

ERP ADOPTION FOR E-GOVERNMENT: AN ANALYSIS OF MOTIVATIONS

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Abstract

In order to provide more efficient government and better services to citizens, public administrations and agencies have invested in Enterprise Resource Planning (ERP) systems as their basic technological infrastructure for e-government. The interest generated by the ERP phenomenon in the public sector, and the particularities of this sector make specific studies of ERP in government organizations necessary. Based on the analysis of secondary data published in the form of "success stories" by the largest ERP vendors, we seek to identify and characterize the actual motivations that lead to the adoption of ERP systems in e-government. A second aim is to characterize public organization with regard to ERP by uncovering typical profiles of motivations among them. Data from 46 stories of public organizations from 15 countries were collected and analyzed. Results indicate that some government organizations adopt ERP systems primarily to integrate their information technology, while others seek greater process efficiency or are strategy-driven. Eight organizations in the "process efficiency" group, so-named after a cluster analysis, have focused on supply-chain management functions. Nineteen "technology integration" organizations have mostly implemented government portals and procurement systems, whereas the nineteen organizations in the "strategy" group look to ERP for online services and customer-relationship management.

Keywords: ERP, Enterprise Systems, E-government, Public Sector, Motivations.

1. INTRODUCTION

Citizens in many countries expect their public administration to provide services of quality, adapted to the most recent developments in the political, economic, social, and technological environments, and at the lowest cost. It is generally in response to these expectations that methods, techniques, or practices that appear promising in the private sector, customer relationship management for instance, are made use of in the public sector (Periseras and Tarabanis, 2000; Veal, 2001; Liu and Lai, 2004). This is particularly true in the area of information technology (IT). While some researchers argue that studying IT management in public organizations is "more of the same" when compared with private enterprises, others see the public sector either as a moderating factor or even as "a whole new ball game" (Zmud, Carte and Te'eni, 2004).

Given that each sector is confronted with specific environmental constraints, the transfer of IT practices from the private to the public sector would not occur automatically. This has been confirmed by prior empirical studies showing differences between private and public organizations with regard to

IT management (Bretschneider, 1990; Newcomer and Caudle, 1991; Cats-Baril and Thompson, 1995; Danziger and Andersen, 2002). These studies indicate, among other things, that in contrast to private firms that implement IT applications as competitive weapons and protect their specific IT competencies, public agencies must often share their applications and competencies with other agencies that have similar activities or functions. Also, given that resources are allocated by budgetary processes rather than by market mechanisms as in the private sector, IT planning in the public sector must often bow to political pressure and is thus mostly oriented in the short term.

E-government has raised operational, functional and strategic issues in regard to the transformation of public organizations and their implementation of new technologies (Rondeau, Croteau and Luc, 2005). On the more specific issue of Enterprise Resources Planning (ERP) systems, the need to develop a body of knowledge specific to public organizations is appreciated more and more (Allen, Kern, and Havenhand, 2002). For instance, Blick, Gullidge and Sommer (2000) show that ERP implementation approaches used in the private sector must be adapted to the culture and regulations peculiar to the public sector. Yet, if studies on ERP in business firms are increasing in number, the same cannot be said for nonprivate organizations. The interest generated by the ERP phenomenon in the public sector (Sprecher, 1999; Miranda, 1998) and the particularities of this sector thus generate e-government issues for the information systems field (Grönlund and Horan) and make specific studies of ERP in government and public organizations necessary.

Falling within the scope of the previously-cited studies, the present study's principal objective is essentially descriptive, that is, to describe the technological, operational, strategic and performance motivations that lead public sector organizations to adopt ERP systems for e-government purposes. While the potential determinants of ERP adoption are multiple (e.g., individual, institutional, and political factors), this study focuses on organizational motivations as these play a central role throughout the ERP implementation, usage and evaluation process. The system's extensiveness, design and implementation approach depend in good part on the motives leading to its adoption by the organization (Parr and Shanks, 2000). It is also important to mention that the definition of implementation objectives is closely related to motivations, and thus the evaluation of the project's success must take these into account. Hence, a thorough analysis of the reasons for which an organization, be it public or private, undertakes an ERP project is deemed essential, as many studies have found such projects to be very costly and risky (e.g., Besson, 1999; Umble and Umble, 2002).

This research first aims to identify and characterize the actual motivations that lead to the adoption of ERP systems in e-government. Another aim is to characterize public organization with regard to ERP by uncovering typical profiles or patterns of motivations among them.

2. ERP SYSTEMS IN THE PUBLIC SECTOR

Even if an important part of the ERP market offer is directed at the private sector, the largest ERP vendors, responding to the interest shown by the public sector for more complete organizational systems, have started to develop functionalities specific to the public sector (Deloitte Research, 2002). As these functionalities were perfected, public sector interest in ERP increased. Proportionately, however, sales performance in this sector by ERP vendors has remained modest (Miranda, 1998).

The government market remains attractive mainly due to its great size and because it must take advantage of the benefits derived from ERP by the private sector (Sprecher, 1999). It even appeared that the ERP market counted on the public sector to give it new impetus, at a time when this market showed signs of running out of steam. In 2001, analysts estimated that the American federal ERP market would grow at an annual rate of nearly 9% over subsequent years, thus reaching almost US\$1.8 billion in 2005, representing more than 4% of federal expenditures in IT (Dorobek, 2001). Other sources provided larger numbers: the American federal ERP market was to climb from US\$2.8 billion in 1998 to US\$3.7 billion in 2003 (Blick *et al.*, 2000). Given a lower ERP adoption rate when

compared to that observed in the private sector, one could ask if this is due to the specificities of public organizations in the use and management of IT.

Studies on IT management have been directed at establishing their particularities in the public sector relative to those in the private sector. These studies are founded upon general differences between public and private organizations related to a) environmental factors, b) organization/environment transactions, and c) internal processes and structures (Caudle *et al.*, 1991). For Heintze and Bretschneider (2000), private organizations differ from public organizations at the environmental, organizational, and individual levels. At the environmental level, public agencies have a tendency to be more strongly influenced by the political than by the economic environment, which imposes a short-term vision, strong measures of accountability, and tasks performed under the watchful eye of the public. At the organizational level, public organizations have a tendency to have more rigid hierarchies and structures, and more paperwork, especially in personnel systems. At the individual level, managers and employees differ from their counterparts in the private sector in, for instance, responding to incentives, identifying with their organization, and being satisfied in their work.

Do these particularities of the public sector have an incidence on the adoption, use, and evaluation of IT? For Bajjaly (1999), private and public organizations may have essentially the same needs in information management and the same potential for the strategic application of IT. Caudle *et al.* (1991), however, have shown that where content is concerned, if the main IT preoccupations of managers are identical in the two sectors, the order of importance is markedly different. Moreover, these authors found that in the public sector, top-level managers, that is, political appointees, are less inclined toward the development of new IT applications than middle-managers, that is, career managers. This suggests that if IS success in general and ERP systems success in particular greatly depend on the support of top-managers in the private sector (Akkermans and Helden, 2002; Nah, Lau and Kuang, 2001; Esteves and Pastor, 2000), IS development strategies in the public sector should put greater emphasis upon middle-management.

3. MOTIVATIONS FOR THE ADOPTION OF ERP SYSTEMS

What can motivate an organization to adopt an ERP system, knowing the high cost and high risk of facing complex implementation problems? Several authors have taken a general interest in the motivations for adoption of ERP (e.g., Stewart, Milford, Jewels, Hunter and Hunter, 2000). For Oliver and Romm (2000), there are three categories of factors that determine an organization's initial search for an ERP solution: 1) the need to improve the performance of current operations, 2) the need to integrate data and systems, and 3) the need to prevent a competitive disadvantage or a business risk from becoming critical.

Ross and Vitale (2000) identify six reasons generally cited by enterprises, classifying them into three categories (infrastructure, capacity, and performance) and underscore their overlapping character: The new common systems platform (infrastructure) makes it possible to acquire new capabilities (process improvement, data visibility), which in turn are supposed to allow improvements in organizational performances (cost reduction, strategic decision making, customer responsiveness). Parr and Shanks (2000) take up the same motives, but give the categories different names: for them, motives are of three orders, i.e., technological (common platform, obsolescence of legacy systems), operational (process improvement, data visibility, operating cost reductions), and strategic (Y2K compliance, multi-site standardization, customer responsiveness, decision-making improvement, need for efficiencies and integration, business restructuring).

A few empirical studies have looked at public sector motivations for ERP. Chang *et al.* (2000) found that public agencies, increasingly adopting ERP systems to replace their operational and control systems, are motivated by concerns for efficiency. In the case of the Naval Air Systems Command, an

ERP was implemented to increase effectiveness and control costs (Blick *et al.*, 2000). Studying public sector institutions of higher learning in the United Kingdom, Allen *et al.* (2002) found four basic reasons for which these organizations had adopted an ERP system: a) to simplify the complex environment of these institutions, through a common system-interface, (b) to avoid fragmentation and duplication of resources and services, c) to reduce confusion and waste, and d) to allow these institutions to adapt more effectively and more quickly to changes in their environment.

Studies have also been conducted to investigate specific ERP functions such as Customer Relationship Management (CRM). In the government sector, CRM is particularly important since it aims at building an interface between the government and its citizens in order to better meet the citizen's needs. According to Crook, Simmonds and Rohleder (2002), the major motivations to implement CRM functions are to improve citizen satisfaction, to respond to customer demands for new and better services, governmental performance targets, political push/pull, advent of new technologies, security and fraud concerns, and pressure to reduce costs.

In the present study, ERP adoption motivations were typified by combining previously cited categorisations (Parr and Shanks, 2000; Ross and Vitale, 2000). This produced the following four categories: 1) technological motivations, 2) operational motivations, 3) performance motivations, and 4) strategic motivations. Technological motivations have to do with infrastructure; operational motivations concern the improvement of processes; performance motivations are contingent on the will to improve results, both quantitative and qualitative; motivations of a strategic order are linked to a change in orientation in the design and delivery of services. This classification appears to have sufficient discriminating power and completeness for research purposes.

4. METHODOLOGY

For the purpose at hand, we utilized information made public by the largest ERP vendors. Five were selected to begin with: SAP, Oracle, PeopleSoft, J.D. Edwards, and Baan, who together held more than 60% of the world market in industrial systems (Jakovljevic, 2001). Their Web sites were visited to identify and select the public sector ERP success stories mentioned in these sites. Finally, the ERP vendors considered were reduced to three: SAP, Oracle, and PeopleSoft, by taking into account the fact that PeopleSoft acquired J.D. Edwards in 2003 (Panker, 2003), and that there is no public sector organization success story on the Baan (2.7% of the total market) Web site. Lately, in December 2004, Oracle acquired PeopleSoft, for a final number of two companies, but this takeover was not completed at the time of data collection for this study. Stories of implementation available on various sites for which the vendors do not furnish details were not considered. In this way the stories studied here were limited to those that are presented on two to four pages. The Web sites were visited on July 7 and 8, 2004. Table 1 provides a summary of the stories recorded and analyzed. Public success stories have been used in previous empirical studies as secondary case data (Shang and Seddon, 2000).

Org. Vendor	international organization	federal government	province / state	municipality / city	agency / public org.	Total
SAP	2	1	3	5	1	12
Oracle	0	2	0	12	14	28
PeopleSoft	0	0	2	2	2	6
Total	2	3	5	19	17	46

Table 1. *E-government ERP stories recorded and analyzed*

Altogether, 46 stories from 15 countries were recorded, 28 for Oracle, 12 for SAP, and 6 for PeopleSoft. These stories were divided into four categories based on the organization concerned: international public organizations (2), federal government (3 stories), province/state (5), municipality/city (19), specialized public agencies or organizations (17). As ERP vendors structure

their offer in a modular fashion, the various modules described in the stories include the following functions: government portal (21 stories), procurement and supply chain management (SCM) (17 stories), online services (11 stories), and customer relationship management (CRM) (9 stories). The various motivations for the adoption of ERP were identified in each story and coded as 24 binary variables (1: present, 0: absent), that is, 5 technological motivations, 9 operational, 6 performance, and 4 strategic.

5. RESULTS

As determinants of ERP adoption, motivations refer to the initial reasons that led to the ERP adoption decision. Figure 1 presents the motivations found in the stories analyzed, with the relationships posited by Ross and Vitale (2000) between types of motivations. At the outset, a breakdown indicates that there are no significant differences in motivations by ERP vendor and by organization category.

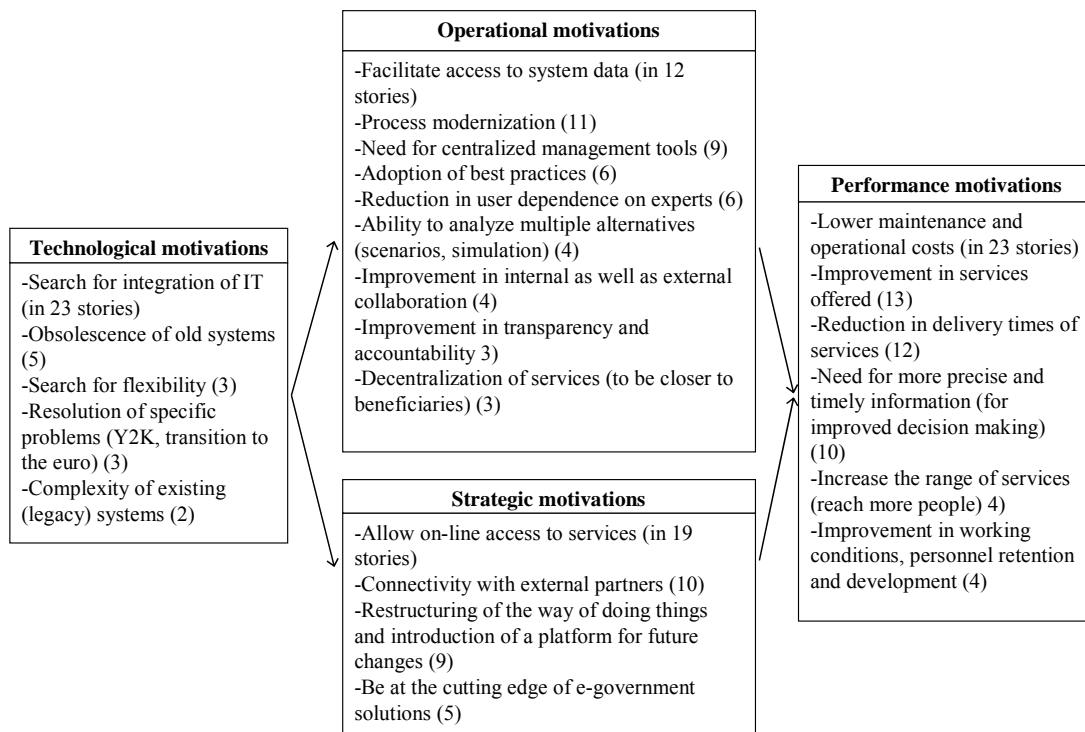


Figure 1. Motivations for adopting ERP in e-government (46 stories)

The most frequently mentioned motivations are of a technological nature, that is, the “search for integration of IT”, and related to performance, namely “lower maintenance and operational costs”, both mentioned in 50 % of the stories. Other motivations present in at least 20 % of the stories include, in the strategic category, “allow on-line access to services” (41 %), “connectivity with external partners” (22 %), and “restructuring of the way of doing and as a platform for future change” (20 %). In the performance category, “improvement in services offered” (28 %), “reduction in delivery times of services” (26 %), and “need for more precise and timely information” (22 %) are the most common motivations. While operational motivations are less important in the stories, they are nonetheless quite varied, the three most important in this category being “facilitate access to system data” (26 %), “process modernization” (24 %), and “need for a centralized management tool” (20 %).

The comparative analysis of these results versus those obtained in research whose objective is to study private enterprise (Oliver and Romm, 2000; Parr and Shanks, 2000; Ross and Vitale, 2000) shows that, in general, the public sector organizations are driven by the same motives as those of the private sector. Nevertheless, there is good reason to note that certain motives can have an impact either more or less significant in the public sector than in the private sector. For example, research of the ability to analyze multiple alternatives may turn out to be a determining motive for public organizations called upon to constantly review their offer of services according to policy changes.

The improvement in transparency and accountability could also weigh more heavily in public than in private organizations to the extent that the actions of the first are conducted in the general interest, and are thus under the watchful eye of the public (Heintze and Bretchneider, 2000; Caudle *et al.*, 1991). Moreover, the necessity to be in phase with e-government put forward in the policies of a certain number of governments constitutes a particularity for public organizations that has no equivalent in the private sector. If private enterprises can be persuaded to adopt ERP, in part by the need to avoid a competitive disadvantage or to avoid a business risk becoming critical (Oliver and Romm, 2000), they are in most cases not subjected to a coordinated pressure forcing them, for example, to unite their forces in such a project, as could be the case in the public sector, the role of coordinator being played by the central government through a certain number of specific policies.

Cluster analysis was used to group the public organizations on the basis of their principal motivations for adopting ERP, that is, motivations common to at least 20 % of the 46 stories. These motivations were chosen as clustering (dichotomous) variables in order to increase their capacity to intervene in the grouping. The SPSS TwoStep algorithm was used as it can handle categorical variables and has the ability to determine the optimal number of clusters, three in this case, as shown in Table 2.

	All stories (n=46)		Process Efficiency (n= 8)	Technology Integration (n=19)	Strategy (n=19)	χ^2
	freq.	%	freq.	freq.	freq.	
Technological motivation						
- search for integration of IT	23	50 %	4	18	1	30.4***
Operational motivation						
- facilitate access to system data	17	37 %	5	6	6	3.4
- process modernization	11	24 %	8	1	2	1.0***
- need for centralized mgt. tool	9	20 %	1	8	0	11.0**
Performance motivation						
- lower maint./operational costs	23	50 %	8	8	7	9.8**
- need for precise/timely information	10	22 %	2	6	2	2.5
- reduced delivery times of services	12	26 %	4	3	5	3.4
- improvement in services offered	13	28 %	3	2	8	5.1
Strategic motivation						
- allow on-line access to services	19	41 %	2	7	10	2.0
- connectivity with external partners	10	22 %	0	1	9	12.6**
- restructuring, platform for change	9	20 %	5	1	3	12.0**

** : p < 0.01 *** : p < 0.001

Table 2. Cluster analysis of stories by main ERP motivations

The first cluster, named “Process Efficiency”, is comprised of 8 organizations (18 % of the stories) whose most frequently mentioned motives are process modernization and lower maintenance and operational costs. For this group, the implementation of an ERP is associated with major changes in government processes that should bring benefits in terms of reduced maintenance and operational costs of actual systems. The second group, “Technology Integration”, is comprised of 19 organizations

(41 %), characterized primarily by the search for integration of IT. These organizations aim to increase the level of sophistication of their IT use by building a common IT architecture that will be supported by the ERP system. In this case, ERP may be viewed as a solution to replace "legacy" systems that are incompatible or do not communicate with one another. The third cluster, named "Strategy" regroups another 19 organizations (41 %) that are principally motivated by the connectivity with external partners and the on-line access to services. For this group, implementing an ERP is justified by the necessity to allow on-line access to government services by citizens, usually in response to the latter's requests for easier and timelier access to government information. Concerning external partners, these can be government suppliers, business, and other governmental entities. In these cases, the ERP can be a worthy solution to the extent that it allows a seamless flow of information between partners and the government's internal information systems.

An added analysis was made to ascertain if there were any differences between the three groups of public organizations as to the main ERP functions implemented. As shown in Table 3, the eight "Process Efficiency" organizations have focused on procurement and SCM functions more than the other two groups. This would denote a basic change in the former organizations in order to modernize their processes, lower their costs and prepare for future restructuring. The "Technology Integration" organizations have mostly implemented government portals and procurement and SCM systems. Indeed, these ERP modules would not be possible without technological integration. This integration is difficult to realize because it usually requires major organizational and managerial changes in addition to the technological ones. The "Strategy" group is the one that gave the most importance to the ERP modules that targeting online services and CRM. This also makes sense since these modules are oriented toward clients and external partners. Overall, there is a strong relationship between what motivates organizations to implement ERP and the module that is chosen. It could be said from these data, that the choices made by the organizations, as reported in the stories, are logical and appropriate.

ERP module	All stories (n=46)		Process Efficiency (n= 8)	Technology Integration (n=19)	Strategy (n=19)	χ^2
	freq.	%	freq.	freq.	freq.	
- government portal	21	46 %	2	11	8	2.6
- procurement, SCM	17	37 %	6	8	3	9.0**
- online services	11	24 %	1	4	6	1.3
- CRM	9	20 %	1	3	5	1.0

** : $p < 0.01$

Table 3. ERP modules implemented by groups of public organizations

6. LIMITATIONS AND IMPLICATIONS

The present study was based on secondary and public data to identify the determinants in the adoption of ERP in e-government. Such data are deemed useful, and have been used in previous studies but they also have their limits. The data utilized having been compiled for purposes other than the research that attempts to exploit them, there is the risk that they do not adequately meet the expectations of the investigator. In our case, we have utilized the success stories published by ERP vendors, and as such we can be concerned about bias due to the selection and presentation of these stories by the vendors for publicity purposes. In this way, for example, more time is spent in these stories on the benefits to be derived from the systems and on the reasons for choosing the vendor; reasons for adoption are treated incidentally, and the difficulties to be encountered are not mentioned at all. We can also question the veracity of this information. This preoccupation has led Shang and Seddon (2000) to interview those in charge of certain enterprises selected by the vendors as success stories, and were

thus able to confirm the veracity of the information reported on the Web sites of the vendors. Moreover, the wording of the stories varies from vendor to vendor, which means that the information that we obtain is not of uniform value. This obviously complicates the comparison of stories.

We can note that the motives for adoption put forward by the organizations are often limited to rational factors, i.e., requirements and problems for which ERP is evidently an adequate solution. This is what Caldas and Wood (1999) call substantive factors, all the while underscoring that they are not the only considerations: there are less evident (or less acceptable) factors, such as institutional and political factors. The first are composed of the external forces present in the organizational environment that push for the adoption of ERP systems, and the others refer to the power plays between different groups inside the organization. The methodology used in the present study could not detect motives that were not the first to appear. It would then be interesting to analyze more thoroughly, beyond the rational and official motives, other institutional or political factors that push for the adoption of ERP in public organizations.

But, it is not enough that an organization be motivated to adopt ERP. In other words, motivation to adopt is a necessary but insufficient condition. There are other factors that can either favour the adoption of ERP, whether by reinforcing the organization in its decision or by facilitating its implementation, or on the contrary hinder it. If it is essential to understand the determinants in ERP adoption, it is just as important, if not more so, to understand what takes place after adoption has been decided: what is the process of selection, what are the exploitation and evaluation conditions, etc. Besides, as noted by Brown and Brudney (1998), even if during the past few years the government services have experienced a proliferation of IT, the benefits they may have derived are neither guaranteed, nor automatic. Studies on the conditions for success of ERP in the public sector are then necessary.

There is also good reason to underscore that we have treated government organization specifically in the present study. Yet, the public sector is characterized by strong diversity, which means that the study could not satisfy specific preoccupations. Hackney and McBride (1995) have, for example, shown that the organizational culture varies as we pass from a hospital environment to local services. As future research pathways, we could carry out more rigorous targeted studies, dealing for example with public organizations having a similar mission (teaching, health, economic development, etc.), or with those that have certain organizational characteristics in common (size, level of government, degree of complexity, etc.). All these investigations would help shed light on the different issues linked to the adoption, implementation, use, and evaluation of ERP in the public sector.

7. CONCLUDING REMARKS

In the present article, we have examined initial motives in the adoption of ERP in e-government. The research contributions lie in a better understanding of the reasons why public organizations decide to implement these systems, the first step in eventually being able to determine the actual impact of ERP-based e-government initiatives on organizational performance in the public sector. A thorough analysis of the motivations of public organizations would help avoid what Markus and Tanis (2000) called the “bandwagon effect”, that is, adopting ERP systems simply because other comparable organizations have done so. Such analysis would also allow ERP vendors to better define their strategies in order to meet the expectations of public organizations.

The trends observed (Dorobek, 2001; Blick *et al.*, 2000) as well as the efforts made by ERP vendors to adapt their products lead one to believe that the adoption of these systems in public organizations will increase, as has been the case in the private sector. As the issue of e-government becomes more critical for public administrations, integrated systems are required in order to enable and better manage government processes, both upstream and downstream, without loss in the quality of service to

citizens. While the experience to date has been that ERP systems can provide benefits, it has also shown that realising these benefits is not automatic and that the risk of partial or total failure is still very high. Thus, ERP adoption, implementation, usage and evaluation issues must be better understood in light of fundamental differences in the various organizational contexts that frame these issues, be they differences between public and private organizations, small and large organizations, or service and manufacturing organizations.

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