Sticking to standards; technical and other isomorphic pressures in deploying ERP-systems

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Abstract

This paper focuses on how and to what extent homogenization coincides with the deployment of ERP-systems. Using the work of DiMaggio and Powell on isomorphic pressures, we argue that the use of ERP-systems may in several ways lead to standardization within and between organizations. Competitive and institutional pressures play a role in ERP-adoption. We introduce a novel form of isomorphism, technical isomorphism. This plays a role in ERP-implementation and manifests itself in the enactment of blueprints for centralization and standard working procedures that are embedded in the ERP-software. A case study of a Dutch publishing company illustrates how coercive and technical isomorphism jointly lead to adaptation of the organization to the system, although the firm aimed to differentiate itself from its competitors.

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1. Introduction

In their quests for competitive advantage, organizations adopt or develop innovations. Enterprise Resource Planning (ERP) systems are such an innovation; their general aim is to enable central and integrative control over all processes throughout the organization by ensuring one data entry point and use of a common database [5,13]. However, adopting ERP-systems may be at odds with gaining competitive advantage, which calls for a unique position that is hard to imitate, whilst ERP-systems are widely used [3]. This apparent contradiction can be fruitfully explored by drawing on DiMaggio and Powell’s classic treatment of the concept of isomorphism [15]. They describe several reasons why organizations are similar or isomorphic. Our paper was developed to present an inventory of pressures that may affect the adoption and use of ERP-systems. The key question is therefore: How and to what extent does homogenization coincide with the deployment of ERP-systems? By
addressing this question, we attempted to clarify some important mechanisms that are ignored when considering and managing ERP-implcitations.

2. Isomorphism

In their influential article *The Iron Cage Revisited*, DiMaggio and Powell elaborated the concept isomorphism: the phenomenon that practices and process are quite similar across organizations. They argued that various pressures induce organizations to become similar to their competitors. Until publication of their article, competitive pressures were widely considered as drivers of isomorphism; competition in product markets allows only effective and efficient producers to survive, as sub-marginal ones go bankrupt. Thus the punishment for ignoring superior techniques is organizational death and therefore non-adopters are eliminated and the remaining population has only adopters.

DiMaggio and Powell added another concept: institutional isomorphism, which may occur through three mechanisms:

- **Coercive forces** result from other organizations on which the institution is dependent (such as governmental agencies, headquarters, important clients) and cultural expectations in the society where it functions (such as legislation and societal norms on corporate governance, stakeholder management and affirmative action).

- **Imitative or mimetic forces** are standard responses to uncertainty. Decision-makers often face uncertainty about appropriate responses; mimicking the choices of other organizations is one way of dealing with this. Managers thus assume that appropriate decisions were made elsewhere, often by a leading competitor. Such pressures may be especially strong when particular concepts and tools are fashionable [4] and managers feel pressured to adopt concepts in vogue appear up to date.

- **Normative pressures** result from professional organizations or strong. Some occupations have established organizations that control or affect their profession by defining entry to the field and setting enforceable norms to which professionals must comply [18]. Examples are lawyers, certified accountants, medical professions, and those organized in medieval guilds [1,28].

DiMaggio and Powell stress that these forces are distinguishable analytically but not necessarily empirically: they often act in conjunction. Also, the strength of isomorphic forces varies: whilst governments may be able to enforce their norms through legislation and legal enforcement, decision-makers in organizations are free to comply with or ignore mimetic forces. In general, human actors are totally free to decide whether or not to conform to isomorphic pressures. However, coercive forces are often much more ‘guiding’ than mimetic ones.

Mizruchi and Fein [29] point out that North American researchers generally focused on institutional isomorphism, and neglect competitive reasons. In particular, they showed that mimetic isomorphism has been the most popular mechanism in research. Studies have been mainly conducted in non-profit environments, such as schools, universities, and municipalities. Walgenbach and Beck [44] showed that machine-tool companies were also subject to institutional pressures. In our work, we applied DiMaggio and Powell’s notion of isomorphism to a specific domain: the adoption, implementation, and use of ERP-systems.

3. Adopting ERP-systems

Authors present some or all of the following arguments in favor of adopting ERP-systems [22,34,35]:

- integration of business processes through integration across modules (applications) by using one ERP architecture;
- integration of key business and management processes to provide a central overview of organizational affairs;
- access to enterprise-wide data on a controlled basis and thus providing information sharing across business processes;
- coordinating and monitoring performance is possible in real time;
- shifting from a tradition functional mode to a business process mode;
providing 'end-to-end connectivity,' thereby bringing functions and divisions together;
integrating geographically dispersed subsidiaries in multinational firms;
providing smooth, continuous, and coherent information flows in the entire value chain;
having a single uniform and coordinated information systems;
sharing one core database for storage and retrieval to reduce redundancy and inconsistency;
removing incompatibility of computer hardware and software systems ('islands of automation', disparate systems).

All these can be classified as “competitive” in nature; they refer to functional-rational goals such as increased efficiency in providing information and more effective decision-making due to an improved insight into the state-of-affairs.

However, it is extremely difficult to conduct reliable investment or cost-benefit analysis of ERP-adoption [27]; especially if the costs occur in imperfectly managed implementation processes [26] or there is insufficient data about the initial versus estimated benefits. These problems are aggravated if the benefits are mostly intangible: ERP-implementations are not laboratory experiments and this makes assessment of the economic impact virtually impossible. Uncertainty about the exact effect of a decision leaves considerable room for other than economic reasons. Interpretations, beliefs, and persuasiveness come to play a role. As the effects are uncertain, following competitors’ actions appears to be a safe choice. Caldas and Wood [10] found evidence in a study of 28 ERP implementations processes in 1998. They interviewed two respondents per implementation (an implementation agent and a key user) within large and mid-sized organizations in a large number of industries; respondents mentioned the following reasons that an ERP-system should be adopted:

- integration of process and/or information (91%);
- following the trend (77%);
- pressure from the IT function (41%);
- pressure from the head office (41%);
- avoiding giving up space to competitors (37%);
- internal political reasons (31%);
- media influence (29%);
- influence of management gurus and consultants (23%);
- pressure from clients and/or suppliers (11%).

This list clearly differs from that presented earlier. The first is well in line with previous arguments but the others refer to non-economic pressures resulting from external trends or specific parties; i.e., isomorphic forces.

Reasons such as following the trend, media influence, and influence of management gurus and consultants are examples of mimetic isomorphism. This is particularly noticeable in the package selection process, an important phase of the ERP adoption trajectory [24]. For example, a Dutch training institute commissioned an extensive evaluation study to select the most appropriate ERP software. A list of criteria was developed and several packages were examined, resulting in package A being selected. However, the institute’s top manager decided to adopt package B. The manager argued that from talks with fellow managers at other training institutes that package B was their choice. Thus, mimetic pressures came to weight more heavily than an economic-rational analysis. Van Everdingen and Waarts [41] showed that personal networks (colleagues, peers, or friends) play an important role in ERP-adoption.

Another important reason was avoiding giving up space to competitors. This follows mimetic isomorphism, but it also seems motivated by economic-rational reasons. Organizations’ market structures drive strategic behavior, e.g., achieving competitive lead by being the first mover. Aiming to stay ahead has, however, several counter effects. The initial investments are relatively high and can easily turn into sunk costs. In addition, competitors can economize on others’ experiences preventing them from having to fund expensive failures.

Finally, the list contains explicit pressures from IT function, head office, clients and/or suppliers, the coercive forces of isomorphism. Pressure from IT-staff may be understood as normative pressure, yet head offices, clients and suppliers clearly represent the dependency of organization within their value chain. Coercion occurs when company headquarters force subsidiaries to follow a company-wide ERP-program [25]. Motivations for such programs may be the desire to coordinate and control the activities of geographi-
cally dispersed subsidiaries or to reduce the costs of corporate information management. Especially after mergers and acquisitions, the integration of various IS into a company-wide system is often an issue. From the point of view of the subsidiary, however, this is coercion that potentially affects local autonomy and may even be at odds with local procedures.

Isomorphic pressures often operate together. For instance, a large Dutch utilities company felt forced to react to many upcoming and ongoing external developments. The executives decided that reviewing IS and integrate them into one infrastructure would be a most important step in dealing with the business drivers. This decision was heavily based on the common ideas that had rapidly diffused through the Dutch utilities. To keep up with the new demands for energy production and trading, innovative utilities companies decided to implement ERP-systems. Many competitors had already invested in SAP and top management felt they should follow them. As a result, SAP became the local industry standard for the energy sector in the Netherlands [2]. Thus, both mimetic and competitive arguments played a role and reinforced one another.

4. Implementing ERP-systems

After an adoption decision has been taken, the software needs to be installed and implemented. A key issue in the process is in aligning the ERP-system with the user organization’s features. This is obvious when consulting the inventory of critical success factors proposed by various authors (e.g., [20]). The questions are:

- Does the technology or the organization play a leading role in this alignment?
- Is the ERP-system made to fit the organization or are organizational changes needed to be able to work with the package?

Whilst both may occur, we argue that organizations have to adapt to the systems rather than the other way around. Indeed, there are several cases where large organizations have requested change and had to give up using the ERP system as the vendor could or would not comply. By conforming to the ERP-embedded procedures, homogeneity occurs.

4.1. Intra-organizational standardization

Large organizations with many subsidiaries often are incompatible in their information systems, especially when they have grown primarily through mergers and acquisitions. For instance, a Norwegian oil company wanted the implementation of the ERP-system to be guided by the concept of common operations managed in a common way; its management strived for common reporting routines and SAP was chosen as a vehicle to enforce the standardization; Bingi et al. have also discussed the way that Digital Equipment Corporation used Peoplesoft as a way to achieve worldwide standardization of its HR as well as move towards a common IT-architecture and infrastructure.

4.2. Inter-organizational homogenization

Homogenization between organizations is considerably more complex than the explicit motive of achieving common working procedures within an organization. Intentionally or unintentionally, standard working procedures embedded in the software are often adopted during the implementation process. As Clausen and Koch [11] suggested, the power of default is strong.

4.2.1. Best practice

Many managers appear to be attracted by the option of implementing the ‘best practices’ embedded in ERP-systems [30,43]. ERP-suppliers and their implementation partners often gain industry-wide experience through working in several organizations in one industry sector. This puts them in a position to compare organizations and study the differences in ways of doing business. The best business process can then be modeled as a preferred working procedure and incorporated as an option in the ERP-package. For instance, SAP accumulated its experiences in delivering and deploying the R/3 system and simultaneously developed models of industry business processes. Designers choose those processes that were considered to be the best practice. Thus industry-specific versions of SAP therefore drive the organization towards standardization. These versions are obviously less generic but incorporate local or industry standards by pre-configuring the R/3 system. Best practices are
therefore often seen as a way to implement better organizational processes.

Some managers realize the negative aspects of disseminating of ERP-systems practices: if best practices are incorporated as standard procedures, competitors can quickly catch up. Large IT consultancies sometimes focus on certain industries and develop their own standard solutions. However, their value may be limited when more user organizations are involved [33].

4.2.2. The risk of non-conformance

Swanson states that:

“attempting to mold the package to idiosyncratic business process requirements may for many firms pose the greatest risk” [40].

Even more explicit is the statement that:

“If a buyer’s business practices don’t follow R/3’s design, the business must redesign its practices so it can use the software. Basically, R/3 is more than a software package – it’s a way of doing business” [8].

Most difficulties in projects emerge when the ERP-software needs to be implemented and tailored to buyer specific processes and requirements [38]. A good example may be found in the study by Hong and Kim who investigated the effect of organizational fit on the success of ERP-projects. They surveyed 106 ERP projects in 59 firms, empirically defining organizational fit in terms of data, process, and user fit. As expected, organizational fit positively correlated with success. Misfit analysis (to define the needed level of ERP adaptation) and resolution plans (to ensure process adaptation) mitigated project risks. In particular, Hong and Kim argued that:

“Beyond a certain level of organizational fit, more adaptation will only lead to lower implementation success. We also learned that, since ERP adaptation also shows a significantly negative direct correlation with implementation success (while process adaptation only shows interaction effect), as many ERP vendors have claimed, process adaptation may be a safe choice than ERP adaptation when organizational fit of ERP is low.”

Thus, non-conformance to ERP-embedded standards increases the risk of project failure. However, our study defined project success in terms of pre-determined goals of the implementation project. This left undiscussed the actual performance of the implemented software: a project can be successful in meeting pre-set deadlines but “deadline-driven” decisions may lead to problems once the package is operational.

4.2.3. The power positions of individuals

In most cases, software engineers and implementation partners are the most powerful actors in the implementation process; thus their preferences weigh heavily and may dominate the result [9]. Implementing an ERP-system involves many uncertainties and organizations tend to rely on external parties. Hong and Kim are very explicit about the attitudes of ERP-vendors vis-a-vis clients; they state:

“Many ERP vendors just ignore the organizational fit concept and urge blind trust on ERP from their clients”.

In addition, Gefen [17] studied the relation between ERP-vendors and their clients as relations of trust. Gefen argued that perceived responsiveness in the past and a lack of dependability positively influenced the clients’ trust in an ERP-vendor. In fact, trust was the belief in the company’s competencies, integrity and benevolence in supporting and enabling customization of their system.

From a political perspective, it was important to note the potential divergence of the interests of clients and their ERP-vendors and/or implementation partners (independent consultants) [39]. These differences of interest stemmed from differences in adaptation perspective. ERP vendors and their consulting partners pushed their best practices methodology. In order to maintain control over the process, they advised against package adaptation. Clients often went along with this advice, as implementing an ERP-systems was a complex and non-transparent process that was difficult and needed technical experts [6]. Differentiation between various specialists has progressed so far that there are niche labor markets for functional specialists on ERP-modules, such as Finance and Control, Logistics, or HR. Mutual consultation between specialists and other parties tends to be limited because specialists are expensive and normally paid by the hour, with consultation taking much time.
4.2.4. Costs

Deviating from standards is costly. Using ‘industry solution templates’ saves time, money and trouble in setting parameters. Firstly, using the templates economizes on the implementation process, as basic parameters are set automatically. Sticking to the basic configuration is a vanilla implementation [19]. Second, using a template involves support from the ERP supplier if problems occur during or after implementation and in incorporating new releases of the software. The more an organization alters the module, the more reluctant are ERP suppliers to provide support. The vendor argues that problems are caused by customer errors, not by the ERP software. As Hong and Kim found, developing add-ons tended to decrease the chance of a successful implementation.

4.2.5. Implementation methodologies

To economize on the implementation process, all main ERP suppliers offer some form of rapid implementation methodology. For instance, SAP has developed ASAP (Accelerated SAP) to facilitate the implementation of SAP R/3. This defines the necessary phasing of the implementation trajectory, including the project management of costs, scopes, service, support, training, and consulting activities. PeopleSoft developed the implementation toolkit DirectPath, comparable with the ASAP methodology, and so did Oracle by introducing FastTrack as an Application Implementation Method (AIM). Baan offered a target implementation methodology based on ‘Dynamic Enterprise Modeler’ (DEM), which specifically supports description and modeling of business processes by process diagrams and production typologies. These rapid implementation methodologies aimed at improving support planning and coordination by standardization and ease the complexities of ERP-implementation. For instance, ASAP defines the necessary phasing of the implementation trajectory, including the project management of costs, scopes, service, support, training, and consulting activities. The SAP R/3 systems, contains 12 standard functional modules that are – on purpose – delivered as one package to the client company. Many organizations, however, choose to install only a few modules and start with the traditional modules to rationalize transaction processing (the Financial Accounting and Controlling (FICO) applications).

5. Technical isomorphism

Embedding organizational procedures and underlying notions in ERP-software may be seen as the manifestation of a form of isomorphic pressure: technical isomorphism. The notion goes back to what is known as Conway’s law. This states that organizations produce system designs that are copies of their communication structures. As an example, he describes how parts of an operating computer system, compiler languages, and weapon systems resemble their designers, showing that “organization will stamp out and image of itself in every design it produces” [12].

Later this phenomenon was conceptualized as inscription. For instance, Orlikowski [31] described how software designers developed 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. These supporting notions do not automatically lead to group work in user organizations but may enable or contribute to its emergence in user organizations. The development and embedding of working procedures into software is separated in time and space from their use in adopting organizations. Thus, notions about how processes take place and how organizations function become inscribed into software during its design. This may be intentional to support certain ways of working but can come about unconsciously.

When software is deployed in user organizations, inscribed organizational procedures can surface. If this happens, homogenization occurs as a result of enacting software-embedded standards. Because this has not yet been recognized as an isomorphic pressure, we coined the term technical isomorphism for it. It is distinct from normative pressures, because the inscribed procedures are not enforced by (and can not be related to) one particular profession, but result from complex interactions between functional experts and software designers [37]. Technical isomorphism is also distinct from mimetic pressures, because imitating is a conscious act whereas the enactment of inscribed rules is often unintentional.

At a more abstract level, technical isomorphism can manifest itself in centralization. ERP-systems potentially enhance control and hence centralized decision-
making. This is not necessarily the result of an organization policy, but a result when organizational members become aware of this potential of ERP. Such centralization may be at odds with contemporary management writing that stresses empowerment of the employees with substantial (enlarged) latitude. Koch and Buhl [21] showed that this contradiction only became obvious when both occurred during implementation.

In 1988, SAP released its R/3 system based on a client-server and open architecture. The software was designed to run on various platforms, and to integrate internally developed systems (such as legacy systems) and third party-software (such as bolt-on software). With the centralized database as the heart of the system, all SAP R/3 functional applications and external applications were (re)organized to interconnected modules. The system became one of the first commercial packages that was driven by an enterprise-wide integration of data and functionalities and hence central control by its architecture. While one of the initial aims was to solve the major problem of redundant data and communication lags in organizations, the centralized design was extended to implementation blueprints that enforced centralized processes control and standardized protocols in adopting organizations.

Technical isomorphism is of broader importance than in ERP-systems. Many machines, production mechanisms, construction principles, and other software packages can also be mentioned. A basic example is the QWERTY-configuration of standard keyboards that became familiar to almost every keyboard user of Roman alphabet systems around the world [14]. More recently, Microsoft operating systems have become de facto world standards. Because of network effects [23,32] there is a strong drive to use Word and therewith its working procedures.

6. An illustrative case

A case study [42] is used to show how various isomorphic pressures can play a role within a company. In 1994, the board of SDU, one of the larger Dutch publishers, decided to investigate the feasibility of adopting an ERP system. Their primary goal was to support the core processes using one standard, integral system. In this way the existing complexity of managing different IT systems could be overcome, and new applications should be easy to incorporate. A core team of employees from the fulfillment and production departments was charged with evaluating the alternatives of extending existing applications or implementing an ERP package.

As the first step, a list of technical requirements was formulated. The ERP package should connect with a UNIX platform, cooperate with relational databases, client server architecture, the Windows interface, etc. SDU had defined its business logic, process schemes, and data models. Consequently, the request for information for potential ERP vendors was prepared at the level of an elaborate functional design.

From the beginning, the need for standard software was stressed. It was SDU’s strategic policy to standardize all processes in line with the system’s core functionalities. It was essential that the ERP package should minimize operational support and contribute to explicit control and continuity of the (IT) organization. After their investigation, the core team suggested adoption of SAP. However, the board rejected this advice, because the team also indicated that the implementation of SAP would be expensive. In particular the tailoring of the software seemed to be a financial and technical barrier. The core selection team involved many potential users, and the decision led to a large number of ex-ante requests for modification, customization, and other types of software tailoring. The board, however, stuck to its initial demand for standard software for the entire organization. Although SAP is known for promising to deliver standard software solutions, in this case ERP software was rejected. The board did not believe that SAP would fit into the organization without significant added costs.

In a next step, the team added employees from the sales, financial, and logistics departments. This new team reexamined the short list of four ERP suppliers and came up with a new preference: Vista, an ERP package developed specifically for the publishing industry. The board took over this advice. Vista contained the major functionalities indicated in SDU’s long list of requirements. At first sight, this gave Vista a good starting position.
As soon as the implementation of Vista proceeded, however, similar problems appeared to those that led to the early rejection of SAP. Driven by high expectations, prospective users submitted specific demands and deviant requirements. Many of them, in particular those that required financial transaction change, could not be met by Vista. This was partly because its first release was poorly tested and there were difficulties with up-scaling the system. Another was the increased time pressure due to the long pre-selection phase. It was estimated that the functional coverage of the system was 90% during the orientation phase, but would drop to 80% in the operational phase. The board, and the core team as its agent, purposely kept standardization and integration as the main goals of the system, balancing demands for customization against budget constraints. As a result, user resistance increased: employees realized that the system could not adapt to their specific needs. Nevertheless, because of the time pressure several functions of the Vista system were declared to be standard.

At the end of the project, SDU has adapted to the ERP-system. As time progressed, resistance decreased because efficiency and business process improvement became clear in most of the organization. However, the Vista system did not live up to all expectations because some demands remained unmet. For instance, the Vista package was originally designed for British companies. Consequently, all pre-designed financial rules had to be translated into the Dutch system of bank tapes to execute the crucial process of billing and payments. It took two years and many man hours to build the appropriate interfaces. In addition, the system failed to support the on-line web shop and could not be connect-ed to the customer database. It finally took third party software applications to solve these problems.

This case demonstrates the effect of technical isomorphism in the pre-designed functionalities in the ERP system on SDU’s firm-specific strategy, processes, and structure.

- Vista restricted most firm-specific demands for technical reasons.
- SDU felt forced to adapt to the publishing industry standard.
- Inter-organizational standardization resulted from 1. the choice for an ERP-package and 2. its technical limitations.
- The only way to achieve some type of customization was through bolt-ons delivered by third party software vendors.

In practice, the user’s high expectations for customization were withdrawn. Inter-industry standardization did not result by using the ERP-package, but the price tag was considerable.

7. Conclusion and discussion

In adopting ERP, competitive and mimetic forces influenced the initial selection of the system. Indeed, ERP-investments are solely intended to improve the organization’s efficiency. With ERP, mimicking competitors and following industry norms governed the managers’ decisions. Coercive pressures also occurred when important clients induced organizations to adopt compatible ERP-systems or when headquarters require subsidiaries to adopt a company-wide system. In the implementation phase, mimetic isomorphism played a role if and when user organizations implemented the software to bring work processes to the level considered to be industry’s best practice.

To specifically clarify the potentially standardizing effect of standard working procedures incorporated into ERP-systems we introduced a novel form of isomorphism: technical isomorphism. This can be demonstrated by mechanisms that encourage actors (developers, consultants, users) to conform to the centralistic philosophy and standards incorporated in the ERP. As far as prescribed working procedures are concerned, the issue remains of course when users do or do not conform to these standards [7,16,36].

Mimetic, institutional and technical isomorphic forces can be separated analytically, but in practice they coincide. In fact, they appear repeatedly as ERP-software is deployed in organizations. In many cases, ERP-modules are implemented in a predefined order to spread risks and investments. For every module the mutual shaping of the organization and its IT is at stake. The longer the duration of the ERP-trajectory and the longer that it takes to achieve benefits, the more managers, consultants, and other project members will be under pressure. This makes the team attempt to retain the initial timetable which favors going for the easy option: sticking to standards.
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