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Technical isomorphism at work: ERP-embedded similarity-enhancing mechanisms

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Abstract

Purpose – The purpose of this paper is to discuss the mechanisms inducing a user organization to conform with enterprise resource planning (ERP)-embedded organizational logics and accompanying implementation procedures.

Design/methodology/approach – Based around the notion of technical isomorphism, the authors describe and analyze how ERP-embedded mechanisms work out in a Dutch utility company. Interviews and document analysis were conducted with key informants over a number of years.

Findings – The company intentionally and unintentionally self-enforced its steering towards conformation with its ERP-system (SAP) through a number of strategic decisions during the adoption and implementation phases.

Research limitations/implications – This case study is the first empirical analysis of an ERP implementation through the lens of technical isomorphism. Further validation of this perspective and these case study results can be used to study other ERP vendor industry combinations.

Practical implications – Prior to adoption, ERP users and their "implementation partners" should analyze intended as well as unintended consequences for their operational processes and organizational design. ERP-embedded organizational logics may be at odds with organizational preferences. If detected early, such mismatches may be corrected.

Originality/value – The paper demonstrates the role of an ERP-provider in enhancing inter-organizational similarities.

Keywords Manufacturing resource planning, Services, Information systems

Paper type Research paper

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Introduction

SAP, the world's leading vendor of enterprise resource planning (ERP) software, put it succinctly: "SAP isn't a software package, it's a way of doing business" (Davenport, 1998, p. 125). SAP undoubtedly meant to stress the far-reaching positive effects of using its software. Yet, the SAP way of doing business may not always be compatible with a client's preferences or even needs. For ERP software to function, it must meet both technical and organizational requirements. Given that ERP is seen as "integrative" (Gulledge, 2006; Light and Wagner, 2006) suggesting tight coupling of technical and organizational aspects, the issue arises whether both can always be made compatible. This becomes even more essential given the importance of aligning IS/IT with corporate strategy (Henderson and Venkatraman, 1993; Luftman, 2003) and its performance (Kearns and Lederer, 2000). Furthermore, as Deephouse (1999) stressed, firms must also find a strategic balance between conformity and differentiation: one needs to keep up with competitors and conform to external norms of various natures, and at the same time distinguish oneself from those competitors to achieve competitive advantage.

With ERP-systems becoming increasingly common (Moon, 2007), it is vital for managers to realize that their use easily leads to increasing similarities between organizations. When ERP-embedded practices are enacted, operational processes come to fit the ERP-embedded standards and therewith those of arguably the majority of other user organizations. Given that these are a user organization's competitors, that organization's distinctive characteristics may erode or even completely disappear. This is not necessarily problematic. Deviations from an industry-standard may be dysfunctional, and ERP-embedded "best practices" may in fact become an "industry solution": ERP-implementations often entail a long overdue assessment of the efficacy of existing processes. However, at the same time, an organization's competitive advantage is also a deviation from the standard. In this case, however, the deviation is valued positively.

Benders *et al.* (2006a) introduced the term "technical isomorphism" to stress the homogenizing effects that new technical systems may induce. In the case of ERP-systems, this notion is relevant when ERP-embedded organizational practices are enacted (Orlikowski, 2001) when implementing, configuring and/or using this software (Dery *et al.*, 2006). ERP-usage is likely to lead to increasing inter-organizational similarities in operational processes. This paper illustrates empirically how various pressures to conform are present in the standard implementation approach of the world's leading ERP-provider, SAP. To do so, we first elaborate the concept of isomorphism and relate it to using ERP-systems. The core of the paper is a discussion of an implementation process at ServiceCo, a Dutch utilities firm. We end by discussing our findings.

Isomorphism and ERP-systems

In their influential article "The iron cage revisited," DiMaggio and Powell (1983) launched their proposition that organizations are subject to various pressures inducing "isomorphism," i.e. similarity in forms. As complements to economic competition as an explanation for isomorphism, DiMaggio and Powell defined three forms of "institutional pressures" to explain isomorphism: coercive, mimetic and normative pressures. Coercive forces result from other organizations upon which an organization is dependent and cultural expectations in society, as for instance elaborated in legislation. Imitative or "mimetic" forces stem from standard responses to uncertainty.

Decision makers often face uncertainty about appropriate responses to environmental changes. Mimicking the choices made by leading competitors is a way of dealing with this. Normative pressures result from professionalization. Particular norms are often institutionalized within occupations and reproduced through selection, education and professional control.

Benders *et al.* (2006a) introduced a fourth type of isomorphism, namely through the use of technical systems. This "technical isomorphism" results from the embeddedness of organizational procedures and business rules within technology (understood both hardware and software). The inscription of organizational notions into software occurs intentionally or comes about unintentionally in the process of system development and software design. This notion was already put forward in a publication of Conway (1968) on organizations that design systems such as program language compilers and weapon systems. Conway discovered that these systems reflect the size and communication structure of the organizational units that designed them. In a similar vein, Orlikowski (2001) described how software designers develop software to support their own preferred working habits. In the case of Lotus Notes for example, the designers' non-hierarchical and cooperative ways of working resulted in software that fit group work well.

Le Loarne (2005) discusses a similar example, but now of an ERP-system. She researched the implementation of the purchase module of SAP within a Department of Pechiney, a multinational firm specialized in the extraction and transformation of raw materials. With the implementation, the purchase procedure as formalized in eight sub processes and preprogrammed within SAP R/3 became leading and prescriptive. Through the compulsory procedures as incorporated within the SAP system, over 70 percent of the users indicated that their tasks were formalized to a significant extent. A quote illustrates this point: "(SAP) is Prussian. We sometimes seem to wear a spiked helmet!" (Le Loarne, 2005, p. 526). A main observation was that SAP reduced the local of degrees of freedom of purchase managers to by-pass certain operations and/or to speed up decision processes. They were permanently forced to enter certain data before continuing to the next process step. As a result, deviations from standard procedures became common, especially if transactions were non-standard. Well-designed validation rules were resisted by employees using each other log-in numbers (and even their bosses) in order to work around the systems, refusing to change their habits.

In the following, we discuss how technical and institutional isomorphism is enhanced during the adoption and deployment of ERP in a Dutch utility company implementing SAP. We describe how isomorphic forces manifest during the processes of organization change and adaptation.

Methodology and background of the ServiceCo case study

In this section, we draw selectively and interpretatively (Sturdy, 1997) on a case study of a large Dutch utilities firm, named ServiceCo in this paper for privacy reasons. We describe the IT-policy of this firm since 1988, the year it adopted SAP R/3. In particular, we focus on the period 2000-2002 during which a specific SAP-module was implemented. Various kinds of data were collected and cross-validated by triangulation. Besides being given the opportunity to conduct interviews, we had access to internal and partly confidential documents. These data were collected on a participative and longitudinal basis. With the aid of one key informant, a snow-balling approach was used leading to an emerging network of seven IT-managers and SAP-users who were questioned

informally and by in-depth interviews in 2002. The interviewees were working at several hierarchical levels, and include employees from SAP and the implementation partner (one of the world's leading consultancies). Before starting the interviews, the aim of our project discussed with the interviewees. After the interviews, a concept transcript of the interview was read and commented by one of the key informants.

ServiceCo was established in 1963 when large fields of natural gas were discovered in The Netherlands. Pursuing to exploit these natural gas fields, the Dutch Government and a number of two commercial partners established ServiceCo to generate the necessary infrastructure and organization of the distribution of natural gas. In 1998, the European Union decided to establish a collective and competitive European energy market. As a result, in 2002, ServiceCo was split into two separate organizations: one part taking care of the gas infrastructure, the other part developing commercial activities within the newly emerged European liberalized context. Our case concerns the first part, referred to in the remainder as ServiceCo. ServiceCo thus facilitates the transportation of natural gas for various national and international suppliers. Suppliers need to request transportation capacity from ServiceCo for delivering natural gas. After a delivery, exact quantities are measured and prices are finally determined. Prices may vary due to an elaborate system (tariff structure) of various sorts of discounts and penalties associated with the transportation of gas. To prevent monopolistic practices, this tariff structure is monitored by a national regulatory association. As demonstrated below, the tariff structure is an important determinant of both the management control and process management within ServiceCo and therefore a key issue for its automation policies. This background is important to understand the emerging importance of SAP for ServiceCo during the last decade. In the next sections, we first describe the mechanisms behind the adoption decisions, and subsequently the interrelation between ServiceCo and SAP's policy during the deployment trajectories.

Results

Phase 1: adopting SAP

ServiceCo decided to adopt SAP as its leading software in 1988 (the same year as the organization was split). The adoption was a strategic decision, as the intention was not only to synchronize the organizational transformation with a technical change but also to make a significant step to stay ahead of its competitors. Over time, the extent to which SAP software is used within the organization was expanded gradually. The package was rolled out module by module. Over the years, new releases were installed. ServiceCo and SAP became increasingly interconnected and interdependent, as ServiceCo was one of the first users of SAP within the Dutch utilities sector.

The adoption decision strongly influenced the new IS/IT strategy of ServiceCo. As described below, this set the preconditions for implementing and deploying SAP. In effect, this started a process of increasing conformance to software-embedded norms. This can be illustrated by following three key elements in the adoption phase:

(1) *The "SAP unless" policy*. Leading for all IT-decisions became the rule of thumb that not too much should be added to the standard (SAP) software. The guidelines for SAP projects as formulated by ServiceCo's IT department entail the principle that maintenance and management costs should be minimized by applying the standard SAP package. Functionality not fitting SAP-standards should, in principle, be adjusted through organizational changes, making the

software became leading for process design. However, deviations from this rule were possible after formal permissions. Internal reports communicate that ServiceCo's SAP policy is based on using standard applications, cost savings through uniformity and standardization, the strategic choice for SAP as the market leader of ERP software, and integration by the supplier. This strategy has become known as the "SAP-unless Policy." This policy implies that for each and every IT application to be (re)developed, it is first assessed whether the required functionality is available in SAP. If not, an alternative is purchased or developed internally. The consequence of this policy is that all IS/IT within ServiceCo will be realized in or converted to SAP.

(2) *The SAP Customer Competence Center (CCC)*. Another adoption decision was to establish a SAP CCC as part of ServiceCo's IT department, consisting of ServiceCo employees with expertise on SAP-related issues. A SAP CCC needs to be organized according to principles and criteria set by SAP in order to be certified and to be allowed to carry the actual name "SAP Customer Competence Center." On the operational level, the CCC takes care of all aspects of IT governance, including service management as well as the promotion of SAP. The CCC at ServiceCo actively assesses the possibilities of SAP for current and future business processes. Integration is considered to be a major challenge. The company has an interest in maintaining a CCC as this allows to solve problems in-house, thus preventing the hiring of expensive external SAP specialists. In case an issue cannot be resolved internally and external expertise is needed, SAP offers reduced rates to clients with a CCC. The latter is one way through which SAP encourages the creation of CCCs. CCCs easily turn into internal SAP advocates, for one thing because the interests of CCC employees are closely aligned with using SAP. This is likely to influence subsequent IT adoption decisions. CCC are monitored and audited on a regular basis. One of the audit rules to stay certified as CCC is that an agreed maximum of calls, i.e. support requests to SAP, may not be exceeded.

(3) *The SAP Industry Solution/Utilities*. A third important element of the adoption phase was that SAP and ServiceCo decided to cooperate in realizing the SAP Industry Solution/Utilities (IS/U). After its development, SAP IS/U was promoted as the "only supplier of an integrated system specifically for the utilities sector." SAP and ServiceCo extended their cooperation by involving other utility companies. At a strategic level, SAP and ServiceCo started the Working Group "SAP@Industry" with five other European gas companies. The initial task was to investigate the necessary improvements in SAP IS/U to create a suitable solution for the gas transmission and sales business in the deregulated market. Thus, ServiceCo did not only take the lead in creating the industry standard IS/U, but also took steps helping to disseminate it.

These three initiatives clearly demonstrate that, from the beginning, ServiceCo was highly motivated to fully adopt SAP, incorporate its philosophy internally and even promote it externally. The adoption phase can be characterized by high expectations and a strong spirit to redesign and innovate the organization, and to take the lead within the Dutch utility industry.

Phase 2: deploying SAP

The SAP system, its modules and accompanied implementation procedure practically orchestrated the deployment process at ServiceCo. During the implementation phase it became clear that the possibilities for specific requirements and modifications during the implementation were either very limited or close to impossible because of its complexity, fixed agreements with SAP and financial consequences. Three key elements were to encourage conformation to SAP standards:

(1) *The Accelerated SAP (ASAP) methodology*. Soon after the adoption phase it was promptly decided at ServiceCo that ASAP has to be the basis of every internal SAP project. In practice, this meant a strong confirmation to this linear-sequential implementation method. ASAP is based on an additive (cumulative) list of five consecutive stages. This clearly constrained ServiceCo's future leeway for maneuvering freely when confronted with different procedures or deviant project conditions during the implementation. Although to some extent organizational particularities can be specified within the business blueprint stage, ASAP requires that subsequently these aimed business procedures are frozen and turned into module configurations, parameters, authorizations, tools, screen and report settings (standardized configuration tools, cf. Carr, 2004, p. 47).

(2) *The SAP blueprints*. As mentioned previously, the business blueprints are not offered within ASAP as a green field situation to the user organization but with a pre-designed format based on a set of best practices. Based on experiential data, blueprints are developed from successful projects into more generic templates. At ServiceCo, the best practice or business blueprint model predefines functions as roles and standard authorizations.

(3) *Change request policy*. During or after the implementation additional enforcing mechanisms were at work. Each modification of the software has to be approved by SAP. To remain certified, the CCC (see above) needs to restrict the number of "escalations," i.e. modifications to the SAP standard software. If the maximum number of escalations is exceeded this could lead to the loss of the certificate. Clearly, SAP aims to limit the attempts of customers to modify their standard software. In the case of ServiceCo, users and managers experienced that if modifications are not reported to SAP, the vendor does not provide any support to problem situations caused by these particular modifications. Although ServiceCo and SAP held a mutual beneficial relationship, as described above, the change request policy clearly expresses SAP's bargaining power if it comes to modification of the software. Consequently, ServiceCo was further induced to conform to the standard SAP system, software and procedures.

These three characteristics of the deployment phase at ServiceCo clearly illustrate the implications of technical isomorphism as a consequence of the self-fulfilling (but unintended) lock-in decisions made during the adoption phase. The flexibility problems during the deployment sharply contrast with the constructive initiatives that were taken during the adoption phase. While the initiation of the SAP-unless policy, the CCC and the Industry Solution within ServiceCo were strategic decisions, the operational restrictions during the module implementation were felt by a large number of employees. For instance, a project member stated:

> With regard to the Customer Interaction Centre – that is a standard comprehensive functionality from which it is difficult to cut out certain things. So it would be very clumsy not to work with it. I don't think you're very smart if you're going to group things into your own screens and so on and then work that way. So SAP indeed prescribes for a large part. And that is also their story: best practice, we have done so-and-so many implementations, we are in fact the best capable to create an optimal way of operating with our systems.

At the shopfloor, the SAP industry solution was criticized by employees stating that:

> You surrender to an ERP supplier, you hang yourself. And you can't do it in a different way these days.

At one point, even the implementation partner tried to discuss ServiceCo's SAP unless policy. One consultant stated that:

> It was almost taken for granted that IS/U offers the required functionality and warned for the danger of misfit between the business requirements and the functionality offered by SAP IS/U.

Discussion

Both at the adoption and the deployment phases, various decisions were taken that had the cumulative and self-reinforcing effect of an increasing conformance to SAP-procedures. These decisions may be interpreted as having been taken by managers out of their free will, yet at the same time SAP encourages conformance to its standards. Deviations are possible, but not necessarily seen as wise. The "SAP unless-policy" is a strong expression and at the same time driving force in this respect. ServiceCo chose to adopt this policy, which drives internal standardization: it quite literally declares SAP to be the norm. Deviations from that norm are possible, but must be argued for. The creation of a SAP Customer Contact Center (CCC) implies that a group of SAP experts comes to "inform" many IT-related decisions, which further supports the further expansion of SAP both in cognitive and in symbolic terms. Strong expertise is present to support SAP, not other software, and the CCC symbolizes SAP's dominance. SAP's policy to certify such centers undoubtedly has the effect of reinforcing its power position within user organizations. ServiceCo's role in developing "Industry Solutions" is an interesting one: rather than conforming to existing standards, it gets the chance to contribute to standard setting for the industry. ERP-providers in general seem quite keen on establishing such industry standards (Wagner and Newell, 2004). Many clients seem to perceive them as an important means to improve their current operational processes, turning an ERP-implementation into more than only ameliorating their information systems.

In the deployment phase, SAP's ASAP methodology and its blueprints are compelling drivers to stay within SAP domains. The change request policy guarantees that any deviations from SAP standards are carefully considered and more importantly, that the number of such deviations is restricted. ServiceCo deliberately followed SAP's standard implementation and project management approach, thereby accepting future restrictions.

The net effect of both phases is what Ortmann (1995, pp. 37-41) calls a "decision corridor." Past decisions create situations which limit the freedom of choice for

future decisions. Managers are constrained in making strategic choices by the situation they are in. Their subsequent decisions normally have the effect of reinforcing the status quo, or in Ortmann's metaphor lengthening the walls of the corridor within which the managers move. Any investment, whether in an ERP-package or other production or information systems, leads to a need to use that investment, even if it does not function as it should. Once installed, it is difficult to stop, if only because a substantial investment has been made. Subsequent decisions generally taken have the effect of putting the package firmer in the saddle. SAP policies reinforce this. "SAP unless"-policies, ASAP and "Industry Solutions" are procedural mechanisms to encourage user organizations to walk further down the SAP-corridor, thereby reinforcing and in a figurative way extending it.

All these processes exemplify "technical isomorphism at work," i.e. they illustrate the presence and workings of ERP-embedded similarity-enhancing mechanisms. These consist of pressures of various kinds, both external (SAP) and internal (ServiceCo), influence decisions which both form and reinforce previous tracks, thereby creating the "SAP corridor." As the proverb "you can bring a horse to the water but you cannot make it drink" implies, technology provider SAP cannot force its users to conform, but can influences the situation in such ways that it is seen as rational to conform to SAP standards.

Managerial and policy implications

Our study has several implications for practitioners. Firstly, managers need to be aware that implementing ERP-packages is likely to have isomorphic effects. Rather than finding out in the post-adoption phase, this should be realized before purchasing a system. In other words, isomorphism should result from conscious decision making rather than becoming an unintentional outcome. Such an insight requires an assessment of the main organizational consequences of implementing the software, and thus close cooperation between managers, the organization's IT-staff, key users and implementation partners as well as an insight into potential organizational consequences. This involves cross-cutting functional and power barriers, issues which are easier said than done (Howcroft and Wilson, 2003; Buhl and Richter, 2004). Managers' current knowledge of ERP-systems seems often insufficient to foresee even some of the main organizational consequences of their decisions. Furthermore, managers should realize that what are declared to be "best practices" may not be "best" for their organization. However, appealing "best" may sound, the efficacy of any practice is to be judged in its local context (Wagner and Newell, 2004). This idea is closely related to the concept of situational methods as developed for IS Development as well as IS implementation (Van de Weerd *et al.*, 2006). In line with this, managers should notice the classic adage "first organize, then automate" (Benders *et al.*, 2006b; Davenport, 1998). IT-systems are to support organizational decision making, but may have the effect of compensating for improperly designed processes. Rather than enabling the latter's sustenance, process and organizational (re)design should be considered prior to implementing IT-systems. Given the inherent centralistic logic embedded in ERP-systems, unwanted centralization may occur if IT-system take precedence over organizational considerations (Koch and Buhl, 2001).

Conclusion

Our case study showed how an organization was pressured towards conformance to SAP-standards, as a result of SAP-initiated mechanisms and procedures and its own decisions. As a result, it gradually moved further down an "SAP-corridor" thereby increasing its own dependence on this software. Where and when to conform and where to deviate from external standards is a quintessential issue for organizations and a key question in strategic balancing (Deephouse, 1999). We suspect that, given the technical nature of ERP-induced isomorphism, much inter-organizational similarity results unintentionally and may even be unwanted. This proposition, however, can only be investigated empirically.

Future research can take a number of directions. In the first place, SAP as market leader has probably more resources than its competitors to build the "conformation pressures" we outlined in this paper. To validate this assumption, researchers might as well study the strength and forms of such pressures for other ERP vendors. Secondly, the origin of different ERP packages vary (Rondeau and Litteral, 2001), for instance from database supplier (Oracle), producers of software for production planning (Baan) or for human resource management (Peoplesoft). Comparing software packages of several vendors may disclose different architectures and organization design assumptions inscribed. Thirdly, technical isomorphism at work will be visible most sharply when there is a direct contrast between organizational preferences on the one hand, and ERP requirements on the other. A key question that follows from this: under what conditions and using what criteria do organizations decide to deviate from or conform to the ERP norm?

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