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BUSINESS INTELLIGENCE ADOPTION IN MANAGEMENT CONTROL AND ORGANIZATIONAL PERFORMANCE OF CAMEROONIAN SMES: A SOCIOTECHNICAL ANALYSIS

By

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Abstract

This article analyzes the conditions governing the adoption of Business Intelligence (BI) in management control practices and its perceived contributions to organizational performance within Cameroonian Small and Medium-sized Enterprises (SMEs). While BI tools facilitate data collection, processing, visualization, and exploitation, their integration does not rely solely on technical solutions. It also requires user competencies, awareness, adequate data quality, and coordination between human actors and digital devices. Grounded primarily in Actor-Network Theory (ANT), this study adopts a qualitative approach based on semi-structured interviews with seven SME managers in Douala, selected through purposive sampling. The findings reveal a perception of BI centered on decision support, data analysis, key performance indicator (KPI) tracking, and automated reporting. The paper concludes by emphasizing the need to approach BI implementation as a socio-technical process rather than a mere equipment acquisition decision.

Key words *Actor-Network Theory, Business Intelligence, management control, organizational performance, SMEs*

INTRODUCTION

Digital transformation is changing the conditions under which organizations produce information, assess their results and make decisions (Ross et al., 2017).

In finance functions, the growing volume of transactional, accounting, commercial and operational data increases the potential for analysis, but it also makes processing more complex. In this context, firms use IT tools to modernize their decision-making processes and strengthen their management systems. These tools are generally based on Enterprise Resource Planning (ERP) systems, to which newer information systems such as Big Data, artificial intelligence and Business Intelligence are added (Granlund and Malmi, 2002; Scapens and Jazayeri, 2003).

According to Negash (2004) and Moss and Atre (2003), BI is a set of methods, technologies and practices for collecting, consolidating, processing and delivering data for decision-making purposes. For management control, these capabilities matter because they can reduce certain repetitive tasks, facilitate the flow of information and make analyses more accessible to operational managers. These transformations thus compel organizations to adapt their structures and operations (Hilmi and Kaizar, 2023). According to a 2021 study by the firm EY, 71% of companies in Asia-Pacific had already begun to digitalize their management control, compared with 62% in Europe, 54% in Latin America, 48% in North America and 42% in Africa and the Middle East.

In Cameroon, this lag mainly concerns SMEs (INS, 2012) because of limited financial resources, an unevenly developed digital infrastructure, heterogeneous management practices and variable access to specialized skills (Takoudjou Nimpa et al., 2019; Fossi Maffock et al., 2019). Many SMEs are unaware of the benefits and workings of BI, which raises the question of raising awareness among, and training, the actors involved.

The research question is therefore the following: how does the implementation of BI in management control practices contribute to improving the organizational performance of Cameroonian SMEs? Three secondary questions refine it:

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- How can awareness-raising about the process of implementing BI in management control professions contribute to improving organizational performance?
- Can training related to the implementation of BI in management control practices contribute to improving organizational performance?
- How can skills related to the implementation of BI in management control practices contribute to improving organizational performance?

These questions lead to the formulation of three research propositions:

P1: Awareness of the process of implementing BI in management control practices improves organizational performance;

P2: Training on the implementation of BI in management control practices improves organizational performance;

P3: Skills related to the implementation of BI in management control practices improve organizational performance.

To explore this research question, the main objective is to understand how the implementation of BI in management control practices contributes to improving the organizational performance of Cameroonian SMEs.

To address the question guiding this research, we adopt a qualitative approach, chosen because of the latitude it gives the researcher in both collecting and processing data, and also because, by its nature, this study explores a field that remains little studied. Data will be collected using an interview guide structured by theme on the topic addressed. The interviews will be analyzed using thematic content analysis.

The first part sets out the debates in the literature on BI, management control and organizational performance. The second part is devoted to the theoretical framework, followed by the presentation of the methodology. The last part presents the results, the theoretical and managerial contributions of this research, as well as its limitations and avenues for future research.

1. LITERATURE REVIEW: BUSINESS INTELLIGENCE, MANAGEMENT CONTROL AND ORGANIZATIONAL PERFORMANCE

1.1 Business Intelligence : from data to usable information

The definition of BI is ambiguous because of the diversity of definitions proposed. The term covers many technologies, data management aspects, applications and methods for analyzing and presenting information drawn from data warehousing and the analysis of historical data; BI today partly overlaps with performance management and content management. For Negash (2004), BI systems combine data collection and storage, knowledge management and analytical tools to provide decision-makers with useful information at the right time and in the right form. Chen, Chiang and Storey (2012) link it more broadly to the field of analytics, from Big Data to organizational impact.

On the basis of a review of the literature, Shollo and Kautz (2010) and Dounia et al. (2025) distinguish three ways of conceiving BI (process, product, set of technologies). As a process, BI refers to the collection and storage of data, their analysis and transformation into information and then knowledge, and finally their use for decision-making. As a product, it refers to the data, information and knowledge that make it possible to anticipate the behavior of the organization's environment. As a technology, it refers to the tools that make these steps possible (data warehouses, extract-transform-load, analysis, visualization, dashboards). This three-facet conception is useful because it links the technical and human dimensions of BI, which is essential for analyzing awareness, training and skills.

However, several studies stress that the value of BI does not stem from technology alone. Trieu (2017) shows that value creation depends on how BI systems are integrated into processes and decisions. Kowalczyk and Buxmann (2015) show, on the basis of a multiple case study, that firms must combine exploitation uses (regular reporting) and exploration uses (ad hoc analyses) to support their decisions. Wieder and Ossimitz (2015) establish that BI improves decision quality mainly through the quality of the information it produces. Finally, Olszak (2016) insists on the need to better understand the use of BI in organizations, beyond its technical implementation.

1.2 The evolution of management control and uses of BI

Management control traditionally aims to produce information that brings objectives, resources deployed and results achieved into line with one another (Anthony, 1965). It relies notably on planning, budget monitoring, cost analysis, variance analysis and dashboards (Bouquin, 2011). The management controller is thus a professional in charge of ensuring the proper functioning of the information-processing procedures that regulate the management of the firm. He or she must be at once a specialist and a generalist, operational and functional, a technician and attentive to human dimensions. The controller prepares forecast budgets, develops dashboards and indicators, analyzes variances between forecasts and actual results, and recommends corrective actions. In SMEs, the controller often combines this function with other missions (accounting, finance, administration, personnel management, IT), which limits the time available for analysis (Bollecker, 2007). Yet digitalization profoundly changes this profession. A first stream of research shows that automation frees the controller from collection and consolidation tasks and allows him or her to become a genuine business partner, close to operational staff. Nespeca and Chiucchi (2018) observe, from a study of Italian consultants, that the arrival of BI systems leads controllers to play a more active role in decisions and to devote more time to the analysis and interpretation of data. Ciampi (2021) stresses that digitalization automates reporting and dashboards, overhauls forecasting processes and speeds

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up access to information, which requires training staff. Lamssarbi et al. (2022) confirm that this change is beneficial when controllers adopt a proactive and collaborative stance.

However, a second stream calls for caution. Cavélius et al. (2020) highlight tensions between the return of a technical expert role (system maintenance, data reliability) and the business partner role: depending on the degree of digitization, technical tasks may even increase at the expense of advisory work. Reutter et al. (2021), in an eighteen-month action research study, show that the controller's involvement in making BI reports reliable remains fragile and that new actors, notably from the IT department, may take over part of the controller's mission. This tension between the opportunity for repositioning and the risk of marginalization makes it necessary to understand under what conditions (awareness, training, skills) the controller succeeds in taking advantage of BI.

1.3 Organizational performance : a multidimensional concept

The widely used concept of performance is not unanimously defined or measured; both depend on the objective pursued and the perspective of analysis. In the tradition of Taylor and Fayol, organizational performance refers to how the firm is organized to achieve its objectives ; it rests on respect for the formal structure, the relationships between the components of the organization, the quality of information flow and the flexibility of the structure. This definition is particularly suited to the object of this article, since BI acts directly on the flow and quality of information.

Performance management relies on performance management and measurement systems (PMS), that is, on mechanisms, processes and structures that help implement strategy through planning, measurement, analysis and control (Ferreira and Otley, 2009). These systems combine financial measures (profitability, return on investment) and non-financial measures (quality, lead times, customer satisfaction, market share, productivity). Financial indicators are considered insufficient on their own because they describe the past rather than guide action; it is therefore recommended to complement them with strategy-related indicators, as in the Balanced Scorecard (BSC), and to use them for internal and external benchmarking. In this research, organizational performance is therefore approached through operational and decision-related dimensions : achievement of objectives, responsiveness, productivity, information quality and resource allocation.

Moreover, the literature identifies several ways in which BI can influence performance : by improving the quality and speed of decisions, by automating repetitive tasks, by allocating resources better and by monitoring indicators more closely (Appelbaum et al., 2017 ; Wieder and Ossimitz, 2015). It also emphasizes the conditions for success. Data reliability comes first : implementing BI does not by itself guarantee data integrity, and dynamic reports based on erroneous data can lead to poor decisions more quickly (Appelbaum et al., 2017 ; Quattrone, 2016). Communication between report designers and users comes second : the participation of end users in the implementation process fosters buy-in and use of the tool in decisions (Eldenburg et al., 2010 ; Mai Django et al., 2025), and inadequate communication between the IT department and users is regularly cited as a cause of project failure.

In SMEs, these conditions are harder to meet. Studies on the Cameroonian context point to the cost of licenses and training, the lack of staff qualified in data analysis and high staff turnover, the fragmentation of data across systems, the absence of a formalized methodology and of clear strategic objectives, a corporate culture that is not conducive to tool adoption, and insufficient management support (Takoudjou Nimpa et al., 2019; Fossi Maffock et al., 2019; Tagne et al., 2021). Indicators can also become targets to be reached at all costs and be manipulated, which reduces trust in the system.

The review shows that existing studies focus either on the roles of the controller or on the impact of BI on performance, but they rarely link these two fields through the human and organizational conditions of adoption (awareness, training, skills), particularly in Central African SMEs.

2. THEORETICAL FRAMEWORK: ACTOR-NETWORK THEORY

Several theories shed light on the use of digital technology in management control (resource-based theory, agency theory, organizational learning theory, behavioral theories, contingency theory, structuration theory and transaction cost theory). Although each contributes usefully, the theoretical framework retained for this research is Actor-Network Theory (ANT). BI is indeed an object in which technologies (software, databases, warehouses) and human actors (management controllers, managers, executives, IT staff) interact to turn data into decisions. ANT is the only one of the theories mentioned that explicitly treats the tool as an actor and describes the process by which it becomes established, which responds directly to our three propositions, all of which concern the conditions of BI adoption.

2.1 Principles of the theory

ANT, also called the sociology of translation, was developed in the early 1980s at the Centre for the Sociology of Innovation of the École des Mines de Paris (Akrich et al., 2006). It rests on three ideas. First, the symmetry between humans and non-humans (society and technology are not two separate worlds but are closely intertwined). Non-humans are neither neutral nor all-powerful; they have a capacity to act, so that technologies must be considered, like individuals, as full actors (or actants) of the network (Callon, 1986 ; Latour, 2006). Second, the notion of network (every person, every object and the organization itself are the always provisional result of a set of humans and non-humans linked together, in which each element must be assigned a role). Third, the process of translation, which makes this possible. Callon (1986) breaks it down into four moments. Problematization formulates the problem and defines the actors concerned and the alliances to be forged. Interessement consists in attracting

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actors and stabilizing their roles. Enrolment assigns them defined roles and commits them to the project. Mobilization of allies checks that spokespersons truly represent those they claim to represent and that the network holds, with controversies and negotiations punctuating the process.

Applied to management tools, this perspective redefines them as sociotechnical devices, that is, as arrangements of humans and non-humans (Akrich, 1987). A tool then appears as a "black box," the result of a network of heterogeneous actants whose workings the user does not know. To understand why a tool is adopted or rejected, one must reconstruct the process of translation and the controversies that accompanied it. ANT thus replaces the classical diffusion model, in which users must adapt to a given technology, with a model of interessement, which assumes co-construction between the tool and its users. Alcouffe et al. (2008) have shown the value of this approach for comparing the diffusion of innovations in management accounting.

2.2 Contribution of the theory to the analysis of BI and organizational performance

From this perspective, the organizational performance linked to BI cannot be separated from the process of translation through which the tool becomes established. A tool alone does not mobilize a network, and a human actor without a concrete tool does not effectively structure collective action (Saba and Gerbaix, 2013). ANT also makes it possible to grasp the controversies and resistance inherent in the implementation of BI systems, performance being the result of a social process of continuous negotiation and alignment.

This led us to link each of the three propositions to a moment of translation, as shown in the following table.

Lever studied	Moment of translation	Role in the network	Proposition
Awareness-raising	Problematization and interessement	Explain what is at stake with BI, attract and reassure actors, define why BI is necessary	P1
Training	Enrolment	Equip actors with the knowledge that enables them to hold their role alongside the tool	P2
Skills	Mobilization and stabilization of the network	Convert data into decisions, maintain reliability and sustained use over time	P3

Source: Authors' own elaboration

These propositions are analytical benchmarks. They are not hypotheses tested by statistical models. They guide the coding and the discussion of the interviews by directing attention to the mechanisms of adoption and to the conditions that facilitate or hinder their operation.

3. METHODOLOGY

The study adopts a constructivist posture, which is consistent with the research question, since the latter concerns perceptions, experiences and the conditions of BI adoption in management control practices. The aim is less to measure an average effect than to understand how actors define the tool, describe its use and identify the obstacles encountered.

The target population consists of SMEs located in the city of Douala, Cameroon. Data collection relies on semi-structured interviews conducted with seven respondents holding functions related to accounting, auditing, management control or general management. The use of varied profiles makes it possible to compare distinct professional viewpoints on BI, management practices and the conditions of digital transformation. The study relies on purposive sampling, consisting of selecting SMEs that have a management control department or use BI tools. Within these firms, respondents are selected according to their position and their ability to provide information on financial activities, management tools or organizational decisions. The profiles of the respondents, designated by anonymous codes, are summarized in the following table.

Table 2: Summary of information on the sample

Table 1 : Correspondence between research propositions and moments of translation

	Gender	Age	Profession	Business sector	Position held in the company	Academic background (Primary, Secondary, Higher)	Years with the company
Interview 1	Female	28 years	Management controller / Auditor	Agri-food	Accounting auditor	Higher education	1 year
Interview 2	Male	27	AFD	Metallurgy and	AFD	Master's (M2)	4 years

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		years		steel			
Interview 3	Male	26 years	Management controller	Pharmaceuticals and cosmetics	Management controller	Master's (M2)	4 years
Interview 4	Male	35 years	General manager	Pharmaceuticals and cosmetics	General manager	Bachelor's	10 years
Interview 5	Male	35 years	Chief accountant	Agri-food	Chief accountant	Master's (M2)	8 years
Interview 6	Male	38 years	Management controller	Metallurgy and steel	Management controller	Master's (M2)	10 years
Interview 7	Male	40 years	Management controller / Auditor	Pharmaceuticals and cosmetics	Management controller / Auditor	Master's (M2)	12 years

Source: Authors' own elaboration. AFD: Administrative and Financial Director

The sample is thus diverse in positions (from auditor to general manager), with three management controllers, and in experience (from 1 to 12 years), the majority of respondents having at least four years of seniority, which strengthens the relevance of their perceptions.

Data collection relies on semi-structured interviews, supplemented by observations and the consultation of documents. A thematic interview guide was developed from the literature review and organized into main headings: the assessment of the management control function and its past and present organization; the factors of its evolution; the assessment of BI, its implementation, the tools used and the challenges encountered; the awareness of actors, training actions and the skills required; and finally, the achievement of objectives, the contribution of BI to performance and the adaptation of management controllers. The interviews were recorded with the respondents' consent and then transcribed verbatim, without modification or interpretation.

The data were processed through qualitative content analysis, of the thematic or cross-sectional type. In this logic, the importance of a theme is measured not by its frequency alone but also by its semantic weight and its novelty with respect to the context. Coding was carried out with NVivo 12 software, using nodes attached to the themes of the guide, which made it possible to establish a codebook, produce matrices and calculate, for each emerging concept, the number of respondents concerned. These occurrences, reported out of seven, are given for descriptive purposes and do not constitute statistical measures. The results obtained are presented in detail in the remainder of the article.

4. RESULTS

The results are presented in two stages. First, we describe the evolution of the management control function and the use of BI in the SMEs studied. Second, we examine the three levers of the propositions (awareness, training, skills) and the link with organizational performance.

4.1 Evolution of the management control function and use of BI in SMEs

4.1.1 The evolution of the management control function

The concept of the management control function may be known in a generic way by a great many people, but everyone has their own conception of it. To make sure that the level of understanding was the same among the people we interviewed, it seemed necessary to learn each respondent's perception of this concept. The following table summarizes the results obtained.

Table 3: Perception of the management control function

Emerging concepts	Occurrences	Proportion (out of 7)	Respondents concerned
Performance management	6	6/7	R1, R2, R3, R4, R6, R7
Decision support	5	5/7	R1, R3, R4, R6, R7
Variance analysis	3	3/7	R1, R3, R4
Budget / activity monitoring	4	4/7	R1, R2, R5, R6
Use of tools (dashboards, indicators, information systems)	5	5/7	R2, R3, R4, R6, R7
Performance optimization / efficiency	5	5/7	R3, R4, R5, R6, R7
Formalization / structuring of processes	2	2/7	R2, R4

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Support to management / decision-making	3	3/7	R3, R4, R7
Cost control	1	1/7	R6
Legal / professional compliance	1	1/7	R2
Independence of management control	1	1/7	R3

Source: Authors' own elaboration

The results reveal a shared and strategic vision of the management control function within SMEs. Performance management emerges as the most recurrent idea, mentioned by 6 respondents out of 7, which demonstrates its central role in business management; as R1 puts it: "*it mainly consisted of managing performance and supporting decision-making through budget monitoring, variance analysis and the proposal of corrective actions*." This function is closely tied to decision support, mentioned by 5 respondents, one of whom, R1, suggests: "*it mainly consisted of managing performance and supporting decision-making through budget monitoring, variance analysis and the proposal of corrective actions*." All of this underlines the mission of the management controller as a facilitator of strategic and operational choices through a close reading of the data.

Moreover, the use of management tools such as dashboards, information systems and performance indicators is also highlighted by 5 respondents. The third respondent echoes this, R3: "*It guarantees independence, variance analysis, and the setting up of steering tools to optimize overall performance*." This reflects a desire to anchor management control in a logic of analysis and objectification of facts, in order to ensure structured steering. Likewise, the optimization of performance, effectiveness and efficiency is at the heart of the concerns of 5 respondents, mainly the most experienced (R4, R6, R7), which shows that this vision strengthens with professional experience.

The organization of the management control function prior to BI is described as manual and reactive. The following table summarizes the respondents' different views on the past organization of the management control function.

Table 4: Past organization of the management control function

Emerging concepts	Occurrences	Proportion (out of 7)	Respondents concerned
Function nonexistent or very underdeveloped	2	2/7	R1, R2
Manual processes (paper, Excel, little or no automation)	5	5/7	R4, R5, R6, R7, R3
Absence or weakness of analytical / strategic steering	3	3/7	R2, R3, R6
Slow processing / consolidation of data	3	3/7	R4, R5, R7
Rudimentary / limited budget monitoring	3	3/7	R3, R6, R4
High risk of human error	1	1/7	R7
Function perceived as a threat in SMEs (managers' power)	1	1/7	R6
Weak integration of the function with other departments	1	1/7	R3

Source: Authors' own elaboration

The analysis of the verbatims reveals several salient trends in the perception and organization of the management control function before the introduction of new technologies. Five respondents cite manual processes; R7 states it as follows: "*In the past, management control was mainly manual, based on spreadsheets, paper reports and long, barely automated processes*." Three respondents mention slow data consolidation (R4, R5, R7), three a weak analytical steering (R2, R3, R6) and three rudimentary budget monitoring (R3, R4, R6). For two respondents, the function was practically nonexistent (R1: "*this function did not exist before*"; R2: "*practically nonexistent in our sector*"). Finally, R6 points out that, in autocratically managed SMEs, the function could be perceived as a threat to the managers' power.

However, the perceived evolution of management control stands out clearly. It converges towards a modernized, equipped, integrated and strategic function, whatever the respondent's position or professional experience. The following table summarizes the respondents' different views on the current organization of the management control function.

Table 5: Current organization of the management control function

Emerging concepts	Occurrences	Proportion (out of 7)	Respondents concerned

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Automation / digitalization / BI	6	6/7	R1, R4, R5, R6, R7, R3
Real-time reporting / instant access	5	5/7	R1, R4, R5, R6, R7
More strategic role (decision-making, recommendations)	5	5/7	R1, R3, R5, R6, R7
Cross-functional integration (departments / management committees)	2	2/7	R2, R3
Structuring through procedures / organization	2	2/7	R2, R3
Better visibility / information quality	3	3/7	R1, R4, R6
Marked past/present contrast	6	6/7	R1, R2, R3, R4, R6, R7

Source: Authors' own elaboration

Automation and digitalization, notably through BI, are cited by 6 respondents out of 7, real-time reporting and instant access to data by 5, a more strategic role (decision support, recommendations) also by 5, and better visibility and information quality by 3. R2 and R3 report a cross-functional integration of management control with the other departments and the management committees, as well as structuring through procedures. The table below summarizes this evolution.

Table 6: Summary of the evolution of the management control function

Dimension	Before BI	With BI
Tools	Paper, spreadsheets, manual processes (5/7)	Automation, digitalization, BI (6/7)
Information	Slow consolidation (3/7); risk of errors (1/7)	Real-time reporting (5/7); better quality (3/7)
Role	Rudimentary budget monitoring (3/7); weak analytical steering (3/7)	More strategic role, decision support (5/7)
Organization	Function nonexistent or underdeveloped (2/7); weak integration (1/7)	Cross-functional integration and structuring (2/7)

Source: Authors' own elaboration

On reading this table, management control is now a dynamic, integrated and performance-oriented function.

4.1.2 BI in the management control function: perception, implementation and challenges

The respondents share an understanding of BI. Six respondents out of seven associate it with tools and technologies that facilitate decision-making, five with the collection, processing and analysis of data, four with the monitoring of performance and indicators, three with the automation of reporting and the production of dashboards, and three with real-time decision support. R1 defines it as "*the set of technologies and processes used to process data in order to enable decision-making*." These perceptions are consistent with the definition of BI as a process and a technology adopted in the literature review.

"*I would say that it is the set of technologies and processes used to process data in order to enable decision-making.*" (R1, accounting auditor, 1 year). "*In the context of our company, Business Intelligence (BI) is defined as a set of technological tools for monitoring and analyzing activity, in order to improve decision-making.*" (R2, administrative and financial director, 4 years).

Respondents with decision-making responsibility (AFD, general manager, management controllers) regard BI as a priority for performance, responsiveness and competitiveness. R4 associates it with business growth and the need for reliable real-time information; R6 with the requirement of efficiency and speed in the face of competition. R2 describes a company in the study and implementation phase. R7 is the only one to judge BI premature, because of his company's insufficient digital maturity, which reflects an organizational obstacle rather than a fundamental disagreement.

The following figure presents, as a word cloud, the vocabulary used by respondents when talking about BI (definition, priority, reasons for and tools of implementation, challenges).

Figure 1: Word cloud of respondents' statements about BI



Source: Authors' own elaboration

Looking at this figure, the dominant vocabulary is that of data ("data," "information," "reliable"), of performance and decision ("performance," "decision-making"), and of responsiveness ("real time," "speed"). Power BI is the only

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tool named recurrently. A second, more discreet register points to obstacles: “lack,” “skills,” “resistance,” “change,” “insufficiency,” “digital maturity.” Respondents therefore associate BI with promises of reliability and speed for decision-making, while stressing the human conditions of its adoption.

4.2 The levers of BI adoption and the link with organizational performance

4.2.1 The levers of BI adoption

Awareness is the first lever studied (P1). The picture, however, is mixed: four respondents out of seven (R1, R2, R5, R7), who hold the positions of auditor, AFD, chief accountant and controller-auditor, state that no awareness-raising strategy has been put in place. R3 reports the absence of a formal strategy and a still limited use. Only two respondents (R4, general manager, and R6, management controller) describe active initiatives, based on practical demonstrations, in-house training and a gradual integration of tools. R4 adds that vendors such as Microsoft contribute to popularization, notably through the features built into office suites. Awareness-raising initiatives are therefore rare and come mostly from profiles with strategic responsibility.

Comparison with the other results is instructive. The two companies where awareness-raising is the most structured (R4 and R6) are also those where controllers’ adaptation to BI is judged complete and where the tool is used in the most diversified way (Power BI, Power Query, SQL, Python). Conversely, where no awareness-raising strategy exists, BI is either not operational (R2, R7) or used with only partial adaptation by controllers (R1, R5). This is a trend and not proof, given the size of the sample, but it is consistent with P1.

Training is the second lever (P2). Six respondents out of seven, with varied profiles (management controllers, auditors, chief accountant, general manager), consider that training in BI tools, in particular Power BI, is essential to strengthen professionals’ skills. Several avenues are proposed. R3 and R6, management controllers, insist on an introduction to technical languages (Python, VBA, DAX) and on personalized support that addresses the company’s specific problems. R2, AFD, recommends seminars, workshops and conferences that foster the sharing of experience with experts. R4, general manager, advocates specialization in a limited number of tools and the integration of artificial intelligence into training.

These results should be read alongside the list of challenges. The lack of skills (R1, R2, R3, R7) and insufficient training prior to implementation (R3) appear among the most frequently cited obstacles. In other words, training is both requested and perceived as insufficiently available, which reinforces the plausibility of P2.

The third lever concerns skills (P3). Mastery of digital and BI tools is cited by six respondents out of seven (R1 to R6). Next come data analysis and the interpretation of indicators, mentioned by five (R1, R3, R5, R6, R7), in particular by the controllers, an auditor and the chief accountant. Two respondents (R4 and R6) insist on the structuring and organization of data. R4 adds an understanding of business needs and processes, and R6 cross-cutting skills in data quality management, modeling and change management.

These results show that the skills expected of the controller go beyond the technical. Mastery of the tool is necessary but not sufficient: one must also know how to interpret indicators, understand business needs and support change. This is reflected in the challenges raised by R6, who stresses the difficulty of identifying and interpreting the right data within a massive volume.

4.2.2 The link between BI and organizational performance

BI plays an increasingly strategic role in contemporary organizations by enabling them to turn raw data into usable information. This capacity to exploit data effectively contributes directly to improving organizational performance. Respondents associate the use of BI with several possible improvements in management (more accessible information, finer monitoring of indicators, easier production of dashboards and better decision-making). Moreover, in four cases out of seven (R1, R4, R6, R7), BI is associated with better achievement of the objectives set. R4 and R7 cite in particular automation, decision support and rapid access to information. Two respondents (R5, R6) point out that objectives are not always achieved, because of data quality. R2 indicates that BI, still being implemented, does not allow its results to be assessed, and R1 reminds us that some variances are due to uncontrollable external factors.

As for the contribution to performance, the reported answers fall into four categories. Three respondents (R1, R5, R6) use BI to monitor operational indicators (margin, lead times, costs, customer satisfaction). Three others (R4, R6, R7) cite process automation and reduced processing time. Two (R3, R4) mention productivity gains and simplified visualization. Two (R6, R7) stress better resource allocation and better decision-making.

As for controllers’ adaptation to BI, it remains partial in four cases (R1, R3, R5, R7), complete in two (R4, R6) and absent in one (R2), where BI is not operational. R7 specifies that implementation is the responsibility of the IT department, which limits controllers’ autonomy in this change. R4 and R6 consider that mastery of BI tools is now indispensable to remain competitive.

The results confirm that BI transforms the management control function in the SMEs studied, moving it from a manual and reactive function to an automated and more strategic one. They also show that this transformation is uneven: the majority of respondents acknowledge the strategic contribution of BI, but the level of implementation, the skills available and the structuring of practices vary greatly. The three levers studied appear as conditions of adoption: little awareness-raising, a strong need for training and still partial skills characterize the firms where BI produces the fewest effects. The main obstacles (skills, resistance to change, data quality, cost) are human, technical and organizational.

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5. DISCUSSION AND INTERPRETATION OF RESULTS

The results indicate a positive link between actors' awareness and BI adoption and, through it, organizational performance. SMEs that have implemented awareness-raising actions report better tool adoption and a higher involvement of controllers in decisions. This result corroborates the work of Reutter et al. (2021), who show that the controller's proactive involvement in the implementation of BI helps make data reliable and facilitates adoption by managers. Brands and Holtzblatt (2015) and Eldenburg et al. (2010) stress the role of communication with end users. Cavélius et al. (2020) and Lamssarbi et al. (2022) point out that BI benefits above all firms whose controllers were involved from the earliest phases. P1 is therefore supported, with the caution required by a sample of seven respondents.

Training appears as a condition for optimal use of BI. It strengthens the ability to exploit data, interpret indicators and decide, and fosters team autonomy. This result is in line with the work of Reutter et al. (2021), for whom the success of BI depends on controllers' ability to understand its technical and decision-related stakes, which requires skills in information systems and data visualization. It also agrees with Ciampi (2021) on the need to train staff. This study adds an element specific to the SME context: respondents ask for targeted training on a small number of tools (Power BI) and personalized support, which is consistent with severe budget constraints.

The development of BI skills contributes to performance because it allows more precise analyses, better anticipation of variances and increased responsiveness. The relational and change-management skills cited by our respondents confirm the business partner role highlighted by Cavélius et al. (2020), Nespeca and Chiucchi (2018) and Lamssarbi et al. (2022), for whom BI makes it possible to go beyond the role of technician. They also confirm the warning of Reutter et al. (2021) that, when implementation is left to the IT department and the controller is not fully involved (R7), the controller's role may be weakened. P3 is therefore supported, specifying that the useful skills are at once technical, analytical and relational.

CONCLUSION

This article sought to understand how the adoption of BI in management control practices contributes to the organizational performance of Cameroonian SMEs. In an environment marked by complexity, economic instability and competitive pressure, BI offers an increased capacity to collect, process and interpret decision-making information. Drawing on seven interviews and on Actor-Network Theory, the study shows that the effective integration of BI rests on the networking of human actors (executives, management controllers, managers, IT staff) and non-human actors (software, databases, infrastructure). Three levers condition this networking. Awareness-raising fosters tool adoption; continuing training determines the quality of use by filling technical gaps; and the skills of management controllers, whether analytical, technical or relational, condition the real value that BI delivers. BI therefore cannot be reduced to an IT solution; it is perceived as a strategic lever whose implementation requires organizational reflection and a managed dynamic of change.

The impact of BI on performance is neither automatic nor homogeneous. It depends on prerequisites such as management commitment, data quality and users' capacity for adoption, as well as on the implementation context. The reported benefits (responsiveness, automation, better resource allocation, finer monitoring of indicators) nevertheless confirm its potential as a lever of competitiveness.

These results must be read in light of the study's limitations, notably the small sample size, the absence of quantitative measures and the uniqueness of the field. Future research could test the model on larger samples and in other sectors, use mixed methods and compare the effect of different BI solutions. This work thus lays the groundwork for continued reflection on the digitalization of management control and its contribution to the competitiveness of firms in emerging economies.

APPENDIX

Interview guide

Business Intelligence Adoption in Management Control and Organizational Performance of Cameroonian SMEs: A Sociotechnical Analysis

I. Information about respondents

- Gender of the respondent
- Age of the respondent
- Profession of the respondent
- Respondent's business sector
- Position held in the company
- Academic background (Primary, Secondary, Higher)
- Number of years with the company

II. Information on the management control function

- How would you define the management control function in your organization?
- How was the management control function organized in your company or sector previously (before the introduction of new technologies or digitalization)?
- How is the management control function organized today? What are the main differences compared with the past organization?
- In your view, what were the main factors that led to the evolution of the management control function in your organization?

III. Information on the use of Business Intelligence in the management control function

- How would you define Business Intelligence (BI) in the context of your company? Please explain.
- In your opinion, is the implementation of Business Intelligence (BI) currently a priority in your company, or is it a premature topic? Please explain.

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- If so, why is it applied in your company?
- Who implemented it? Since when?
- Which Business Intelligence tools do you use in your daily work? Why did you choose these particular tools?
- What are the main benefits you have observed from the use of BI? Impact on decision-making? Improved efficiency? Cost reduction?
- What are the main challenges (difficulties encountered) you face when integrating BI into your management control processes? Please explain.

IV. Information on awareness, training and skills related to the implementation of BI in management control professions

- What awareness-raising and popularization strategies on Business Intelligence (BI) are currently available or planned within your company? Please explain.
- How do you assess the level of awareness of BI among Cameroonian companies? What awareness initiatives already exist (e.g., training, seminars, workshops)? Please explain.
- What other types of training would be most beneficial to management control professionals regarding BI? Do you have recommendations on best training practices? Please explain.
- What training on the constraints related to the implementation of BI in management control professions is currently available or planned within your company? Please explain.
- How do you assess the quality of this training (strengths, areas for improvement)? Please explain.
- Which skills are essential to successfully implement BI? How do you assess your team's BI skills? Please explain.
- Which technical skills are needed to set up an effective BI system? Do you have a team dedicated to BI? If so, what are its members' skills? Please explain.

V. Information on the management control function in the era of business intelligence and organizational performance

- Within your organization, are the objectives you set according to the strategy you define always achieved since BI was implemented? If so, how? If not, what could be the causes of this failure to meet the objectives you had set? Please explain.
- How does BI contribute to improving organizational performance? KPI (key performance indicator) monitoring tools: which performance indicators (KPIs) have you put in place thanks to BI?
- How do you assess the evolution of the company's effectiveness and efficiency since BI was implemented in your organization? Please explain.
- Have you ever self-assessed your organizational processes with regard to BI within your organization? If so, please share the list of procedures reviewed. If not, why not? Please explain.

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