data collected from the monthly and annual reports submitted by the concessionaire to the Provincial Authority, the following quantitative analyses were carried out:

2.1. Graphical analysis

In this sub-section, a number of graphs relating to the performance indicators of the public water service will be presented:

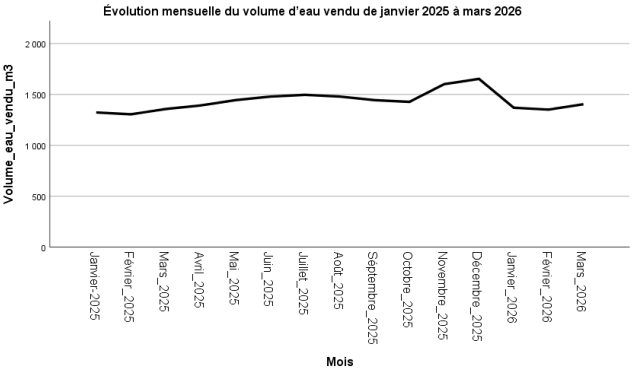
Graph 1. Monthly trend in the monthly recovery rate.



Source: Author, based on SPSS software

This graph shows that the collection rate remained broadly stable, with a slight upward trend between January 2025 and December 2025. A slight decline was observed at the start of 2026, followed by a gradual recovery until March 2026. Overall, therefore, the graph highlights a relatively satisfactory collection rate throughout the period under review, ranging between 80 and 90 per cent.

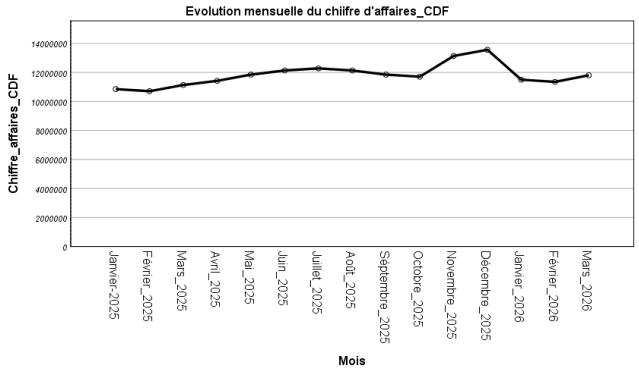
Graph 2. Monthly trend in the volume of water sold from January 2025 to March 2026.



Source: author, based on SPSS software

This graph shows that the volume of water sold followed a slightly upward trend between January 2025 and December 2025, with a higher level observed towards the end of 2025. However, a decline is evident at the start of 2026, followed by a slight stabilisation until March 2026.

Graph 3. Monthly trend in turnover from January 2025 to March 2026.



Source: author, based on SPSS software

This figure shows that turnover followed a broadly upward trend between January 2025 and December 2025, reflecting a gradual improvement in the financial performance of the public water service. The highest level is observed towards the end of 2025. Thus, the turnover generated by the public water service in the Miabi region from January 2025 to March 2026 ranged from 10 to 14 million Congolese francs, with slight fluctuations within this range.

However, a decline is evident at the start of 2026, followed by a slight recovery in March 2026. Overall, the graph highlights a positive trend in turnover over the period under review.

2.2. Descriptive analysis

Table 9. Monthly descriptive statistics for public water service performance indicators (January 2025 – March 2026).

Variables	N	Minimum	Maximum	Mean	Standard deviation
Volume of water sold (m³)	15	1,305	1,653	1,434.93	97.339
Network loss rate (%)	15	3.29	3.37	3.3313	0.02264
Functional terminals	15	16	18	17.07	0.704
Operating hours per day	15	7.60	8.40	7,9720	0.25518
Repair rate (%)	15	85.71	85.71	85.7100	0.00000

Source: Monthly operational data from the delegating company and the concessionaire

This table shows that, over the 15 months covered by the study — from January 2025 to March 2026—the monthly volume of water sold ranged from a minimum of 1,305 m³ to a maximum of 1,653 m³. The monthly average of 1,434.93 m³ indicates that, on average, nearly 1,435 m³ of water was sold each month during the period under review. Furthermore, the standard deviation of 97.339 illustrates a moderate dispersion of sales volumes around the monthly average, reflecting a relatively controlled variation in water sales over the various months observed.

With regard to the monthly network loss rate, the recorded values range from 3.29 per cent to 3.37 per cent, with an average of 3.3313 per cent. This average indicates that the technical losses observed in the network remain relatively low throughout the period under review. The very low standard deviation of 0.02264 reveals very little monthly variation in the loss rate, thus reflecting a high degree of stability in the technical performance of the water distribution network.

For operational hydrants, the minimum number observed was 16, compared with a maximum of 18, depending on the month in question. The average of 17.07 hydrants shows that, on average, approximately 17 terminals remained operational each month during the period under study. The standard deviation of 0.704 indicates a low dispersion of values around the mean, revealing relative stability in the operational status of the distribution terminals.

With regard to the operating hours of the public water service, monthly observations range from a minimum of 7.60 hours to a maximum of 8.40 hours per day. The monthly average of 7.9720 hours indicates that, on average the service operated for approximately 8 hours a day during the period under study. The standard deviation of 0.25518 shows little variation in operating hours from one day to the next, indicating a certain degree of regularity in service continuity.

Finally, the monthly repair rate has an identical minimum and maximum of 85.71 per cent, with an average also equal to 85.71 per cent. The standard deviation of zero (0.00000) indicates a complete absence of variation in this indicator across all the months studied. This means that the repair rate remained constant from January 2025 to March 2026.

2.3. Correlation and regression analysis

Table 10. Pearson's correlation between the control index and the growth indicators.

Variables	Control index	Log profit margin	Collection rate (%)	Log volume of water sold	Log of operating hours
Control index	1				
Sig.					
Log profit margin	0.386	1			
Sig.	0.155				
Collection rate (%)	0.327	0.853	1		

Sig.	0.234	0.000			
Log volume of water sold	0.375	0.993	0.873	1	
Sig.	0.168	0.000	0.000		
Log of operating hours	0.094	0.270	0.489	0.287	1
Sig.	0.739	0.330	0.064	0.300	

Source: author, based on SPSS data;

This table shows that the control index exhibits positive correlations with all the performance indicators selected. However, these relationships remain statistically insignificant at the 5 per cent level, as the associated probabilities are greater than 0.05.

Indeed, the control index is positively correlated with the logarithmic profit margin ($r = 0{,}386$), the recovery rate ($r = 0{,}327$) and the logarithm of the volume of water sold ($r = 0{,}375$). These results suggest that a strengthening of management control mechanisms tends to be accompanied by an improvement in the financial and operational performance of the concessionaire. Nevertheless, the lack of statistical significance indicates that this relationship remains moderate in the sample studied.

Furthermore, the correlation between the control index and the logarithm of daily operating hours is very weak ($r = 0{,}094$) and not statistically significant ($p = 0{,}739$). This suggests that the control mechanisms in place have little influence on the day-to-day continuity of the service.

The table also highlights very strong positive correlations between certain performance variables. The logarithmic profit margin shows a very high and significant correlation with the logarithm of the volume of water sold ($r = 0{,}993; p < 0{,}01$). This result indicates that an increase in the volume of water actually sold is almost automatically accompanied by a rise in profitability.

Similarly, the collection rate shows a strong positive correlation with the profit margin ($r = 0{,}853; p < 0{,}01$) as well as with the volume of water sold ($r = 0{,}873; p < 0{,}01$). These results reflect the central role of revenue collection in improving the financial performance of the concessionaire.

Finally, daily operating hours show positive but weak correlations with the other performance indicators. This suggests that service continuity does not necessarily evolve at the same pace as financial or commercial performance.

Overall, these results show that management control has positive relationships with several dimensions of performance, even though these relationships remain moderate and statistically insignificant within the context of this limited sample.

Table 11. Results of the linear regression between the management control index and the invoice collection rate.

MODEL COEFFICIENTS					
Variables	**B**	**Standard error**	**Beta**	**t**	**Sig.**
Constant	83.857	0.448		187,039	0
Control index	1,148	0.919	0.327	1.25	0.234
SUMMARY OF THE MODEL					
Model	**R**	**R²**	**Adjusted R²**	**Standard error**	
1	0.327	0.107	0.039	1.73641	
ANALYSIS OF VARIANCE (ANOVA)					
Source	**Sum of squares**	**Ddl**	**Mean square**	**F**	**Sig.**
Regression	4,708	1	4,708	1,561	0.234
Residues	39,197	13	3,015		
Total	43,904	14			

Source: SPSS analysis data

This table shows that the control index has a positive effect on the recovery rate. Indeed, the coefficient associated with the control index is positive ($B = 1{,}148$), which means that an improvement in management control tends to increase the recovery rate of the concessionaire.

However, this relationship remains statistically insignificant at the 5 per cent level, as the probability associated with the coefficient is greater than 0.05 ($p = 0{,}234$). This indicates that the available data do not allow us to confirm with certainty the existence of a significant effect of management control on revenue collection.

The coefficient of determination ($R^2 = 0{,}107$) shows that the control index explains only 10.7 per cent of the observed variations in the recovery rate. This low level of explanation suggests that other factors not included in the model strongly influence recovery performance.

The analysis of variance (ANOVA) also confirms this model's limited explanatory power. The Fisher's F-statistic obtained ($F = 1{,}561$) is associated with a probability of 0.234, which is above the critical threshold of 5 per cent. The overall model is therefore not statistically significant.

Despite this lack of statistical significance, the positive sign of the coefficient remains consistent with the theoretical rationale of management control. This suggests that strengthening control mechanisms may help to improve commercial performance, even if this effect remains limited in the sample studied.

These results can be explained by several factors, notably:

- The small sample size ($N = 15$);
- The operational nature of the monthly data;
- The probable existence of other variables influencing collection, such as:
    - Users' purchasing power;
    - The technical conditions of the network;
    - Commercial practices;
    - Institutional constraints;

Overall, the results indicate that management control has a positive relationship with, but one that is not yet strong enough to significantly explain, the collection performance of the concessionaire.

Table 12. Results of the linear regression between the control index and the logarithm of the volume of water sold per month.

MODEL COEFFICIENTS					
Variables	**B**	**Standard error**	**Beta**	**T**	**Sig.**
Constant	7.267	0.016		441,164	0
Control index	0.049	0.034	0.375	1.46	0.168
MODEL SUMMARY					
Model	**R**	**R²**	**Adjusted R²**	**Standard error**	
1	0.375	0.141	0.075	0.0638	
ANALYSIS OF VARIANCE (ANOVA)					
Source	**Sum of squares**	**Ddl**	**Mean square**	**F**	**Sig.**
Regression	0.009	1	0.009	2.132	0.168
Residues	0.053	13	0.004		
Total	0.062	14			

Source: SPSS analysis data

This table shows that the control index has a positive effect on the logarithm of the volume of water sold. The coefficient associated with the control index is positive ($B = 0{,}049$), which means that an improvement in management control tends to increase the volume of water actually sold by the concessionaire.

The standardised coefficient ($\beta = 0{,}375$) indicates a moderate positive relationship between management control and operational performance. This suggests that strengthening the control mechanisms exercised by the delegating authority

may help to improve the commercial and operational efficiency of the water service.

However, this relationship remains statistically insignificant at the 5 per cent level, as the probability associated with the coefficient is greater than 0.05 ($p = 0{,}168$). Thus, the available data do not allow us to state with certainty that there is a significant effect of management control on the volume of water sold.

The coefficient of determination ($R^2 = 0{,}141$) shows that the control index explains approximately 14.1 per cent of the observed variations in the volume of water sold. Although this explanatory power remains relatively low, it is slightly higher than that observed in the collection rate model.

The analysis of variance (ANOVA) also confirms this low overall significance of the model. The Fisher's F-statistic obtained ($F = 2{,}132$) is associated with a probability of 0.168, which is above the critical threshold of 5 per cent. The model is therefore not statistically significant overall.

Despite this lack of statistical significance, the positive sign of the coefficient remains consistent with the theoretical rationale of management control. Indeed, more rigorous control can promote:

- Better technical oversight;
- A reduction in malfunctions;
- Improved service continuity;
- Better utilisation of the water produced.

These results may also be influenced by several methodological and operational constraints, notably:

- The small sample size ($N = 15$);
- The monthly nature of the data;
- The existence of other explanatory factors not included in the model, such as:
    - The condition of the infrastructure;
    - Network losses;
    - User demand;
    - Energy constraints;
    - Weather conditions;

Overall, the results indicate that management control has a positive relationship with the operational performance of the concessionaire, even though this influence remains statistically limited within the sample studied.

Section III. Analysis of performance as perceived by users

3.1. Descriptive analysis

Table 13. Users' perception of the service following delegation.

Variables	Measures	Number	Percentage
Perception of the service since management was delegated	The service has improved	364	95.0
	No change	19	5.0
	Total	**383**	**100.0**

Source: Author, based on survey data and analysis using SPSS

The table above shows that the vast majority of users— that is, 95.0 per cent — report having noticed an improvement in the public water service in the MIABI area since the delegation. In addition to this positive perception shared by almost all users surveyed, only 5 per cent disagree and, in turn, find that this service has not undergone any change; therefore, no improvement is recorded for these respondents.

3.2. Analysis of the internal consistency of the perceived performance variables

Prior to constructing the composite index of perceived performance, the internal consistency of the selected variables was verified using Cronbach's alpha. The aim of this step was to ensure that the various items used did indeed measure the same construct relating to the perceived performance of the public water service.

Table 14. Cronbach's alpha results.

Number of items	Cronbach's alpha	Interpretation
12	0.957	Very satisfactory internal consistency

This table shows a Cronbach's alpha value of 0.975, which is very high; this means that the variables selected in this study to measure the performance as perceived by users or beneficiaries of the water service in the Miabi region demonstrate very satisfactory internal consistency. Thus, the various items used in this study adequately measure a single construct relating to the performance of the public water service.

3.3. Validation of Principal Component Analysis (PCA)

Principal Component Analysis was used to construct a composite index of the perceived performance of the public water service based on the various dimensions assessed by users.

Table 15. PCA validation indicators.

Indicators	Values
Kaiser-Meyer-Olkin (KMO) index	0.976
Bartlett's test (Sig.)	0.000
Total variance explained	67.984
Number of significant components retained	1

This table shows that the data used are suitable for Principal Component Analysis. The total explained variance of 67.984 per cent indicates that the selected components are effective at summarising the various dimensions of perceived performance of the public water service.

The variables included in the PCA mainly related to:

- Water availability;
- The frequency of water cuts;
- Water quality;
- Water pressure;
- Service quality;
- Accessibility;
- The responsiveness of the service;
- Overall user satisfaction.

Thus, the factor scores derived from the PCA were used to construct a composite index of perceived performance, which was utilised in subsequent analyses.

3.4. Testing the normality of the perceived performance index

In order to assess the normality of the distribution of the perceived performance index, the Kolmogorov–Smirnov and Shapiro–Wilk tests were employed.

Table 16. Normality tests for the perceived performance index.

Tests	Statistic	ddl	Significance
Kolmogorov–Smirnov	0.065	383	0.000
Shapiro-Wilk	0.959	383	0.000

This table shows that the Kolmogorov-Smirnov and Shapiro-Wilk tests indicate significance below the 5 per cent threshold, theoretically suggesting a deviation from normality. However, given the large sample size, these tests remain particularly sensitive to small deviations in distribution. The observed skewness coefficients nevertheless indicate a relatively balanced distribution, which allows us to consider the ANOVA sufficiently robust for this study.

3.5. Testing for homogeneity of variances

Levene's test was used to test the hypothesis of homogeneity of variances between the different neighbourhoods.

Table 17. Test for homogeneity of variances (Levene).

Levene's statistic	ddl1	ddl2	Significance
0.807	15	367	0.670

An examination of this table shows that the Levene's test is significant at a level below the 5 per cent threshold. Consequently, the assumption of homogeneity of variances across neighbourhoods is met, confirming the validity of using a standard ANOVA.

3.6. Comparison of perceived performance by neighbourhood: ANOVA results

A one-way analysis of variance (ANOVA) was carried out to determine whether the mean levels of perceived performance differed significantly across the neighbourhoods studied.

Table 18. ANOVA results by neighbourhood.

Source of variation	Sum of squares	ddl	Mean square	F	Meaning
Intergroups	11,027	15	0.735	0.727	0.757
Intra-group	370,973	367	1,011		
Total	**382,000**	**382**			

This table shows that the differences observed between neighbourhoods regarding the perceived performance of the public water service are not statistically significant at the 5 per cent level. Users in the various neighbourhoods therefore appear, on the whole, to perceive the public water service in a relatively similar way.

3.7. Robustness analysis: Kruskal-Wallis test

In order to enhance the robustness of the results obtained from the ANOVA, the non-parametric Kruskal-Wallis test was also employed.

Table 19. Results of the Kruskal-Wallis test.

Indicators	Kruskal-Wallis
Kruskal-Wallis H	11.023
Ddl	15
Asymptotic significance	0.751

This table shows that the non-parametric Kruskal-Wallis test reveals no statistically significant difference between the neighbourhoods regarding the perceived performance of the public water service. This result confirms the conclusions drawn from the ANOVA and thus reinforces the robustness of the analyses carried out.

Section IV. Discussion of results, limitations and recommendations

4.1. Discussion of the results

The results obtained in this study show, overall, that management control is an important mechanism for improving the performance of the public water service within the framework of the delegation scheme established in the Miabi territory of Eastern Kasai. The qualitative, quantitative and perceptual analyses all point to the view that the systems for monitoring, control, reporting and performance evaluation contribute to strengthening the management of the delegatee's activities.

The qualitative findings indicate that the stakeholders involved in the delegation process regard management control as a tool that promotes improvements in the operational and organisational performance of the public water service. The aspects most frequently mentioned in the interviews relate primarily to performance monitoring, performance improvement, service continuity and decision-making. These results confirm the hypothesis that management control acts as a regulatory mechanism enabling the improvement of the service's overall performance.

These findings are consistent with the work of Christopher Hood (1991) on New Public Management, which suggests that the introduction of management tools derived from the private sector helps to improve the efficiency of public services. They also corroborate the analyses by Bouquin (2010) and Gervais (2009), who regard management control

as a strategic tool for steering organisational behaviour towards the achievement of performance objectives.

4.2. Limitations of the study

Our study builds on previous academic research that has established a link between the use of management control tools and performance.

Despite the scientific and practical value of this study, certain limitations must be highlighted. These include: the relatively limited size of the monthly quantitative data; the study was conducted solely within the Miabi region, which limits the generalisability of the results; and the qualitative analyses are based primarily on the perceptions of the stakeholders involved in the delegation process.

4.3. Recommendations

In light of the results obtained, several recommendations can be made to enhance the effectiveness of management control in the delegation of public water services in Kasaï Oriental.

Firstly, it appears necessary to strengthen the mechanisms for technical and financial monitoring of the delegatee by improving regular monitoring, strengthening performance indicators and modernising reporting systems.

Secondly, the provincial authority should increase the digitalisation of control and monitoring tools in order to improve the speed, reliability and traceability of information relating to the operation of the public water service.

Thirdly, it would be important to strengthen the technical and managerial capacities of staff involved in monitoring the concession through regular training in management control, performance analysis and public service governance.

Fourthly, the provincial authorities should gradually improve the network's technical infrastructure in order to reduce the operational constraints that limit the effectiveness of management control and the quality of the service provided to users.

Fifthly, it would be useful to establish an integrated system for monitoring performance indicators, enabling the centralisation of data relating to production, revenue collection, technical losses, service continuity and user satisfaction.

Finally, future research should conduct a more in-depth analysis of the effects of management control on the performance of public water services, using longer-term longitudinal data and covering a range of water supply systems, in order to enhance the robustness of the empirical findings.

Conclusion

The aim of this study was to analyse management control as a performance tool within the framework of the delegation of public water services in Kasaï Oriental. More specifically, the aim was to examine the contribution of management control to service performance, to identify the main management tools used within the framework of the delegation of public water services, and to analyse the contribution of management control mechanisms to enhancing transparency and accountability between the delegating authority and the concessionaire. To sustain performance levels, management control is not limited solely to financial indicators; it also serves to structure the organisation of a company. According to BOUQUIN, H. (2010), as further developed in the work of SEDRA, H. et al. (2024). Management control improves resource management and the quality of public services when properly implemented (Pollitt & Bouckaert, 2003).According to Pierre Bauby, privatisation policies must be accompanied by robust public regulatory mechanisms (Pierre Bauby, 2023), as poorly regulated privatisations can sometimes increase inequalities in access to essential services (David Hall, 2023).Studies by Mantsie, R.-W. & Ngamokouba, G. (2024) show that institutional constraints limit the effectiveness of modern control tools. Management control is becoming essential as a strategic tool for regulating and guiding the approach, by monitoring the technical, financial and social performance of operators. (Séraphin NGONDO N.,2026). Delegation contracts remain flawed and require permanent mechanisms for public regulation (Bonnet Beaugrand, F. ,2008), as performance depends heavily on local governance and the institutional organisational model (Simon Porcher, 2012). As highlighted by (BENTAHAR, A. 2021), performance measurement is a fundamental concept in management science, as it enables results to be compared against objectives and difficulties to be anticipated.

To achieve these objectives, the study employed a mixed-methods approach combining quantitative and qualitative analyses. The quantitative data were analysed using IBM SPSS Statistics software, employing descriptive statistics, correlation analyses, comparison tests and the construction of composite performance indices. The qualitative data from interviews with staff at both organisations were analysed using NVivo through a thematic analysis based on the coding of respondents' statements.

The results show that management control is an important mechanism for steering and improving the performance of the public water service. The qualitative analyses reveal that systems for monitoring performance indicators, technical and financial reports, and dashboards contribute to the monitoring of activities, decision-making and the strengthening of control over the operations carried out by the concessionaire.

The results also show that reporting and information-sharing mechanisms help to enhance transparency and reduce information asymmetries between the parties involved in the delegation. Management control enables better allocation of resources and improves outcomes (Andrews & Van de Walle, 2013); similarly, results-oriented management, supported by management control, has contributed to improved performance in public administrations (Nassiri & Abba, 2019).

Quantitative analyses highlight positive relationships between the control index and several performance indicators, notably the volume of water sold, the recovery rate and the profit margin, although some relationships remain statistically insignificant due to constraints relating to the size of the available data set.

Furthermore, the results of the user survey reveal an overall positive perception of the public water service since the introduction of delegated management. The majority of users surveyed consider that the service has improved, reflecting a noticeable improvement in the functioning of the public water service in the Miabi region, as public services depend on coordination between local stakeholders and those responsible for implementation (Jean-Marc Offner, 2024).

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