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Strategic Decision Support Systems for Local Government: A Performance Management Issue?

The Use of Information Systems on the Decision-making and Performance Management of Local Government

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Abstract

This paper aims to lay the grounds of a framework for further research on Decision Support Systems (DSS) in French local government organizations. A survey conducted in 2008 with 225 CIOs and executives in collaboration with the French Association of Management Control in French local government (AFIGESE) is used to analyze the maturity of implementation of these systems in French sub-national communities (cities and regions). Results show their importance for local public managers on decision making, performance, and management control. A literature review of the decision making process in the public sector and a theoretical framework on the design science of information systems is hence developed to provide the basis of a research program dedicated to the conception of DSS as IT artifacts for local governments.

Keywords: information systems, local government, decision support systems, strategic management

1. Introduction

Managing the information resources in the decision making processes is one of the most prominent challenges of the public sector (Viscusi, Batini, & Mecella, 2010). A better internal information management is an opportunity to innovate in reducing bureaucracy and diminishing the costs of the administration (Riedl, 2003; Tambouris, Gorilas, & Boukis, 2001). Local governments are facing the complexity of an uncertain and evolving environment that include external constraints like the changing legal framework or the evaluation of public policies, and internal constraints related to management control (data from ERP systems and business software). To cope with the tremendously growing amount of data they are supposed to collect, store, and process in this new complex environment, public managers are investing huge sums of money in decision support-related technologies at a strategic level, expecting these tools to increase the performance of their organization. Yet, when adopting DSS-related technologies in their organizations, local governments often do not pay enough attention to some factors specific to public administration, such as more convoluted decision making processes, or the growing complexity of the issues they tackle. Thus we explore in this paper the role of Decision Support Systems (DSS) for Local Government as these kinds of information systems are developing at a fast pace in the public administration, and do not receive the academic attention they deserve.

We use an exploratory survey carried out in collaboration with the French Association of Management Control in French local government (AFIGESE) to understand the way in which Chief Executive Officers and Chief Information Officers address these IS-projects. This study conducted in 2008 with 225 CIOs and executives provide details about how and for what purposes these organizations are investing in DSS-related projects (datawarehousing, BI...), to identify the most progressive organizations and the key success factors for DSS projects, and to discover opportunities for further research. Results show the perceived importance of DSS for local public managers on decision making, performance, and management control. This survey enables us to explore the widening gap between research and practice in the IS discipline in the DSS area (Arnott & Pervan, 2005) and to construct a theoretical framework for the design of DSS in the public sector.

Academic literature on the theme of Decision Support Systems in public organizations is relatively scarce, and virtually non-existent in French journals. For the most part, the academic literature that focused on DSS use in public administration dates from 1970-2000. Public management researchers did not keep up with the pace of technological innovation and this theme gradually went out of fashion in the public management literature. At the same time, DSS-related technologies (datawarehousing and BI mostly) were massively adopted in public organizations and local government. The writing of this paper was motivated by this gap in the literature.

This paper is organized as follows: the results of the AFIGESE survey are analyzed. Then we explore the literature on decision theory and the DSS area in the Information Systems discipline for Public management. A theoretical framework for the conception of DSS in the public sector based on the fundamentals of the decision making process is developed. At the end we propose a research program for the study of DSS in Local Governments to understand the maturity of implementation of these systems in the public administration and the implications for next developments.

2. Key Findings from the AFIGESE Case

The objectives of the AFIGESE were both theoretical and practical. The management control staffs of cities, departments and regions wanted to know the state of the art in the DSS field for the researchers. But also the actual stage of implementation of these systems in local governments and spot the best practices of the most advanced communities along with their project roadmaps. In this perspective a first survey has been launched in 2008 toward 400 members of the association including CEO's, CFO's and CIO's of the biggest cities and regions in France through an electronic questionnaire of 33 questions. The survey has received great interest from the executives with an exceptional response rate of 56%, especially from members of urban communities (93% of response rate at this level).

2.1 DSS Usage & Information Needs

The AFIGESE case is instructive because it reveals an important gap between the investments in DSS and their logic in local governments with the continuing practice of public managers in these organizations. 71,3% of the respondents claimed that their organization implemented a DSS. In the organizations that did not have a DSS, 78,2% said that they wished to implement one in the very short term, confirming that this is a growing subject of attention for CEO's and CIO's. Although DSS are massively adopted by local governments, 57,9% of the respondents say that the organization's information systems do not provide to the users the information they wish.

However, a large majority (65%) acknowledges that the needed information exists, but is dispersed across various (81,7%) and compartmentalized storage and retrieval systems (80%). 42, 9% of respondents believe that the information volume is too important.

This is in line with the literature: according to Marr and Creelman, "few organizations will state that they have too little data. Unfortunately, this data is rarely translated into actionable knowledge. Most public sector organizations have built large and expensive baronies, whose sole purpose is to collect and report data. The data is rarely used for the purpose of performance improvement – a tick box mentality has prevailed" (Marr & Creelman, 2011). The authors note that public organizations are overloaded with data, yet they make "strategic decisions with comparatively little data support". Furthermore, having the information at hand doesn't necessarily mean that appropriate action will be taken, as public managers, especially at higher hierarchical levels, rely more on bargaining than on analysis (Aggarwal & Mirani, 1999). Even simple analyses, made "by hand" in a spreadsheet format, may be considered too sensitive because they reveal some particular organizational arrangement.

Although 69,5% of respondents assume that the request for a DSS is coupled with a global steering effort; users are often to face scattered information, which seems quite contradictory. When asked what tools they used to manage information, respondents answered spreadsheet software (97,8%) and automated queries on the business software (80,4%). 38% said they had an information center, and 29, 3% a data warehouse. Only 23,9% said that the information was integrated in a DSS. These results tend to show that although DSS may be a hot topic in local government organizations, integrated and architected approaches remain rare, and spreadsheet, connected or not with a data source, the most used decision support tool. In fact, anecdotal evidence suggests that in some cases, although there may be huge investments in datawarehousing, the "do-it-yourself" (DIY) culture prevails: ad-hoc tools are developed using spreadsheet or database software (Excel®, Access®,) to fulfill the actual and most pressing reporting and analysis needs.

In most cases, local government organizations do not need complex tools, and may overestimate their needs, driven by technology or vendor discourse. As one employee said during the survey: "we are only a local government organization, we do not put satellites into orbit".

2.2 Barriers to the Adoption of DSSs

54% of the respondents think that resistance to change impedes the adoption of DSSs. The introduction of a DSS in a public organization may threaten the balance of power between departments. As information is made public (even though the access to information may be limited by design to authorized executives only), the inner reality of the organization is revealed. For example, the HR department may be reluctant to share "his" information, as this means losing some control or bargaining power with other departments.

33,3% of the respondents blame lack of interest from the top executives. This is not surprising, as the majority of French administrators ("Hauts Fonctionnaires") receive basically no training in information systems (Rochet, 2011). They even may be reluctant to involve themselves in anything related to information technology, and tend to perceive IT departments as a mere technologies/service "provider" rather than as a strategic asset for the organization. Other perceived barriers are the lack of technical competencies (41,4%) or human resources (48,3%). Local government organizations rarely have in-house competencies to tackle DSS projects on their own, and rely on the expertise of consultants and vendors that are more used to deal with DSS in private organizations.

Only 14,9% point out that the lack of information regarding the return on investment (ROI) of DSS projects may block their adoption. Indeed, complex, costly and inefficient systems may be the rule more than the exception, as ROI is not the primary driver in most IT-related investments in local government organizations. As Garson points out, "while ... formal assessments and justifications of new IT systems have become prevalent in large private firms, state governments, and federal government agencies, it is less likely that most local governments have developed the internal capacity to complete such tasks" (Garson, 2007). But the ROI argument may not be a relevant one, as it is extremely difficult to assess the contribution of a DSS to the decision making process and decision outcomes because of the ambiguous relationship between information and decision (J. G. March, 1988).

Finally, the lack of financial resources is cited by only 21, 8% of the respondents as a factor hindering DSS implementation.

2.3 Rationale for the Investments in DSS

What is the rationale behind DSS implementation in local government organizations? Most respondents argue that their investments in DSS are driven by "steering" needs (69%) and "search for performance" (64,4%). We contend that there may be an empirically verifiable link between the use of decision support systems and greater organizational performance. Anecdotal evidence suggests that too little emphasis is placed on deciding what the organization's actual information needs are. Organizations that successfully implemented a DSS stress that the system must be refined by continuous iterations with end users, in order to remain coherent with the organization's needs and objectives. For the use of DSS to be beneficial in local government organizations, they must pay great attention to the design phase of a DSS project (deciding what the problems they face are, and the information they might need in order to solve them). In organizations that do not make this effort, DSS will only be a fancy tool, disconnected from the real decision support needs of the organization. Ultimately, a successful DSS project will be a by-product of good organization and decision-making processes. We assume that only when 1) decision making processes are already efficient and 2) the organization is used to engage in "problem finding" (and not only "problem solving") will the use of a DSS have a notable impact. In this perspective, it is important to note that "Modernization" (46%), "change management" (31%) and "cutting costs" (28, 7%) account for an important part of the investment decisions, conferring the "magic bullet" role to IT as pointed by the literature (Carr, 2004).

The survey did not take into account the finest distinctions between the different types of decision support systems, such as management information systems (MIS - focused on the reporting of day-to-day operations, to inform structured/semi-structured decisions), decision support systems (DSS - designed to support decision-making at tactical level, when the problems and solutions are not specified in advance, i.e. unstructured) and Executive Information Systems (EIS - similar to DSSs but targeting senior executives and presenting highly aggregated data). These distinctions have essentially academic connotations, and are largely ignored by business or government end-users: in practice Business Intelligence (BI) is used by the vendors as an umbrella term, and a synonym for decision support. Anyway, most of the software packages available offer advanced data analysis, modeling and visualization capabilities, and are versatile enough to be adapted at each level of decision. In the academic literature, the preferred term is "Enterprise Reporting and Analysis Systems", which are "enterprise

focused DSS including executive information systems (EIS), business intelligence (BI), and more recently, corporate performance management systems (CPM). BI tool access and analyze data warehouse information using predefined reporting software, query tools, and analysis tools" (Arnott and Pervan, 2008). For the most part, local government organizations are investing in "Enterprise Reporting and Analysis Systems", and rely on datawarehousing for their data infrastructure.

The AFIGESE case and its findings introduce the need to review the literature on DSS as information systems to define properly these technologies for the practitioners.

3. State of the Art in the Information Systems Discipline for the DSS Area

3.1 From Decision Theories to Decision Support Systems

Decision Support Systems (DSS) are a specific kind of Information Systems that focus on "integrating data and models in order to improve the decision-making process" (Arnott & Pervan, 2005; Vaisman, 2007). As Arnott and Pervan noted it, there is a "widening gap" between research and practice in the DSS area as in the Information Systems discipline in general. It is especially true concerning the Public Sector where grounded researches on the development of DSS are almost inexistent for the last 10 years. Before exploring the DSS area, we must first return to the fundamentals of action and decision.

Collective action is achieved through decision systems inside organizations (Tabatoni & Jarniou, 1975). In this perspective, each decision is the choice of a solution to a problem. These problems appear when the decision maker perceives a significant change in the system which determines its objectives, and implies action (Simon, 1960). In the management sciences, to decide means identifying and solving the problems faced by an organization (Le Moigne, 1974), following Simon's famous quote (1960, p. 1): "Decision making as synonymous with managing". As noted by Simon 40 years ago in this major article, "In the post-industrial society, the central problem is not how to organize to produce efficiently (although this will always remain an important consideration), but how to organize to make decisions —that is, to process information" (Simon, 1973).

The literature on information and decision has quickly showed the problem of information overload and the limited cognitive capacities of the actors to process this information in order to take decisions (J. G. March & Simon, 1958). Thus the need to facilitate access to decision support as well as to enhance individual and organizational learning is explicitly addressed in the decision support systems literature (Alavi & Henderson, 1981; Desanctis & Gallupe, 1987; Henderson & Schilling, 1985). Decision support systems appeared fifty years ago, and were marked by the technical idiosyncrasies of this era (Vidal & Petit, 2009). Since technology prevails in organizations, they tend to focus on the type of information most easily accessible, that is, highly structured data generated by transaction processing systems (Davenport, 1999).

Power defines a DSS as "an interactive computer-based system or subsystem intended to help decision makers use communications technologies, data, documents, knowledge, and/or models to identify and solve problems, complete decision process tasks, and make decisions" (Power, 2008). In other words, they ought to provide a good view of the organization's processes, and to help anticipate future actions for an intelligent control by managers. Decision Support System is a general term for any computer application that enhances a person or group's ability to make decisions ... In general; Decision Support Systems are a class of computerized information systems that supports decision-making activities. Five more specific Decision Support System types include: communications-driven DSS, data-driven DSS, document-driven DSS, knowledge-driven DSS, and model-driven DSS" (Power, 2008). The basic ingredients of a DSS are: the data management system, the model management system, the knowledge engine, the user interface, and the users (F. Filip, Donciulescu, & C. I. Filip, 2004).

According to (White, 2007, p.24) DSS are "difficult to define precisely" ... "they range from simple spreadsheets to complex systems comprising their own databases and mathematical modeling software for statistical analysis, linear programming, goal programming, and a host of other more specialized modeling techniques". A DSS is "designed to assist mid-level managers in making semi-structured decisions: decisions in which there is some degree of uncertainty and an absence of routine, programmed decision-making procedures".

Decision support systems tailored for executive use are called Executive Information Systems (EIS). "EISs are a logical and practical extension of DSS for top management strategic decision making. An EIS puts highly aggregated data about an agency and its external environment on the desktop of high-level public executives where they can perform analytical operations similar to a DSS but with much broader scope—a comprehensive view of the entire agency and the strategic position of the agency within its political, social and cultural

environments. It allows the top-level executives to monitor the performance of their agencies in accordance with a variety of key performance indicators identified by the executives, conduct analyses of what is going on in the agency, and 'drill down' through the aggregate data to get at issues or potential problems." (White, 2007).

The field of computerized decision support has undergone many developments, and substantial progress has been made in data management and visualization, and human-computer interaction. Although the contribution of DSS is obvious for structured decisions, it's still low for unstructured decisions. A lot of research works attempted to highlight this contribution by establishing a direct relationship between the capabilities of the DSS and the performance of decision making (more relevant, effective or faster decision making). The results were generally weak. As suggested by Todd and Benbasat (1999), several factors are to be taken into account to explain the performance of decision-making (Todd & Benbasat, 1999). It is difficult to assess the contribution of DSS, especially because the user can always arbitrate between the "cognitive efforts" that he wishes to provide and the expected relevance or accuracy for the decision he has to take. The use of a DSS may produce no observable effect, even if its contribution is crucial for the decision maker (Reix, 2004).

3.2 Public versus Private Decision Support Systems

There has been much literature on the differences between public and private organizations.

Ring and Perry point out five key differences: policy ambiguity, the openness of government (public scrutiny), attentive publics (stakeholder's influence), artificial time constraints (imposed by law, or tenure of public officials), and shaky coalitions as competing interests in the definition of public policy (Ring & Perry, 1985).

These differences have repercussions on how organizations manage their IT projects (Rocheleau 2005, p.2). Today there is a consensus in the literature that information systems in public organizations ought to be managed differently than in private organizations. Rocheleau states that despite the fact that "managing IT in the public sector presents different challenges than those faced in the private sector ... there has been little systematic attention given to these differences by IT researchers" (Rocheleau, 2005).

Decision-making processes differ highly too. Following the "public-private differences" stream of research begun by Rainey, Backoff and Levine (1976), Nutt found differences in their approaches to decision-making (Nutt, 2005). He states that "organizations with public features are seen as being constrained in ways that limit what they can do when making strategic choices."

As Rainey puts it "public organizations should have distinct decision-making processes because of factors different from those faced by private organizations, such as political interventions and constraints and more diverse, diffuse objectives" (Rainey, 2009). In fact, decision-making processes in public organizations involve a variety of stakeholders, such as political officials, technical experts, interest groups, organizations, administrators, and citizens.

How is this relevant regarding DSS? Aggarwal and Mirani (1999) point out that private and public sector "differ inherently in their objectives, processes, priorities, task environment, and success measures". Their research show that DSS usage varied according to the private or public nature of the organization. They found DSS usage to be greater in the private sector. In the private sector, DSS users were more mostly at the top management level, whereas in public organization DSS users were more likely to be found at the lower levels of the managerial hierarchy.

In a private organization, the bottom line is generally easier to understand. Thus, private organizations know more or less what they expect from a DSS (reaching more customers, finding new opportunities, better knowledge of the firm's competitive environment). A DSS may help a company identify strategies to enlarge its customer base. In most public organizations, however, goals are unclear; objectives are vague and often conflicting. For these reasons, determining what performance outcomes is expected may be a daunting task. This is clearly not to say that public organizations are inefficient by design, and that they ought to be managed like private organizations in order to run better. In fact, public and private organizations operate in different contexts, and the awareness of that fact may enable both public and private managers to be more effective in their own environment (Rocheleau, 2005).

4. DSS Conception for the Public Sector

4.1 What Do Local Government Organizations Can Expect from DSS?

In general, DSS are expected to provide data that facilitate the understanding of the organization's internal and external environment. Internally, many issues are the same those in private organizations: resource allocation,

operations... On the external level: understanding of the social, cultural, economic, legal environment. DSS, then, are supposed to help the organization operate better, and optimize the outcomes of the public policies.

For example, knowledge of the population is paramount in order to implement public policies effectively, and reliance on DSS may ease the process. Mezzanazanica and al. studied the use of datawarehouses and business intelligence tools to exploit administrative archives (Mezzanzanica, Cesarini, & Boselli, 2005). They state that "the exploitation of such asset requires Public Administrations to integrate information spread across several departments, to address data quality issues arising when administrative data is used, and to develop analytical and reporting models". In public organizations, "information related to individual and collective needs plays a large and relevant role; therefore a deep knowledge of the population is required."

As Decision Support Systems are built following the dominant approach, which focuses mainly on problem solving (Fabbri, Christophe Schmitt, & Nancy, 2010), their use by public managers may be more complicated. In this approach, the managers act as if the problem was already given and that only the solution was important, ignoring the fact that the problem often needs to be conceived first. The weakness of the DSS for the identification and modeling of problems is obvious regarding the abundance of tools dedicated to problem solving (C. Schmitt, 2005). The paradox for the public sector and especially local governments is that heavy investments are made in DSS for structured decisions at the upper level. This probably because their decision makers "may be less autonomous, expending more of their energy in coping with extraneous stakeholders such as the general public and supervisory agencies. Their decisions often require the use of multiple and complex criteria that go beyond purely "rational" considerations" (Aggarwal & Mirani, 1999). The problem is that DSS were originally meant to provide interactive solutions for complex, nonrecurring decisions made by senior managers (Gallupe, 1991). DSS for Local governments are instead used for semi-structured, recurring decisions such as periodic budgeting.

It is often pointed in the literature that public management deals with ill-structured problems which require deep understanding of the "problem spaces" where the problems are represented. Thus the conception of DSS for public management can be understood as a design science concerned with the "dispositions willing to change an existing situation to a preferred situation" (Simon, 2004).

4.2 Design Science for Local Governments DSS: A Research Program

Following Orlikowski and Iacono, we believe that "theorizing about IT artifacts should be at the core of IS research projects" (Orlikowski & Iacono, 2001). This view is supported by Benbasat and Zmud who call for a close relation between IS research constructs and IT artifacts (Benbasat & Zmud, 2003). The widening gap between research and practice in the Information Systems discipline that we already mentioned can be solved in the DSS field with more research paper focusing on the design of IT artifacts for practitioners. With this approach we seek to foster innovations that "define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, management, and use of information systems can be effectively and efficiently accomplished" (Denning, 1997; Tsichritzis, 1998). Hence we propose a research program based on the framework developed by Hevner & al. taking into account that "knowledge and understanding of a design problem and its solution are acquired in the building and application of an artifact" (Hevner, S. March, Park, & Ram, 2004). This program would include interpretative case studies inside the most advanced local governments identified by the AFIGESE survey to understand the creation process and evaluate the IT artifacts intended to solve strategic organizational problem.

5. Conclusion, Limitations and Further Research

5.1 Discussion

"Whatever the information collected, one always asks for additional information; the requested information is not taken into account in the decision; information is used to justify a decision already made... the relationship between decision and information is thus unstable and ambiguous" (March 1991). The "Management Information System" (MIS) paradigm remains quite strong: it is assumed that all the needed information exists, that every decision to be taken can be grounded on information, and that the system has to give decision-makers the information they need to decide. In this rational model, it is assumed that decision-makers know what they need to decide, that the environment is stable, and that good information ensures good decisions.

In local government organizations that successfully implemented DSS, there was a strong emphasis on their structuring role, insofar as they are used as leverage to improve transparency throughout the organization, clarify the objectives, and help formulate the organization's strategy. Thus this positive feedback only can take place when

- Goals are clearly defined.
- Impacts on the organization are anticipated.
- Users are actively involved in the multiple iterations necessary to refine and adapt the system to the organization's needs and objective.

In organizations that implemented DSS on the wrong premises (vendor- or technology-driven choice, managerial fad, benchmarking...) we are likely to find complex, costly DSS in place, filled with data and reports that are mostly unusable precisely because goals were unclear, impacts underestimated, and users not involved.

Successful DSS projects are envisioned as organizational transformation projects; unsuccessful ones fail because of unanticipated consequences of the introduction of such technology (transparency, relationships between administrative units, subversion of the power structure, inadequation with the user's skill level, resistance to technology innovation...). Factors such as infighting and lack of clearly defined objectives and responsibilities, common in most public organizations can hinder the success of DSS projects.

5.2 Limitations

The main limitation of this research lies in the methodology adopted for our preliminary exploratory phase with a quantitative survey realized to evaluate the stage of DSS implementation in local governments' organizations. We wanted to have a global view of the DSS maturity that was sufficiently general to build an accurate research program. Hence some problems were inherent to this phase: DSS were not defined using an academic language which limits the possibility to develop any typology. The study cannot provide any analysis on the real usage of information in the organizations surveyed which is an important basis to understand how to design properly DSS, following our research program proposition.

Eventually the AFIGESE survey did not include any questions on the training of users nor the general IT literacy of the members of the organization. As this is probably an important factor for the successful adoption of DSS in public organizations, or any IT-related project for that matter, this theme needs to be investigated in further research.

5.3 Conclusion and Further Research

At the end of this first research phase in the DSS field for public management, we can answer the question on the relationship between this type of information systems and performance. The literature provides us great insights on this theme as most public organizations share the specificities of the absence of profit maximization. Thus, determining a level of performance outcomes with DSS seems not relevant as their conception for strategic public management should rely more on heuristic help in a complex environment than the supply of algorithm to realize automated tasks like maximization.

For this reason, further research needs to provide rigorous qualitative studies on information current practice and decision making process assisted with DSS in local government, research that is highly relevant to professionals, without sacrificing academic rigor. This would be part of a research program which intends to understand and develop DSS as IT artifacts to help problem solving in the public sector.

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