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A TYPOLOGY OF SITUATIONS OF ACCOUNTING SYSTEMS INTEGRATION

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Abstract: *This paper presents the first results of a qualitative research about the organization of the Accounting Information Systems (AIS) of four companies operating in different contexts (two medium-sized and two large companies). Our study's main objective is to contribute to the understanding of the determinants of the integration of accounting information systems. It shows that the strategy is, beyond all other considerations, the primary determinant of integration practices of accounting systems of the companies surveyed, followed by the size and elements of context such as the system of management control. Organizations whose activities are not diversified (or monoactivity) opt more for accounting systems partially integrated or stand-alone while those whose activities are diversified prefer more diversified integrated accounting systems whose design is based on event-based approach and multidimensional accounting (Sorter 1969). The integration of accounting subsystems seems to be part of the mechanisms developed by diverse organizations to manage / control their very different structures. Hence, the theory of differentiation-integration (Lawrence and Lorsch 1969) explains very well the practical integration of accounting systems observed. Our study leads to a typology of modes of integration of accounting systems: (1) Conventional two-dimensional system, (2) Quasi-integrated centralized system (3) Integrated system, (4) Multidimensional system.*

Keywords: Theory of differentiation-integration, event-based approach, ERP, two-dimensional system, quasi-integrated system, integrated system, multidimensional system.

INTRODUCTION

This paper deals with the organization (or architecture) of Accounting Information Systems (AIS) and as a research integration of accounting information systems. We define Accounting Information System as all technical devices (applications, databases, interfaces, ERP¹, Data Warehouse, EAI²) that an organization puts in place to: (1) capture, classify and record data of encrypted database, and (2) provide after appropriate treatment, a set of information consistent with the needs of various stakeholders. Furthermore, as some authors in the field (Dupuy, 1990, Kipfer, 1991, Benchmarking survey of OEC 1998, Grenier, 2000, Tort, 2000, Méreaux, 2011), we retain the broadest definition of Accounting Information System including: (1) applications upstream feeding the accounting system data (Purchasing, Production, Sales, Payroll), (2) accounting applications to synthesize data streams from different business units of the company and to produce summary statements (balance, ledgers, balance sheet, income statement) and (3) downstream applications that exploit the data for the particular needs of management control (dashboards) and reporting.

We mean by an integrated accounting system, a system which provides the coupling between the various accounting (financial accounting, management accounting) and between them and applications upstream (operations) and downstream (decisions). It should allow (1) the unique but also multidimensional entry of economic events (Purchasing, Production, Sales), (2) the storing of data in its raw state into a common database that is accessible to all users, (3) the restitution of multidimensional and differentiated information. Enterprise Resource Planning (ERP) fulfill these conditions. Grenier (2000 : 1126) writes that ERP "gather in the same set features previously contained in separate applications: purchasing, production, sales, human resources, accounting, treasury, etc. Most often designed around a central core of an accounting, these systems have the following characteristics: (1) they realize the integration of the different business processes: purchasing, manufacturing, shipping, invoicing, payments, (2) they realize the integration between business processes and management processes, (3) they rely on a single input event described in all their dimensions (hence the name of event-driven systems and multidimensional). "

Our study's main objective is to contribute to the understanding of the determinants of the integration of the Accounting Information System. It offers, through case studies, to provide qualitative explanations of the integration of accounting systems of the studied companies and to identify their determinants. These practices are poorly studied by the accounting community (El Orf and Tort, 2006, Méreaux, 2011), as pointed out by Bidan (2004 : 10): "the practices of integration are a still uncultivated research area". Meyssonier and Pourtier (2004 : 2) wrote that " the theme of ERP is still not enough dealt with by the accounting community ". Our study also aims to highlight the relevance of the approach of the events accounting which provides a theoretical framework for the study of integrated accounting information systems. This demonstration was impossible a few years ago because it had never been put in practice before. The emergence of ERP was the starting point of our research. These integrated software packages, which were first implemented in large companies, won the field of SMEs today. The 2006 Survey of the Observatory CEGOS³ on accounting

¹ Enterprise Resource Planning.

² Enterprise Application Integration.

³ <http://www.lacademie.info>.

and finance function performed on a sample of 61 French companies (SMEs and large firms) reveals that 77% of large companies on the panel are equipped with an ERP with an average of 4 modules management (such as Finance, HR, MIS, Sales, Logistics ...). SMEs also show scores higher than the equipment ERP results observed in previous studies.

However, only a few firms implemented all ERP modules (Themistocleous *et al.*, 2002, Bidan *et al.*, 2002). Markus (2000) recognizes that company information systems are often composed of a mixture of several tools (ERP, EAI, Data Warehouse), but he also insists on the fact that one of them is usually the main technology of integration. Reix (2004 : 96) notes that "after fifty years of computerization, there is, in most companies, the coexistence of old applications using operating systems 'owners' applications, "client-server" type applications from personal computing and applications focused on Internet technologies. "

The general observation is that the organizational practices of accounting systems differ from one company to another or from one unit to another, but the reasons of this discrepancy are not sufficiently known. Our research is an attempt to answer the question: "*Why do the integration practices of accounting systems of the companies studied differ ?*". This issue can be clarified by the following two questions: "*How are the accounting systems of the companies studied organized (integrated, autonomous, etc.)?* ", and «*What are the contingency factors that explain their degree of integration?* ". Our work also aims to demonstrate the relevance of Sorter's event-based approach as a theoretical framework of design of information systems of the companies studied. The problem is not only to describe and explain the practices of non-integration or integration of accounting applications of the companies studied, but also to confront them to the model of reference of Sorter (event-based approach): «*Is the event-based approach relevant to understand the practical organization of the accounting systems of the companies studied ?*". Finally, as our work's objective is to mobilize the theory of Lawrence and Lorsch (1967) that reveals different situations of organizational differentiation and integration, it will be legitimate to ask the following two questions: "*are there different situations of differentiation and integration of sub-accounting systems?*", "*does the theory of differentiation-integration of Lawrence and Lorsch allow us to explain the observed accounting integration situations?* ".

The analysis of the various writings reveals that the theoretical answers to these questions remain intuitive and at odds with reality. Some authors limit themselves to the prediction of favorable factors conducive to the development of integrated accounting, such as large businesses, corporate groups, banks (these structures are in fact characterized by a strong need for differentiation of accounting systems). These authors have drafted, based on their common sense and their own experience, the types of practices involving AIS in contingency factors. Beauvoir and Flaters (1995) and Grenier and Bonnebouche (1998), for example, have proposed a theoretical typology involving respectively three types of accounting organization ("Autonomous Accounting", "Semi-integrated Accounting," "Integrated Accounting") into three types of firm size ("small, medium to large, and very large businesses"). Other authors have recently attempted to empirically validate some links between the AIS and practices of contingency factors. Tort's thesis (2001) shows the relevance of accounting integration in large French companies are often characterized by structural complexity due to the multiplicity of business units and legal entities. Dealing with

information systems management of French SMEs, Bidan's thesis (2003) shows that environment and size strongly influence the practices of integration of information systems, whereas Samara's (2004) shows that the practical integration of accounting systems of banks are determined by environment, strategy and size.

1. THE THEORETICAL FRAMEWORK

Our study intends to combine two different theories for understanding the determinants of the accounting systems integration:

1.1. Sorter's theory of events (1969) which was proposed following a study carried out by the researcher on the epistemological status of accounting, considers that the accounting data generated by economic events should be stored in the rough. In fact, the raw data allow differentiated sub-systems to satisfy multiple users whose needs are varied and changing. Each user can indeed build, using data stored in the rough (or disaggregated), the corresponding sub-system to his needs. This normative accounting theory and its extensions propose a method of organizing and processing of accounting data whose principles are to:

- The capture single but multidimensional data generated by economic events (Purchasing, Production, Sales),
- The storage of these data in its disaggregated state into a common database that is accessible to all users,
- The ability to query, on a multidimensional level, the stored raw data for these users.

The real application of these principles has emerged in the mid-1990s through the ERP (SAP, BAAN, ORACLE, JD EDWARDS...). These software packages allow, indeed, total integration of company information systems (Davenport, 1998, Rowe, 1999, Reix, 2000, Markus and Tanis, 2000, Markus, 2001), and therefore constitute a very complete implementation of Sorter's theory (Grenier, 2000, Tondeur and De Villarmois, 2003, Levy, 2004, El Orf, 2005, El Orf and Tort, 2006, Doucet and De Villarmois, 2007).

1.2. The theory of differentiation-integration of Lawrence and Lorsch (1967) shows that the "one best way" does not exist and that the organization system, in order to be efficient, must fit the organizational context of the company (environment, strategy, size, structure ...) (Lawrence and Lorsch, 1967, Khandwalla, 1977, Otley, 1980, Mintzberg, 1982, Kalika, 1989). More specifically, the mechanisms of differentiation and integration of the organization must be tailored to the company. Each functional unit has, indeed, its tasks, objectives, constraints, behavior as well as its work horizons, and the company must develop integration mechanisms suited to its specificity such as hierarchy, procedures for managing, coordinating committees, meetings but also the accounting system (Lawrence and Lorsch, 1967).

The accounting system, which is part of the organization, must meet the requirements of differentiation and integration of the company (Dupuy, 1990, Kipfer, 1991, Bouquin, 1991, Bergeron, 1996, El Orf, 2005, El Orf and Tort, 2006). Indeed, each unit, to cope with its environment, must establish appropriate information systems. The multiplicity of functional units naturally generates a multiplicity of users and a

variety of needs, which implies the differentiation of sub-systems of company information. This differentiation can take many forms such as the nature of the data used (data on cost, time, quality ...) and methods of treating these data (integrated applications, semi-integrated, autonomous, manual processing).

Ultimately, our research aims to mobilize the theory of differentiation-integration of Lawrence and Lorsch to provide, by analogy, explanations of integration practices of accounting systems studied. This transposition can be expressed as follows :

- There are various modes of integration of the organization adapted to different constraints (Lawrence and Lorsch),
- The accounting information system is a dimension of organization,
- There may be quite different modes of integration of the accounting system adapted to different constraints.

Our work is based, regarding our research issue and accounting literature, on a conceptual framework combining the theory of Lawrence and Lorsch (1967) with the few existing studies on the organization of accounting systems, including De Beauvoir and Flaters (1995), Bonnebouche and Grenier (1998), Leclere (1995), Tort (1998, 2000 and 2003), Samara (2004) and Bidan (2003).

2.METHODOLOGY

We used for this work a method based on a "hybrid exploration" (Charreire and Durieux, 1999) which is to work by back and forth between empirical observations and theoretical knowledge. Indeed, we initially mobilized the theory of Lawrence and Lorsch and integrated the literature regarding the integration of accounting systems (Grenier, 2000, Tort, 2003, etc.), and then relied on that knowledge to make sense of our empirical observations. The exploratory nature of this research led us to choose a qualitative approach which is based on semi-structured interviews and direct observations made with users of the accounting systems of the companies surveyed (accounting, business, buyers, stores, HR, marketing, management controllers). For data analysis, we compared the cases with comparison tables (or matrixes as defined by Huberman and Miles, 1991). We have also mobilized the theory of differentiation-integration to provide explanations for observed integration practices (that is Yin's method of pattern-matching, 1989). Our analysis method can be described as hybrid (qualitative data analysis supported by Lawrence and Lorsch theory).

2.1. The choice of cases

To answer our research questions, we studied four Tunisian companies selected according to criteria of size and strategy (see Table 1). These companies were analyzed by pairs with different characteristics (opposite cases). The first pair consists of two major companies operating in two different contexts (different strategies).

- The group POULINA is a large company that operates in various competitive sectors and thus faces very heterogeneous and dynamic environments. Its competitive strategy is based on diversification into high value added activities to maximize its profits. Its organization is very differentiated and integration mechanisms are highly developed. They use the matrix structure, meetings, executive committees, rules and

procedures and are based on developed management information systems (ERP, Data Warehouse, EAI, CRM, Intranet). Its control system is designed to track the implementation of the strategy of the group by its subsidiaries (controlled by the results in the sense of Mintzberg, 1982: financial control by the holding company coupled with a multi-criteria management control at the subsidiary level). It is based on a cutting of the structure in responsibility centers and the establishment of an transfer pricing system between them. As for its control system, it is designed around a system of multi-criteria management control inspired by the Balanced Scorecards. This system is powered by multidimensional and integrated databases (ERP, Data Warehouse) which are installed in all group subsidiaries and used by all units (purchasing, production, sales). Leaders and executives of this company have a strong management culture. They are experts in management.

- The SONEDE is a large public company with a monopoly of production and distribution of drinking water. It evolves in a very stable and controlled environment. Its mission is to provide potable water to all parts of the country. Its objectives are social rather than economic. Its functional structure is highly centralized and is not designed for management control. Its control mechanisms are based primarily on procedures and rules (standardized work) but also on the planning of water infrastructure projects (planning control). Its control system is based on qualitative indicators and techniques closely related to its mission of serving water (supply rates of water, quality and water saving ...). It consumes very little accounting data. Accounting therefore occupies a rudimentary position in its control system. It is primarily designed to manage daily operations (suppliers, customers, banks) but also to produce statutory accounting records. Accounting activities are, like the decision-making activities, highly concentrated within the head office. Accounting applications are therefore centralized and partially integrated (specific applications, proprietary applications from IBM, some ERP modules). The ERP has been installed at the head office, not to control the management of regional entities, but to centralize the flow of accounting data from these entities. Leaders and executives of this company have a culture of public administration.

The opposition of these two cases should allow us to highlight the effect of the strategy and size but also the environment, structure and management control over the level of integration of accounting systems.

The second pair consists of two medium-sized companies operating in two different contexts (different strategies).

- The group MEDDEB is a diversified family company in the agribusiness sector. It faces a competitive and varied environment. Its coordination mechanisms are diverse and multiple (functional structure in transition matrix, regular meetings, management reports). Its strategy, which focuses on cost savings and differentiation and diversification of products, is made operational through a system of management control to monitor the profit centers and associated key success factors. Its accounting information system, which plays a central role in the mechanisms of integration, is designed for management control of its operating entities (budget control coupled to a non-financial control). It consists of integrated applications (an ERP) and some specific applications and standard software (CIEL). This integration is designed primarily to facilitate the production of analytical data necessary for the

implementation of the strategy of domination by the cost (mainly budget control). This company is owned by a leader with a strong management culture.

- The SME is a construction firm (construction and public works) that operates in an environment that is both competitive and regulated but also hostile. Its strategy is focused on compliance with specifications relating to contracts with its main client (the State and SOEs). Coordination is primarily achieved through standardization of work (technical standards) and the standardization of skills (engineering training) but also the mutual adjustment (project structure). Its management control system is designed to track the key success factors of the sector, namely the time of project implementation and compliance with the technical specifications of the works (it is a control system with a strong technical basis). This system consumes very little accounting data. Accounting thus plays a very timid role in its control mechanisms. Its role is limited to the management of current operations conducted with third parties (suppliers, banks). Its accounting applications are heterogeneous, highly centralized and juxtaposed. The preparation of annual financial statements is outsourced to an accounting firm. Note that this company is headed by a technician in construction (low management culture).

The opposition of these two cases should allow us to reinforce and complement the findings from the opposition SONEDE and POULINA cases but also to generate new proposals on the accounting practices of organization of medium-sized family businesses.

The table below summarizes the main characteristics of the cases studied.

Table 1. Characteristics of firms in our study

Company Specificity	POULINA	SONEDE	MEDDEB	SME
Industry	Agriculture, industry and service	Exploitation and distribution of drinking water	Dairy products and beverages	Construction and public works
Strategy	Diversified	Mono-activity	Diversified	Mono-activity
Size	great 7200 employees	Great 6851 employees	average 654 employees	average 786 employees
Age	1967	1968	1996	1993
Number of legal entities	68 companies	1 company	4 companies	1 company
legal nature	Private company	Public company	Private company	Private company
Management structure	Decentralized	Centralized	Few decentralized	Centralized

3. THE RESULTS OF THE STUDY: DETERMINANTS OF THE ACCOUNTING INTEGRATION

Comparative analysis of the case has generated valid conclusions on the determinants of the accounting systems organization of large and medium companies. If the overall picture is that integration practices are strongly related to elements of the context, certain organizational attributes seem to be key determinants. The strategy appears to be, beyond all other considerations, the main concern of practices studied, followed by the size and other elements of context such as the management control system. Note that the goal will not be to see how each determinant impacts in all cases of the organization, but rather to show the effect of each of them, to see how they combine and their dynamics in real situations.

3.1. Determinants of the accounting organization of POULINA and SONEDE cases

The integration of information systems of POULINA Group seems related to its sophisticated matrix structure (highly differentiated) and its multi-criteria management control system which is a direct result of the diversification of its activities (and its Cost Leadership Strategy) and development of its size (combined effect of size and diversification). POULINA has unified its accounting systems, through ERP, to control the management of its highly differentiated structures. Its multidimensional databases installed in the various subsidiaries irrigate varied monitoring tools and management control along with financial statements, budget, income statement, instrument panels and non-financial items (indicators for monitoring operations which are upstream of accounting income). These tools, which form the group's dashboard system, allow the control of the different decentralized entities that were created to manage the different activities (diversification strategy) and monitor their competitiveness factors (cost, quality, time, etc.). A logical consistency and complementarity seems to exist between the strategy pursued by the group, its structure, its management control system, and the design of its accounting information system: the operationalization of the strategy of diversification of activities required differentiated and decentralized structures which control required a sophisticated management control system using very detailed analytical data about the various group entities, which are produced by multidimensional databases (ERP, data Warehouse : highly integrated system).

On theoretical level, the study of POULINA shows the relevance of the event-based and multidimensional approach of Sorter as a design framework of information systems of diversified and differentiated large structures (raw data storage in common multidimensional databases can satisfy multiple users, 1500 users, whose needs are varied and changing). It also shows the relevance of the theory of differentiation-integration of Lawrence and Lorsch, as an explanatory framework for the integration of the studied accounting systems. Indeed, this integration has produced differentiated sub-information systems to integrate differentiated structures. The high voltage differentiation-integration that characterizes the structure and accounting system of POULINA is a consequence of the gradual diversification of its activities and of the development of its size. This tension is exacerbated in recent years, as explained by CEO Poulina:

"after my experience of 20 years as head of the Group, I can make the following observation: the activity of our Group has gradually diversified. This prompted senior management to create new subsidiaries to manage the newly created activity. Then in each subsidiary, we have implemented an information system appropriate for its business. With the diversity and decentralization of operations, it has become difficult or impossible in some cases to ensure their control. We took advantage of the changing technology of data processing, including ERP and Data Warehouse, to unify our databases to link local systems to the control system of the head office. This integration, made from the late 90s, was to replace SAGE applications that have formed until here the core of our information system, by ERP. This remelting of our information system, integration, allowed us to control the activities of our subsidiaries in real time and thus to face the risks associated with decentralization of powers and geographical decentralization of our activities ".

In contrast, the SONEDE, despite its size, has a system much less integrated than POULINA. This seems to be related to the absence of an economic competitive strategy (business diversification and cost saving) due to the lack of competition (monopoly status: stable environment). Its management structure is highly centralized and its management control system is very rudimentary. It is a mechanistic bureaucracy par excellence. Integration is achieved through standardization of procedures (Mintzberg 1982) and investment planning including water infrastructure. This situation seems to be justified by the stability of the environment (monopoly so no competitors so no tracking competitive factors, mainly the cost⁴) but also by its non-economic mission (social and political rationality prevails over technical economic rationality) (Burlaud and Gibert, 1984). "Our company has no management control tools because it has no competitors. If it had competitors, like most businesses, it would have put in place tools to monitor its costs and revenues in order to remain competitive", says the Financial Officer. "Our competitiveness is to fulfill our public service mission (no interruption of water supply for example)", he adds. The ERP has been installed at the head office, not to control the management, but to process and centralize the huge volume of data generated by regional structures, mainly the districts. SONEDE is a large company with operations in all regions of the country and produces large amounts of data (two million subscribers, 30,000 fixed assets, 7,000 employees, etc.). The centralization of this data is indeed necessary to centrally manage current transactions made with third parties but also to the production of legal records. The Accounting Officer justifies the implementation of the ERP in these terms: "The Sonede is a very large public company whose activities cover all areas of the country and generate a huge volume of data requiring the establishment of a powerful software that centralizes all the economic data". "For SONEDE, the most important is not the integration of accounting, nor the development of management control, but the centralization of all transactional data in a common database to establish the legal and accounting documents to manage current accounts", he adds.

The case of SONEDE shows that the implementation of an ERP is not always synonymous with integration, as promises this software designers and advocates of the event theory. This package has not been established to integrate the various accounts, such as POULINA's, but to centralize the data generated by the activities of

⁴ Note that the cost of water is calculated extra amount of very broad way, to negotiate rates with the water ministry.

regions and the head office. The ERP is reduced to a simple general accounting software (two-dimensional accounting: double-entry bookkeeping system) whose role is to centralize and collect economic data needed to produce statutory accounting records and centralized management of operations. This is an accounting database, "a super-powerful machine that can store huge data," says the CFO.

Table 2. Summary of determinants of the accounting organization of POULINA and SONEDE cases

Company Variables	POULINA	SONEDE
Objective (Rationality)	Maximize profit (economic rationality)	Making a public service (socio-political rationality)
Environment	Mixed due to the diversification of activities and products, but also partners (customers); - Dynamic because of the competition.	- Homogeneous because of the homogeneity of regional activities; - Stable due to the absence of competition (monopoly).
Strategy	-Diversification into high value added activities; - Costs; - Quality; - delay.	-Serving water in all regions (to satisfy water demand in all regions) - improve the quality of water; -water conservation.
Structure	Matrix: - Highly decentralized; - Highly differentiated; - Geographically decentralized; - Multiple legal entities; - Multiplicity of responsibility centers.	Functional: -Highly centralized structure (management of economic transactions is centralized); -Homogeneous regional structures (an agency organization).
Main mode of coordination	-Standardization of results; -Standardization of procedures.	-Standardization of procedures; -Planning control.
Major problems of management accounting organization	Multi-criteria control entities: the diversification of activities has been a problem of management control of decentralized and differentiated structures which implied a need for detailed data (multidimensional) on these structures geographically diverse and decentralized.	The planning control and centralized management of transactions with third parties created a need for centralization of data generated by regional entities. This centralization allows centralized monitoring of transactions (customers, suppliers, banks) but also the production of accounting records.
Organization of accounting systems	Integrated accounting system, multidimensional, differentiated and decentralized producing highly detailed analytical data about the performance of subsidiaries, responsible for implementing Group strategy. This system controls the management of differentiated and decentralized structures.	Accounting system partially integrated, centralized and poorly differentiated (limited integration area). The ERP is installed at the head office not to control the management, but to centralize the data required to produce statutory accounting records and management of current operations

3.2. Determinants of the accounting organization of MEDDEB and SME cases

The opposition MEDDEB-SME has enabled us to confirm the results from the analysis of POULINA and SONEDE cases but especially to reveal new determinants of the accounting that seem specific to medium-sized family businesses. Indeed, besides the strategy and management control, the culture of owner-manager appears to be a key determinant of the accounting organization of medium-sized family businesses: the accounting organization of the family business is the work of his leader. The importance of accounting in the company's business and the nature of the control system in place (financial or budgetary, non-financial control) are two other key determinants of the accounting organization. Indeed, the non-integration of accounting applications of SME is indicative of the shy place occupied by accounting in this business. Its role is limited to the management of current transactions made with third parties, including suppliers and banks (few customers). The minimal role of accounting is explained by the highly technical nature of the activity and control system in place but also by the low management culture of owner-manager. Indeed, the value chain of the SME (construction and public works) is composed of technical activities that consume very little data accounting: "Accounting has a small role in the functioning and coordination of our activities, accounting has a slight presence in our daily work, technical data take precedence over accounting data", explains a project manager. In addition, management control focuses on monitoring project time at the expense of costs (with a strong technical control). So it uses a lot of technical data but very little accounting data. This system is imposed by the nature of the business (value chain) but also by the hostility of the environment. Indeed, an accumulation of late in project implementation may cause irreversible effects on the survival of this company. It can generate, in addition to penalties for late, the loss of its main customer (the State). Finally, the culture of the engineer of the CEO and his staff did not favor the establishment of a control system by accounting earnings (as defined by Mintzberg, 1982), "project accounting was not developed not only because it did not matter, but simply because our CEO, the key decision maker, has not led to its establishment due to lack of management culture", says the financial director. "The need for an accounting system to track our activities really exists especially when the environment becomes increasingly morose (skyrocketing cost of consumable materials, competitive prices). The problem is that our CEO does not see things the same way. Our company may have difficulties within months because of the absence of an accounting project", he adds. The result is that cost accounting is rudimentary and so is the management control. Therefore, the issue of integration of financial accounting with cost accounting does not arise.

It also follows that the current accounting system is composed of heterogeneous and juxtaposed applications, installed at different times in different departments, to manage different tasks resulting from simple technical specialization (suppliers, payroll, banking). In other words, it is a two-dimensional system designed piecemeal, without any overall strategy to meet urgent needs of a small number of users (10 users) whose needs are homogeneous and stable (the environment is stable and homogeneous). The preparation of the accounting is outsourced, which proves the weak role of accounting as a management tool, unlike MEDDEB where the financial statements are tools for management control of profit centers, and where premiums subsidiaries leaders are indexed on the accounting profit.

In contrast, the accounting system of the MEDDEB company is, like POULINA, composed of integrated applications with the ERP (the integration is the result of a combination of contingency factors pushing towards integration: strong management culture, product diversification, medium size, management control). This integration is both upstream and downstream of the accounting chain. Upstream data entry is decentralized, single and multidimensional. The axes of seizure involve both management accounting and financial accounting (unique accounting key). Downstream, the refunds are multiple and differentiated as users are more numerous (120 users) and their needs are varied and changing (dynamic and varied environment). Users can formulate multi-criteria queries (query multidimensional data bases) to extract varied management statements according to the needs of the moment. They can get instant statements per responsibility center, legal entity, activity, product, article, geographic area, customer, supplier, etc. These statements, mainly those regarding budgets, are used primarily in management control of differentiated structures (110 responsibility centers, four legal entities, 40 products) but also to manage current account (3000 customers, suppliers 4000, unlike the SME with a few clients: the State and some public companies). The integration of accounting databases (integration system) seems to be an appropriate response to the need for management control since it can generate very detailed analytical data on the different structures (budgetary control) but also to monitor a variety of aspects of the environment (eg. the 3,000 customers). In other words, MEDDEB has unified its databases, to facilitate management control of its various structures with sub-differentiated information systems (it is a tool to control the implementation of the strategy by subsidiaries). Note that this system (accounting and control) is the work of the owner-manager, a doctor in management control, as he explains:

"With the diversification of our activities and products, I found that the level of detail needed to monitor our responsibility centers, legal entities and activities is difficult to achieve with our legacy applications, too heterogeneous and disintegrated. To have a summary information on a product, activity, or entity, I had to call several services. Our attention is turned towards the establishment of a single information system to quickly produce detailed as well as synthetic data about our various entities. So we decided to install an integrated system to facilitate access to management data to all users, including management controllers". "We can, thanks to the current integrated software package, extract very detailed budget data. The budget can be established by category (product, activity, function, region) and period (week, month, quarter, semester, year)". "Before the implementation of ERP, we were in the situation of a disorganized mechanic or handyman with tools scattered in different toolboxes located in different places, which slowed his work for when he needs a tool he does not know in which box it is, he is obliged each time to perform painstaking research that is not always successful especially when it's a job that requires several tools ", he adds.

Note also that accounting plays a most important role in MEDDEB than in SME. Indeed, it is much more present (very entrenched) in the value chain. The integration seems to have intensified its use (since the data are more accessible and rich). It accelerated the operation of the administrative chain directly linked to the performance of routine tasks (purchase order, invoice, delivery note) and, therefore, shortened the response time to the customer. The response time to customer orders is significantly reduced through the integration of accounting systems (integration

between inventory management and sales management). This aspect does not matter within the SME as order management is a very long process whose execution time is not computer-related (accounting system) or to the will of the company. In fact the controls are in the construction sector, governed by the public market: bidding, participation in the tender, counting. This explains, also, the very basic nature of business management.

Table 3. Summary of the accounting organization of MEDDEB and SME cases

Company Variables	MEDDEB	SME
The owner-manager culture	Management culture	Engineering culture
Strategy	-Diversification in products with high added value; -Cost reduction; -Differentiation.	- Compliance with specifications: - delay; - Quality; - Technical specificity.
Environment	Competitive and diverse (many manufactured products)	Regulated and homogeneous (same constraints in all regions) but hostile.
Structure	Functional transition matrix: - Structure decentralized; - Differentiated structures (subsidiaries); - Multiplicity of responsibility centers.	Project structure: - Geographically centralized but decentralized; - Homogeneous structure (same type of projects in all regions); - No responsibility center.
Coordination	-Standardization of results; -Hierarchy.	-Standardization work; -Standardization of skills; -Technical reports.
Major problems of management	-Controlling entities: outcomes, cost, revenue.	Control of project implementation: deadlines, technical specifications of the final product.
Role of accounting in the value chain	Accounting is used by the activities of the value chain (purchasing, production, sales)	Accounting is used very little by the value chain (construction projects). This uses a lot of data but very little technical accounting data.
Organization of accounting systems	Differentiated and integrated accounting system: ERP product sub-systems differentiated information to control the management of various structures but also to manage transactions.	Accounting system disintegrated (two-dimensional), composed of juxtaposed different applications, implemented at different times on different systems to manage operations.

4. A TYPOLOGY OF INTEGRATION OF ACCOUNTING SYSTEMS

Our goal here is to sketch a typology of configurations of accounting systems based on our findings generated above. In other words, we now organize our findings as a typology of accounting integration. Depending on the size and business strategy (and other intermediate factors: structure, management control, management culture, etc.), it will be possible to consider four modes of accounting integration quite different from each other : (1) Conventional two-dimensional system, (2) Quasi-integrated centralized system, (3) Integrated system (4) Multidimensional system. Each configuration type will be supported by a figure explaining schematically the links between the main determinants of the accounting organization.

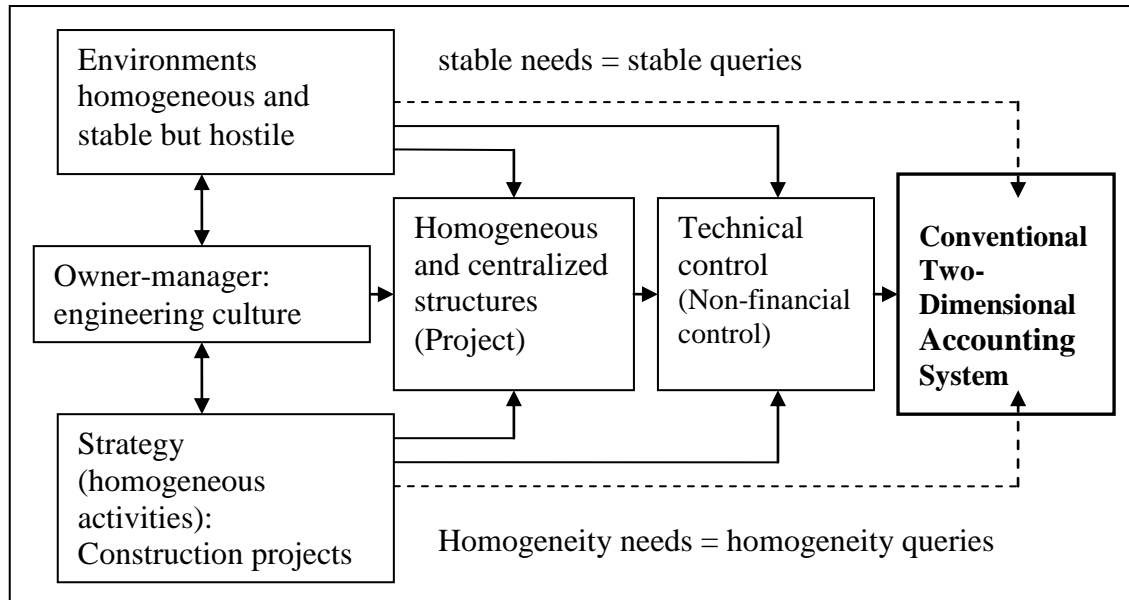
4.1. Case 1 (Conventional two-dimensional system)

This is the typical situation of medium-sized family businesses that are generally owned and run by business-oriented people who often have poor management culture (engineers, technicians ...). In these companies, generally having a centralized structure (no culture of delegation of power because of the weak management culture, unlike the owner of MEDDEB which delegates authority because of its strong management culture), coordination is generally provided by direct supervision, work standardization (conformity to technical standards) and the standardization of skills (engineering training). The role of accounting is minimal. It is often limited to management of current transactions made with third parties. Management control is rudimentary. The SME whose owner-manager is a technician in construction, fits this situation. Indeed, the control problems in this business buildings and public works are rather technical and financial (to face the hostility of the environment). They relate to purely technical aspects that are intimately related to project implementation (timeliness and technical standards). Therefore, it consumes a lot of technical data and very little accounting data (non-financial control). These technical data are also produced by software specific to the construction sector (Software Project). "Cost accounting is very rudimentary so the question of its integration with the financial accounting does not arise," says the Financial Manager. In this context, the needs can be met by standard software packages composed of non-integrated applications (eg. Ciel package) and internally developed applications to meet specific needs.

Accounting plays a timid role in the value chain, because it is composed of over-technical activities. Its role is limited to the management of routine tasks that have gradually developed with the business development of the SME. These tasks have indeed been computerized at different times with different methods to meet urgent but generally stable needs. The current system consists of centralized applications but also heterogeneous and juxtaposed. This is a system that was computerized process by process without any intension or desire for integration, "our information system was managed piecemeal, with no overall vision. Problems are resolved in a hurry, as they arose, without thinking globally, without really taking into account the problems related or options already selected, without seeking sustainable solutions." The multi-criteria query possibilities are very limited not only because the user needs are limited and stable but also because the input of events is two-dimensional (double-entry bookkeeping system). An invoice can be entered into several multiple autonomous systems. This entry mode does not allow multi-criteria queries (closed system). The SME system may well be considered as *conventional two-dimensional system*: it is a

compilation of heterogeneous and juxtaposed applications. These applications produce standard and rudimentary management records that have been set to meet the needs usually known in advance.

Figure 1. Determinants of the accounting organization of SME



4.2. Case 2 (Quasi-integrated centralized system)

This system seems appropriate to the context of large companies geographically decentralized but with centralized and highly homogeneous structures (case of public company). The logic of result-based management accounting here is often absent and coordination is usually achieved by standardization of work and planning (mechanistic bureaucracy as defined by Mintzberg, 1982). Among the major problems of management of these large structures, often evolving into a stable environment, is the treatment of a large volume of data generated from internal operations and transactions with third parties (suppliers, customers, banks, social security, tax, etc.). SONEDE seems to fit perfectly to this situation. Indeed, despite its size and the geographical decentralization of its business scope, it has a structure that is both centralized and poorly differentiated (structure per function). Written procedures and control planning play a very important integration (same procedures in all regions). Regional structures, although homogeneous since they are in the same activities, produce a huge volume of data. These data are partly captured at the regional level in specific applications and then transported, via software interfaces ("carriers"), at the head office where all accounting activities and the human and computer means required are concentrated. Indeed, the JD Edwards software has been installed at the head office, not to control the management of regional structures, as for POULINA, but to centralize the data produced by these structures (regional activities), mainly the districts (this is a real transactional database in the meaning of Tort, 2003). This centralization is essential to the production of statutory accounting records (journals, balances, balance sheets, income statements) but also to centrally manage current transactions (suppliers, banks ...). Accounting assistant is indeed a tool for managing transactions with third parties (the role of accounting can be reduced to the

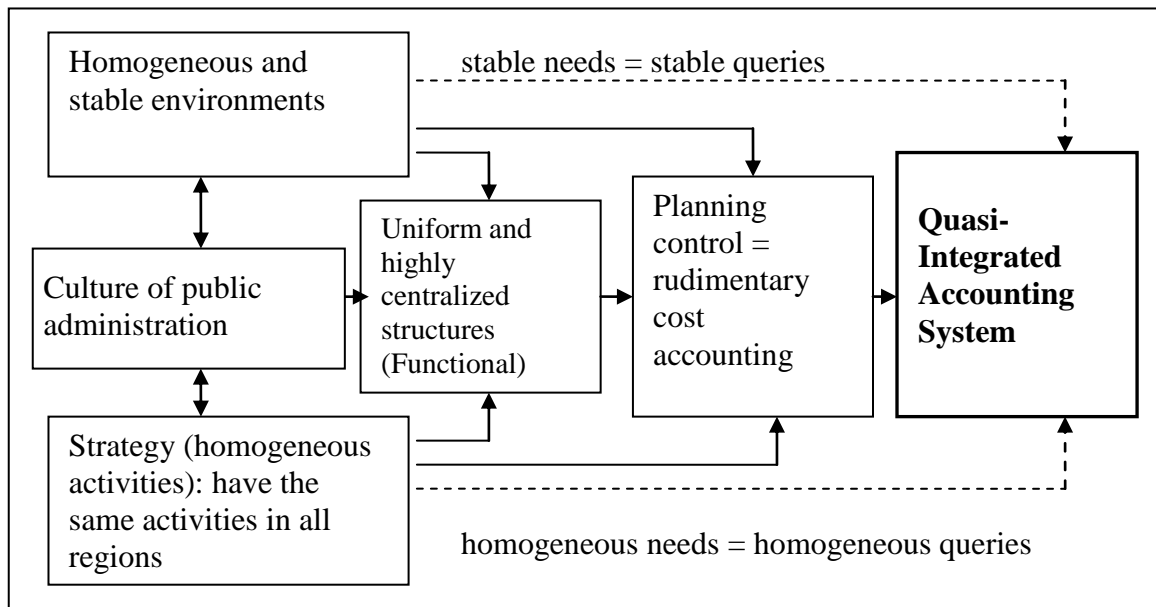
management of current transactions made with third parties). Financial statements, apart from their binding, used to control the major financial balances, (unlike POULINA financial statements, which are essential tools of financial control of subsidiaries). Management control is rudimentary, as we have already explained. This company has not, in fact, needed to implement such control, because its structure is highly centralized due to the complete absence of competition and strategy of economic competition. Management control here is the implementation of economic rationality (the lack of competition has not encouraged the SONEDE to diversify or to monitor its costs to be competitive). "Our company has no management control tools because it has no competitors. If it had competitors, like most businesses, it would have put in place tools to monitor its costs and revenues in order to remain competitive". SONEDE has in effect a monopoly on drinking water and its objectives are socio-political rather than economic (providing public services). The control is limited to the planning of water infrastructure investments planned in the Five Year Plan (Planning Control) and overall financial stability, like any other public company (Anthony, 1988). This type of control, very comprehensive (unlike POULINA's multi-criteria), does not require a detailed, multidimensional system (cost accounting). The data related to the planning of water infrastructure projects are largely taken from the SPSS software used by management studies.

Moreover, the effect of management culture of executives and managers of the SONEDE, most of which are graduated from the Ecole Nationale d'Administration in Tunis (ENAT), has been hampered by the over-regulated environment (status monopoly) and the binding mode of governance. The role of these managers is limited to the common tasks that often have a technical and administrative nature, "our managers have not been recruited to develop tools for management control but to manage the daily tasks. Even those who are graduates of top business schools acquire over time a culture of public administration. I mean that their culture of management acquired from a university is transformed over time into a public company culture", says the Financial Chief. Finally, note that the differentiating effect of size on the accounting system was neutralized by the homogeneity of the structures and regional activities (the same activities in all regions), but also by the monopoly status of SONEDE and its structural consequences (no cutting by responsibility centers). SONEDE, indeed, did not need to streamline its management system by cutting the structure into centers of responsibility, firstly because its objective is not economic and also its environment is stable due to the complete absence of competition.

The accounting system of Sonede can be described as *quasi-integrated centralized system*, because it consists of several specific applications and an ERP whose coverage is limited to the functional head (centralized system). This package is implemented not to include general accounting and cost accounting, because it is very rudimentary, but to ensure vertical integration with the functional modules and applications that generate huge data related to transactions with third parties including customers, suppliers and banks. It is interfaced with specific applications installed at the head office (AS 400 applications for HR and accounting clients) but also in regional districts (commercial applications). The objective of this integration / interfacing is not the real-time control operations as for POULINA, but transport and the centralization of transactional data to produce statutory accounting records. "For Sonede, the most important is not the integration of accounting, nor the development of management control, but the centralization of all transactional data in a common

database to establish the legal and accounting documents to manage current transactions." The strong centralization of modules of the ERP at head office has greatly reduced the functional coverage of this software and, by extension, the degree of integration. It is therefore a "partial and centralized integration," says the financial director, "although we have an ERP, our information system is not integrated: it is a partial and centralized integration."

Figure 2. Determinants of the accounting organization of SONEDE

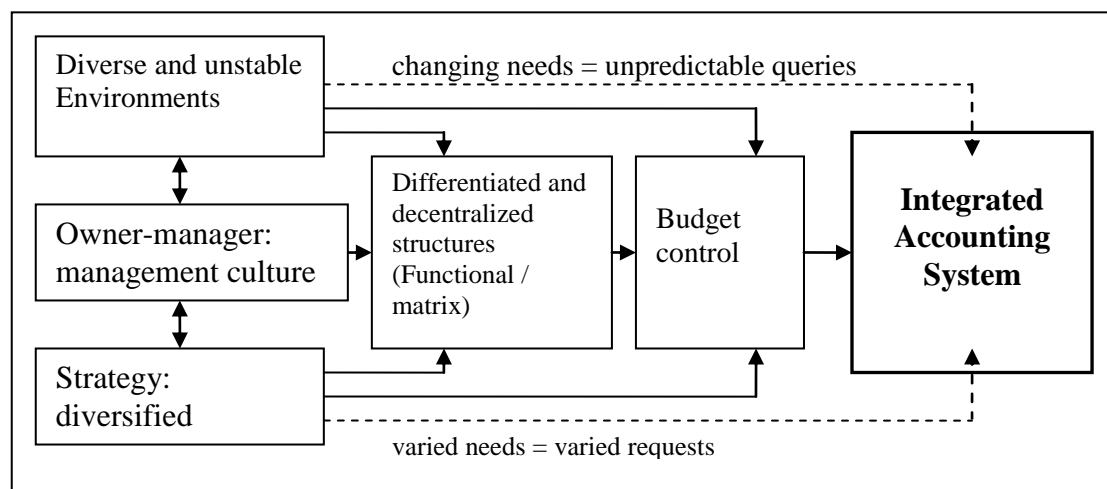


4.3. Case 3 (Integrated System)

This system seems appropriate to the context of corporate groups with medium-sized family leaders with a strong management culture. These companies need an accounting allowing a variety of refunds for management control (mainly budget control) (Tort, 2003). In this sense, the JD Edwards software package developed within the group MEDDEB has greatly facilitated the production of analytical data on the different structures that manage the different activities and products (varied and changing needs of users). Its implementation is part of a logical improvement of management control (budget control), as outlined by the Group CEO: "With the diversification of our activities and products, I found that the level of detail required for the monitoring of our responsibility centers, legal entities and activities is difficult to achieve with our old monolithic applications, too heterogeneous and disintegrated..." "now we can, through our integrated software package, extract very detailed budget data ". Note that the implementation of this package is the work of the owner-manager of the group that has a strong management culture. he is, indeed, Doctor in Management Sciences (management control) of the University of Paris 1 (Sorbonne). This leader also built a structure of management control frameworks composed of young graduates in accounting, audit and control. This structure, whose oversight role was strengthened after the introduction of ERP, is responsible for monitoring activities and products of the group.

MEDDEB's accounting system can be described as *integrated* as the ERP system in place ensures, like in POULINA, integration between financial accounting and management accounting (horizontal integration) but also between them and applications upstream (purchasing, sales, cash). However, although the basic data entry, which irrigates these accounts is multi-criteria, the query possibilities are still limited, less developed than POULINA's (it is limited to the financial and budget aspects). The Query Tool is composed of basic modules of the ERP (no data warehouse). This prevents performing various criteria for very advanced management control. The calculation of certain costs is made on Excel using raw data retrieved from the database of the ERP. Qualitative data are used to produce non-financial indicators. These data, which are produced by machines not connected to the ERP (default quality, waste loss), can establish dashboards with Excel.

Figure 3. Determinants of the accounting organization of MEDDEB



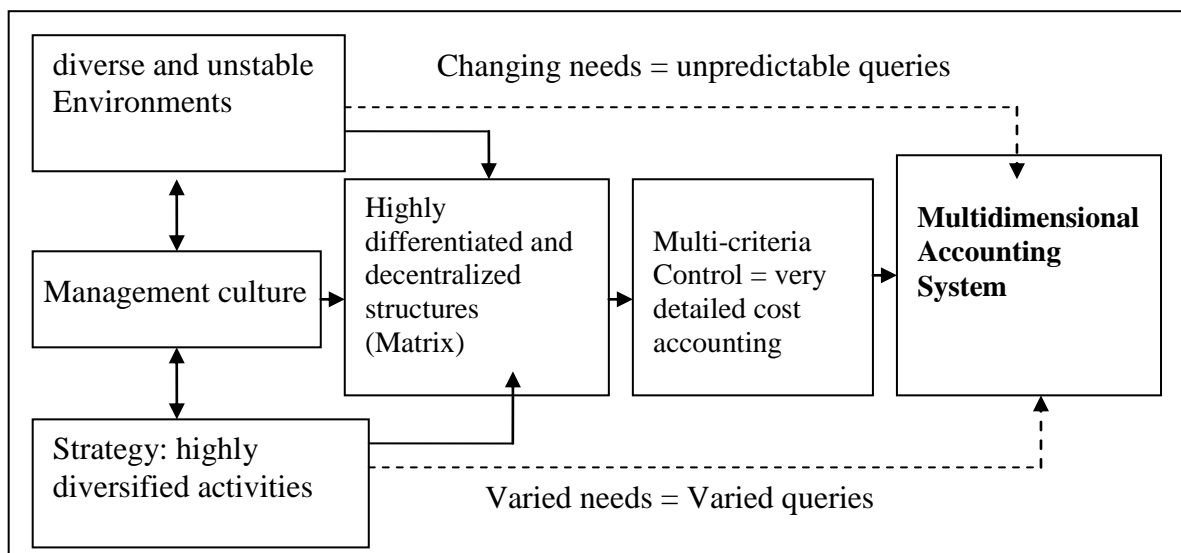
4.4. Case 4 (Multidimensional System)

This system seems perfectly adapted to large differentiated structures with widely diversified activities and facing varied and changing environments. POULINA Group is one of those large diversified and decentralized companies where integration mechanisms are varied (Lawrence and Lorsch, 1967). To control its structural diversity and preserve its unity (unit control is a true management problem for this company because of its strong differentiation, differentiation-integration voltage is very high), this Group has established various integrating mechanisms such as matrix structure, meetings, committees, procedures, company culture, common values, common databases, but also the accounting system. The latter occupies a central place in these mechanisms (it is a tool of control by the results in the sense of Mintzberg 1982). This is a highly integrated information system (ERP) with storage and multidimensional querying devices (Data Warehouse) allowing different users, whose numbers now is close to 1,500, to extract differentiated sub-information systems (monitoring statements of operations, financial statements, budgets, financial dashboards, non-financial scorecards, etc.) to treat and monitor current operations but also to control the management of different activities and group entities (68 companies) whose structures are very heterogeneous and decentralized. The variety

and variability of needs of the users of information systems of different structures of the Group, due to the variety of aspects of the environment which they face, seems to justify the integration (integration allows the differentiation in the meaning of Sorter: storing multidimensional data in a raw state into a common database can respond to needs not known in advance). Finally, note that the design of information system of the group can not be analyzed independently of the strong management culture available to leaders and managers who have been hired to manage the increasing structural complexity due to the increase of group size and the diversification of its activities. The current system (management system and information system) is indeed the work of senior-management experts, graduates of national and international business schools. Burlaud (1995) said here that "structural constraints favor certain types of leaders who themselves provide certain types of tools."

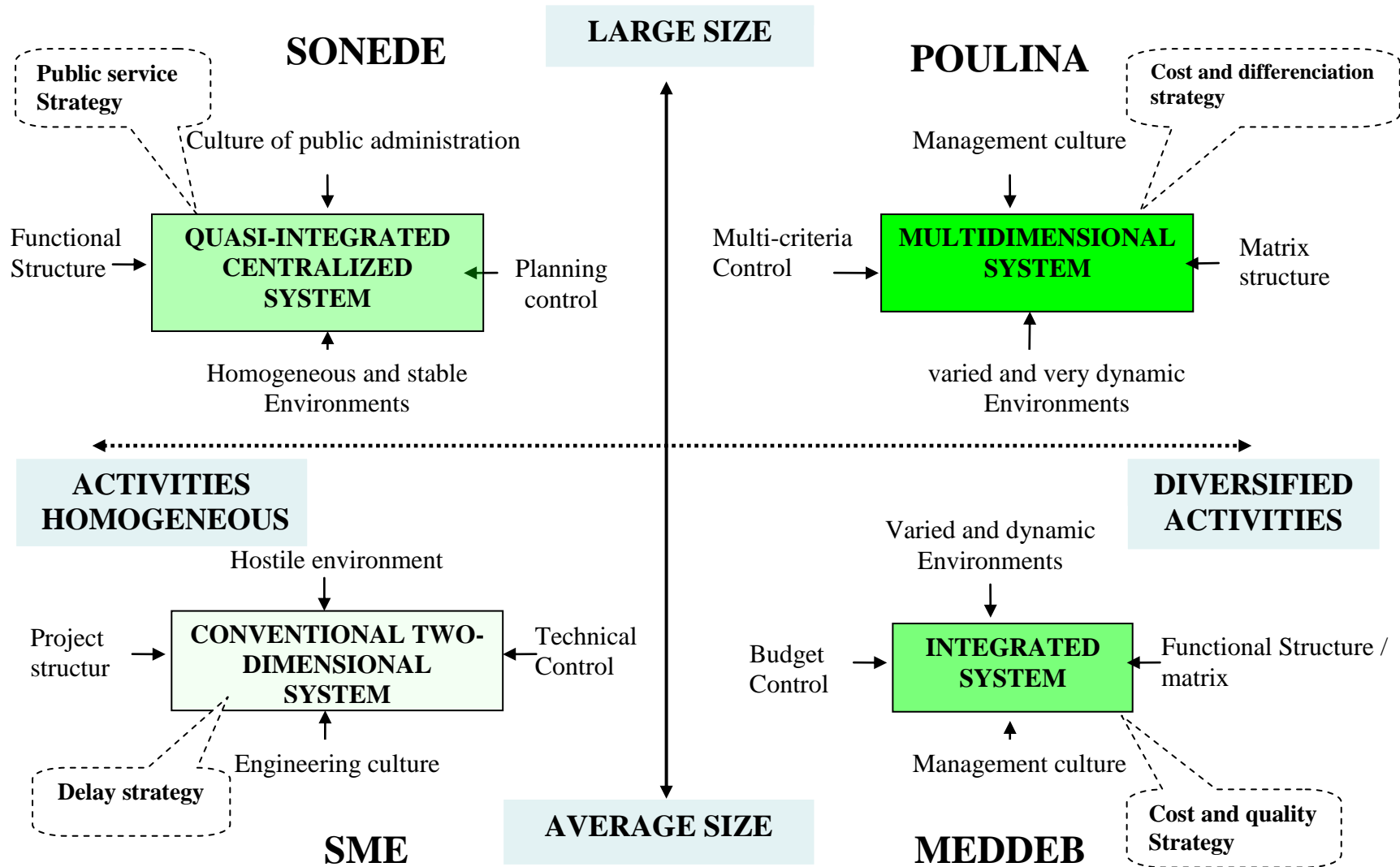
We can describe as highly integrated POULINA's accounting system (*multidimensional system*) because all the subsidiaries have an ERP for entering single but multi-criteria events at the site of their achievement and a Data Warehouse that allows to query the databases of this software in several dimensions and have a by-product in the highly differentiated refunds, financial (revenue per customer, product, region, income per entity, product, activity, subsidiary) but also non-financial (eg delivery time by product, customer), to monitor and control the various entities. Integration goes beyond the simple coupling between the financial accounting and cost accounting (horizontal integration). This is a very complete integration in the meaning of Tort (2003), because it is an integration between the various accounts (horizontal integration) but also between them and the upstream applications, supporting all these accounts with single entry and Multi-axis events, and downstream applications that exploit multidimensional databases using the multi-criteria query system. The Data Warehouse has become the main tool for querying databases of the group units (purchasing, production, sales, accounting, management accounting, financial accounting ...). It is a system deeply rooted in the daily management of the group entities. It can perform multi-criteria queries according to the needs of the period. The results of these queries often take the form of a multidimensional cube combining several lines of information (eg results by division, activity, product, profit center, legal entity, region, period ...). It is a multidimensional system par excellence.

Figure 4. Determinants of the accounting organization of POULINA



The following typology represents the four modes of organization of accounting described above. It clearly shows that the effect of size varies from case to case. Its effect on the organization and accounting systems of SONEDE and POULINA is not the same as their structures have been developed in different ways. Indeed, the development of the size of POULINA is the result of a diversification of activities to "maximize profits", which resulted in the creation of new entities with differentiated structures and equipped with sophisticated mechanisms of integration (ERP high functional coverage, data warehouse, EAI, few specific applications, etc.). The differentiating effect-size integrator (Blau, 1970) was enhanced by diversification (diversification-size combination) and its structural variations (cutting into responsibility centers, subsidiaries). While the development of the size of SONEDE was simply the result of enlarging the scope of activities of production and service of water throughout the country to meet the needs of all regions in drinking water, the differentiating effect size was somewhat mitigated by the homogeneity of regional activities (same activities in all regions) and also by the absence of an organizational division for management control (socio-political goals, public and not economic service). Poor differentiation of regional structures (or homogeneity of the regional structures) explains the underdeveloped mechanisms of integration (ERP low functional coverage, many specific applications). This comparison confirms the theory of Lawrence and Lorsch: the higher differentiation is, the more developed integration becomes. This theory applies to the accounting system.

Figure 5. Typology of integration of accounting system



Finally, note that this typology can be used by managers as a benchmark for the design of information systems. However, we do not claim to reduce the organizational practices of accounting firms to this synthetic typology, because social phenomena are unique, idiographic, complex and unpredictable. It could, indeed, exist in small construction companies that have implemented an ERP but also large diversified firms that have not installed such a system (the same causes do not produce the same effects). In addition, our typology is only a summary of key findings generated by case analysis. It therefore does not have all the variables, especially those who have not been well revealed by our case study, such as the importance of accounting in the value chain. This can be widened further in future studies by comparing the accounting system of a bank for example, where accounting irrigates all the links in the value chain (strategic role), with a company's construction sector, where the chain value uses a lot of technical data and very little accounting data, as shown in the SME case. Other variables can be highlighted such as the business sector (industry, banking ...). The private or public aspect may also be considered. Indeed, management control, key determinant of the accounting organization as shown in our thesis, is generally more developed in private than in public companies. The variable ownership structure (family or shareholder) is also to be studied deeply. Indeed, the accounting system of the family business often reflects the culture of management of its owner-manager, as shown in the case of MEDDEB and SME, while the accounting system of the company whose capital is open (held by several shareholders) is generally developed (it meets standards for the dissemination of financial information), because these businesses are run by "experts" in management (with a strong management culture) that have an accounting system to make account of their management. Finally, the strategy of management information system is to be more studied. Behind the development of POULINA's information system lurks a management strategy of the information system that fits into the overall strategy of the group while SONEDE has no such strategy. It has a very oriented computer department towards application maintenance to solve pressing technical issues. Finally, the SME does not even have a computer technician (no department). Its information system was designed piecemeal according to current needs. The role of backers may not be neutral with respect to management practices. The World Bank urged the SONEDE to modernize its management system by implementing an ERP system. This may suggest that the implementation of this software does not always represent a true need for internal management but it is partly driven by external pressure groups, including backers.

DISCUSSION AND CONCLUSIONS

The contribution of our study is a double perspective. On a practical level, the typology of integration of accounting systems should enable practitioners to position themselves in relation to four types of accounting organization practices: (1) Conventional two-dimensional system, (2) Quasi-integrated centralized system, (3) Integrated system (4) Multidimensional system. To reinforce practitioners in their choice of accounting organization, we explained why such a company has established such a system (Which mode of accounting integration must be chosen according to the constraints which the company faces?). Strategy and size (and other intermediate variables: environment, differentiation of structures, management control, management culture) are here key determinants of integration. Organizations whose activities are not diversified (or mono-activity) and facing homogeneous and stable environments, are opting more for partially integrated accounting systems (SONEDE case) or autonomous (SME case) while those that are more diversified, and facing a variety of environments and dynamic focus on integrated accounting systems (MEDDEB case) or multidimensional (POULINA case) whose design is based on event-based approach to

accounting. However, although integration is the most important practice of differentiated structures (POULINA and MEDDEB), these structures have some older applications tailored to specific fields. It is not always appropriate to make a clean sweep of all existing applications to install more fully integrated ones. The final system seems to be more the result of an evolution which corresponds to a logic of urbanization rather than a complete overhaul of the existing system. Hence the relevance of the concept of urbanization information system (Samara, 2004, Reix, 2004).

On a theoretical level, we have shown the relevance of the theory of differentiation-integration of Lawrence and Lorsch, as an explanatory framework for integrating accounting systems practices of the companies studied (explaining the evolution towards the event-system). Differentiated structures of diversified firms (POULINA and MEDDEB) have, indeed, an integrated system (ERP, Data Warehouse) while homogeneous structures have a partially integrated system (SONEDE) or autonomous (SME). We therefore extended by transposition the scope of this theory to organizations with an accounting information system. So we can now talk about the theory of differentiation-integration of accounting subsystems (Dupuy 1990). This theory fits into the General System Theory. Indeed, it considers that differentiation and integration are "the two keys by which most researchers now intend to describe or analyze the process of evolution of the General System" (Le Moigne, 1973: 187).

We also showed the relevance of Sorter's theory of event, as a design framework of information systems differentiated structures (the event model is relevant but contingent). Indeed, POULINA and MEDDEB groups, whose structures are differentiated due to the diversification of their activities, have set up an information system whose design is very similar to that of Sorter (1969). This is a multidimensional system with a high level of integration through ERP installed in all subsidiaries. These software packages allow, thanks to their raw and multidimensional database, to extract differentiated information subsystems to meet the diverse needs of different services and functions of the group (purchase, sales, human resources, marketing, business management, accounting, finance, management control ...). In this sense, our research also shows that the scope of the event-based approach is no longer limited to accounting, as was originally intended by the founders of this approach (Sorter, 1969). It has expanded to the entire management information system (all features and services of the business). The ERP is therefore the generalization of event-based approach and multi-dimensional accounting. These packages extend the scope of this approach (integration) to the whole company: production management, purchasing, sales, human resources, accounting and financial management.

However, our study also shows that the realization of the theory of Sorter is contingent and partial. Indeed, despite its dominant architecture and multidimensional event, the information system of POULINA and MEDDEB groups has some specific applications that are designed according to the approach by the computerization process (two-dimensional approach). This goes again with the idea that a fully integrated information system does not exist ("Utopia" under Markus 2000). The effective information system is often composed of a mixture of heterogeneous applications that reflect the variety of company structures and under different design logics (event-based, multidimensional, two-dimensional). We can say that, in practice, the event-based approach (developing an integrated accounting system) and the process approach (automating business process by process) were not exclusive and are complementary. These two logics coexist within the same information system.

Finally, note that our typology of integration can be reinforced by studies of similar cases (replication). Our study can be enriched by including other variables. It would be interesting to study companies using cloud computing. It would be interesting to conduct research on the accounting organization of large multinationals, operating in countries with different reference systems (different cultures, different accounting legislations). The differentiation-integration tension in this case is very strong, "Multinational companies should not only try to treat the inevitable differences between functional specialists and products, but also to bring together various cultural systems," says Lawrence and Lorsch (1967 : 210).

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