

## **ERP computerisation and limiting bureaucracy: reality or illusion?**

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## **Abstract**

Organisations change to cope with more decisive dynamic surroundings by trying to limit bureaucracy. Dynamics further cause an increase in the need for information within organisations. This often results in additional investments in company-oriented ICT, especially “Enterprise Resource Planning” (ERP) software. ICT normally requires formalisation and standardisation and these are indeed bureaucratic forces. This raises the question, what influence does the introduction of ERP software have on limiting bureaucratisation within organisations? In this article, this question is addressed by means of a longitudinal case study. The results suggest that the implemented ERP software generated an increased bureaucratic effect on the organisation investigated. This effect can be explained by means of a socio-structural, a socio-cultural and a socio-political perspective. In conclusion, an alternative ERP approach that can support a decrease in bureaucratisation is presented. Inspired by an archipelago metaphor, this approach embraces variety instead of the uniformity that is often adopted in current ERP practice.

## **Introduction**

Bureaucratic organisations often lack the necessary business agility to deal with dynamic surroundings (Volberda, 1997; 1998; 2004; Van Amelsvoort, 2000). This is the ability to cope with external and internal changes which are unpredictable or uncertain (Dove, 2001; Haeckel, 1999; Baskerville *et al.*, 2005). Failing business agility, organizations are likely to experience unmanageable uncertainty and unpredictability. For this reason, increasingly more organisations actively attempt to limit bureaucratic structures and cultures because, from a strategic point of view, less bureaucracy increases an organisation’s ability to anticipate and respond to changes in a timely manner (Volberda, 1997; 1998; 2004). Examples of attempts to decrease bureaucracy in an organisation include a) self-directed units; b) process-oriented, customer-oriented and result-oriented management; and c) network and hybrid organisations.

Additionally, dynamics result in increased information needs within organisations (Galbraith, 1973; 1977). As a result, many organisations have, since the 1990s, increased their investments in company-oriented ICT and, in particular, “Enterprise Resource Planning” (ERP) software (Davenport, 1998). It is interesting to note that ICT actually requires a certain degree of formalisation and standardisation (Prakken, 2000; Markus & Robey, 1988; Markus, 1984; Galjaard, 1979) and that the increased use of ICT can create a situation in which increasingly more work processes, situations and people are subject to some degree of technical and calculated control (Zuurmond, 1994; Frissen, 1989). What we see then is that the intention to use ICT to promote a process of de-bureaucratisation is at odds with the requirement to formalise and standardise, which are in and of themselves bureaucratic processes.

Despite this interesting contradictory situation and the fact that the relationship between IT and bureaucracy received significant attention in the 1980s and 1990s, the topic “ERP and bureaucratisation” has, to date, received little scientific attention (Govers, 2003; 2006). There are at least three reasons for this: (1) there are a limited number of empirical studies on the relationship between ERP and bureaucratisation; (2) ERP software can be diffused in different organisational settings because of its open system approach; and (3) ERP software consists of a high level of customising flexibility. ERP vendors and consultancies claim that, because of the latter two reasons, ERP software can create and facilitate business agility (cf. SAP, Oracle, Baan, PWC, Capgemini, etc.). However, conclusive and empirical arguments have not yet validated this claim and practice has shown that many ERP projects encounter serious difficulties with respect to customisation (e.g. Boersma & Kingma, 2005; Davenport, 1998). This raises questions with respect to the extent to which ERP computerisation leads to bureaucratisation. A positive relationship between the two would indicate that ERP computerisation and de-bureaucratisation cannot occur concurrently. This would imply that, despite efforts to limit bureaucratisation processes, the dominance of bureaucratisation would enter the organisation through the

back door using ERP computerisation. This would evidently impede business agility instead of facilitating it (cf. Mathiassen & Pries-Heje, 2006; Van Oosterhout *et al.*, 2006). In order to generate insight on whether ERP leads to increased or decreased bureaucratisation, we present a case-study in which this matter is examined longitudinally. The following issues are discussed: ERP computerisation, bureaucratisation, methodology, results, discussion, alternative ERP approach and conclusion.

### **ERP computerisation**

Computerisation consists of two elements (e.g. Laudon & Laudon, 2000). On the one hand it includes the introduction of computers together with the software to keep, analyse, transform, treat and present large quantities of data, and on the other hand to organise and maintain the provision of information with ICT. Currently, computerisation - as from the 1990s up to now - is frequently realised using ERP software.

ERP is defined as: an administrative computer system in the form of a standard software package, functionality in a lot of areas, strongly integrated, as such that it can support the whole management of organisations administratively and in an integrated manner (Shehab *et al.*, 2004; Jacobs & Whybark, 2000; Markus *et al.*, 2000; Klaus *et al.*, 2000; Davenport, 1998). An important characteristic of ERP software is storing 'all' data of 'all' company functions in one system (system integration) and by one central database (data integration). System integration with a fast, seamless and reliable integration of aspects, e.g. financial, logistical, commercial, and human resources, information flows belonging to business functions are realised in one system.

The introduction of ERP software indicates a change process, which is not always successful. The expected and the claimed advantages appear not always to be realisable, for example in the areas of control, competitive advantage, efficiency and flexibility (Benders *et al.*, 2006; Govers, 2006; Kim *et al.*, 2005; Al-Mashari & Al-Mudimigh, 2003; Davenport;

1998). Boersma and Kingma (2005: 124) conclude on that the following: "(t)he image of ERP seems to have changed from a highly promising into a highly demanding technology." It is exactly the socio-organisational and ever demanding ERP which can have an influence on bureaucratisation.

### **Bureaucratisation**

Bureaucratisation is a modernisation process which is structural and cultural recognizable (Weber, 1947; 1979; Van der Loo & Van Reijen, 1997; Heusgens, 2005; Volberda, 1997). Respectively structural and cultural become apparent in differentiation and rationalisation. Both expressions influence each other: the cultural expression reinforces the structural expression and the other way around.

#### *Structural expression: differentiation*

Within organisations differentiation becomes apparent in the degree of division of labour and the associated coordination. There are five terms which derive from literature for the degree of division of labour and infer coordination of (table 1): specialisation, hierarchisation, centralisation, formalisation, and standardisation (Vroom, 1980; Lammers, 1994; Weber, 1947; De Sitter, 1982; 2000; Zuurmond, 1994; Mintzberg, 1983; Pugh, 1981).

Table 1: Degree of differentiation

Characteristic	Description
Specialisation	Degree in which labour is set out divided in separate functions. (Vertically).
Hierarchisation	Degree in which decision-making is legitimated, and is vertically separated by borders and instructions.
Centralisation	Degree in which the decision-making in the organisation takes place from one central point.
Formalisation	Degree in which operations, decisions and rules are formally fixed. (Formal, means in writing or computerisation.)
Standardisation	The routine moderation of the working method by means of rules

These characteristics can be filled in, ideal typical, in two manners:

1. a bureaucratic manner because the characteristics are maximised, this process contains bureaucratisation;
2. a non-bureaucratic – agile – way because the characteristics are minimised, this process contains de-bureaucratisation.

*Cultural expression: rationalisation*

Within organisations rationalisation becomes apparent in a functional and substantial sense (Weber, 1947; Mannheim, 1935; cf. Morgan, 1986; Volberda, 1997; 2004; Van der Loo & Van Reijen, 1997). In a bureaucracy flourishes a functional rationalisation, i.e. arranging and systematising the reality with the intention to control its predictability. Thus it concerns, to reach concrete aims in the most efficient way. Broekstra (1996) calls it a though of manipulability. Efficiency, obedience, and calculation form the base ingredients of a bureaucratic culture (Vroom, 1980; Frissen, 1989; Zuurmond, 1994; De Geus, 1989; Morgan, 1986). Obedience to the authority of the leading forms the main point for efficient acts. For a manageable and efficient organisation calculability of people, labour and work processes, and the harmonisation of these issues are necessary. The control defines for these functional-rational standards (rules). It approaches, actually predicts, with this people, work processes and harmonisation and assumes obedient compliance of these standards, as a result of which controllability is reached. The urge to control people, as an uncertain factor, through control and discipline, has been motivated by mistrust.

In a non-bureaucratic, agile organisation substantial rationalisation flourishes, i.e. arranging the sense making process with the intention to derive and to attribute value to this (Weick, 2001). Thus, it assumes reflection and self organisation (Broekstra, 1996). Effectiveness, dynamics, and ambivalence form the base ingredients of a non-bureaucratic, agile culture (De Geus, 1989; Zuurmond, 1994; De Sitter, 1998; Morgan, 1986). Dynamics mean that situations are changeable and therefore are restrictedly predictable. Ac-

ording to not-bureaucratic thinking structural minimising organisational harmonisation patterns (by means of minimum possible division of labour) with the mobilisation and development of the human potential, offers a guarantee for a durable, viable organisation in a complex, dynamic context. People, as a reliable factor, structurally space are offered to make choices, so that it can be dealt with effectively. Standards (rules) offer the frame of reference within which people act. Within these standards ambivalence between obedience and disobedience is looked for: obedience is important in achieving objectives (single loop learning, Argyris & Schön, 1978); disobedience is necessary to make targeted actions possible and to bring up standards for discussion and to change (double loop learning, Argyris & Schön, 1978).

## **Methodology**

A simple, longitudinal case study has been used qualitatively to assess the influence of ERP computerisation on the degree of bureaucratisation in a selected case. It concerns an average Western European venture: a medium industrial producer located in The Netherlands of mass-produced and semi mass-produced ceramic products which were self developed, produced and sold; on request the venture is treated anonymously. Both static-comparative and dynamical have been assessed. Static-comparative means that on several measure moments the degree of bureaucratisation is assessed; dynamical means that also the developments between the measure moments are assessed. This approach has been chosen, because 'static' results cannot be interpreted separate from the preceding 'dynamical' process and the other way round. Both are necessary for a nuanced and well-founded appraisal of the central research question: what influence had the ERP computerisation on the degree of bureaucratisation within the organisation investigated?

### *Appraisal model for the degree of bureaucracy*

At the operationalisation of characteristics (table 1) has particularly assumed the appraisal model of Zuurmond (1994; cf. Kubicek & Welter, 1985). Zuurmond's study con-

cerns a theoretical and empirical reorientation on Weber's ideal type of bureaucracy from the information era; he calls this reorientation the 'infocracy'. Table 2 outlines this appraisal model and the manner of data collection which is used in this case.

Table 2: Appraisal model degree of bureaucracy

Characteristic	Operationalisation (criterion)	Data Collection
Specialisation	Function integration Functional department shaping Multi-skilled employees	Enumeration, contents of functions Organization chart (calculation) Consultation, function structures, observation
Hierarchisation	Depth of the organisation Span of control Ratio between E-C-S *)	Organization chart, observation Organization chart, observation Organization chart, observation
Centralisation	Formal decision structure Balance of power Employee perception of centralisation	Formal documents, observation, Consultation, calculation Consultation, formal documents
Formalisation	Role performance Rule specification Information-forwarding	Formal documents, observation Regulations, procedures, observation Formal documents
Standardisation	Routine Rule-conducted behaviour Employee perception of standardisation	Measuring, consultation Consultation, formal documents Consultation, formal documents

\*) Employees in execution, control and support

To prevent possible subjectivity as a result of the action-oriented approach, it has been chosen to have the collected data confirmed by experienced people of authority within the venture (i.e. face validity – Borg *et al.*, 1993).

### *Appraisal*

With the static-comparative appraisal of this practical case four methodological issues are involved, as it happens: (1) how it is measured, (2) what scale is used, (3) what are the weighing factors, and (4) how is an end judgement (classification) reached? An ordinal scale has been used. The scale values represent the following qualitative scores: (1) very bureaucratic (ideal type), (2) reasonably bureaucratic, (3) mixed form, (4) reasonably on-bureaucratic and (5) very on-bureaucratic (ideal type). The scores only reflect or talk of more or less bureaucracy, without giving an absolute meaning to the mutual scores. The characteristics specialisation, hierarchisation, centralisation, formalisation and standardi-

sation have been assessed on two measure moments (i.e. beginning 1995 and beginning 2000). Concerning the weighing factors there is no reason to have the one criterion weighs heavier than the other. The weighing factors are therefore right. Additionally, they noticed that the criteria can vary independently of each other (Zuurmond, 1994). There can be scored on one criterion less bureaucratic, whereas on the other more bureaucratic is scored. Use has been made of, to assess the qualitative differences in their entirety, 'multi-criteria' analysis (Prakken, 2000). At the dynamic appraisal it has been looked at how the characteristics developed between the two measure moments. This has been based on observation, discussions with organisation members and on document analysis. A recent development to more respectively less bureaucratic characteristics involves an increase of bureaucratisation respectively decrease of bureaucratisation (i.e. de-bureaucratisation).

## **Results**

In this paragraph the result of static-comparative and dynamic appraisal is described. Connecting the influence of ERP computerisation on the observed bureaucratic quality of the organisation is discussed.

### *Static-comparative appraisal*

Static-comparative appraisal shows that the venture finds itself both beginning 1995 and beginning 2000 between rather bureaucratic (2) and mixed form (3), see table 3. The comparison between both situations shows that there is no difference on four of the fifteen criteria. On four of the fifteen criteria a shift has appeared in the direction of less bureaucracy (in this case at specialisation and especially at hierarchisation) and on seven of the fifteen criteria shifts in the direction of more bureaucracy (in this case at formalisation and standardisation and especially at centralisation). Summarising it is concluded that the situation beginning of 2000 is more bureaucratic than those of beginning 1995.

Table 3: appraisal of the bureaucratic quality of the organisation

Characteristics	Criteria	beginning 1995					beginning 2000					Diff.
		1	2	3	4	5	1	2	3	4	5	
Specialisation	Function integration		■					■				no
	Functional department shaping		■					■				no
	Multi-skilled employees		■						■			less
Hierarchisation	Depth of organisation		■						■			less
	Span of control		■						■			less
	Ratio between E-C-S *)	■						■				less
Centralisation	Formal decision structure			■				■				more
	Balance of power			■				■				more
	Employee perception of central.			■				■				more
Formalisation	Information-forwarding			■				■				more
	Role performance			■					■			no
	Rule specification			■				■				more
Standardisation	Routine			■				■				more
	Rule-conducted behaviour			■				■				more
	Employee perception of stand.			■					■			no

Legend: no = no difference, bur = more bureaucratic, and less = less bureaucratic.

\*) Employees in execution, control and support

### *Dynamic appraisal*

After static-comparative appraisal the question on order is how the organisation develops itself, in terms of bureaucratisation, between the two measure moments. Table 4 summarises this.

Table 4: Appraisal of the degree of bureaucratisation

Characteristic	Perception	Tendency to
Specialisation	Increase function integration Decrease of the number of functional departments Increase of multi-skilled employees	De-specialisation <i>(de-bureaucratisation)</i>
Hierarchisation	Increase of the span of control Less depth in the organisation ratio between execution, controlling and supporting unchanged	De-hierarchisation <i>(de-bureaucratisation)</i>
Centralisation	Increase formal decision structure High power distance; power increase at finance and techno-staffs*) Differentiated perception concerning centralisation	Centralisation <i>(bureaucratisation)</i>
Formalisation	Increasing knowledge and skills More binding role specifications and data transmission More space for bottom-up role performance	Formalisation <i>(bureaucratisation)</i>
Standardisation	Increase of routines of non-production task Increase of rule-conducted of non-production task Differentiated power perception concerning standardisation	Standardisation <i>(bureaucratisation)</i>

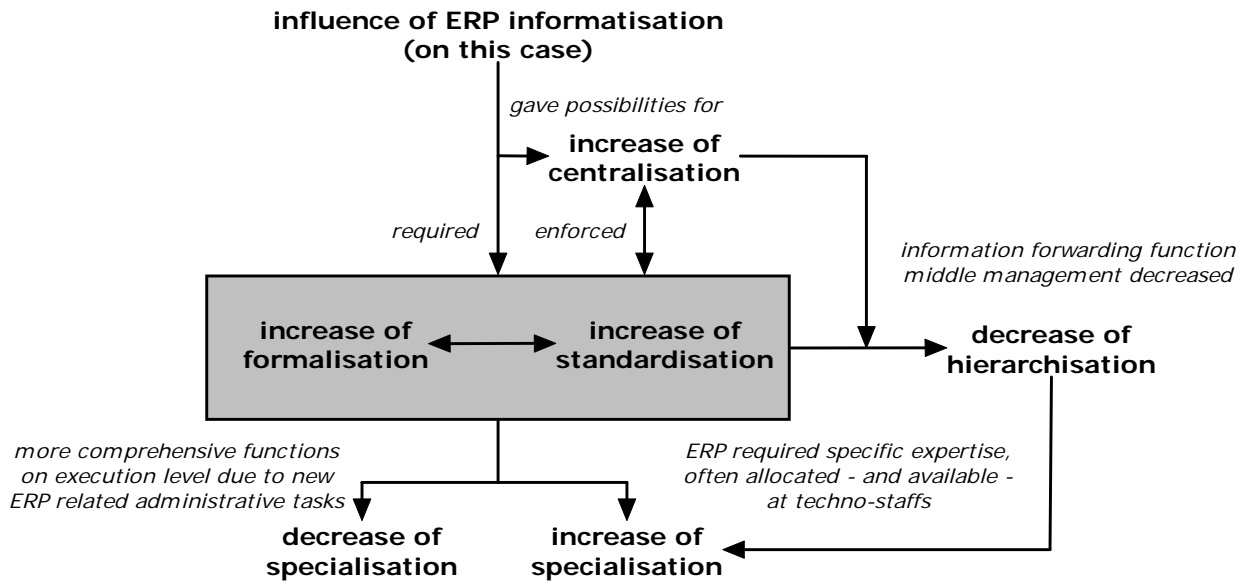
\*) staff positioned in the technostructure (Mintzberg, 1983)

From table 4 it becomes clear that the venture share of the existing bureaucratic instrument is, partly at least, maintained and partly dismantled.

#### *Influence of ERP computerisation on the organisation*

If it is zoomed in on the results fall on the one hand an increase of formalisation, standardisation and centralisation, and on the other hand a decrease of hierarchisation and specialisation. Moreover for specialisation a concealed increase can also be seen, which will be explained in the section below. These findings raise the question what influence has the ERP computerisation had on the bureaucratic quality of the organisation investigated? We will go more deeply into that in the section below. The conclusion is that the ERP computerisation had a bureaucratic impact on the organisation (see figure 1).

Figure 1: Influence of ERP computerisation on the organisation



*Increase of formalisation*

Before ERP computerisation the formal and informal procedures and rules, in comparison with the existing computerisation, must be tighter formalised. This was necessary to prevent system technical problems occurring: more unambiguously processes and relations between processes were fixed; the more the ERP system could function integrated without problems. For the venture this resulted in an increase of rule specification. This increase took place in a subtle and almost invisible manner, because the rule specification is hidden behind the computer screen in programme codes and algorithms.

*Increase of standardisation*

These algorithms guided users, in comparison with the starting-point situation, are more compelling. There was talk of more rule-conducted behaviour, or of more standardisation. ERP enforced this rule-conducted in a subtle manner. This subtlety was, judging by the differentiated employee perception concerning standardisation, not experience by everyone. The ERP system demanded nevertheless more routine operations (e.g. data entry), screens no longer stood on their own and work processes were tightly secured in the ERP

structure. This structure proved to be very sensitive; the ERP system stagnated by the incomplete or too late recording of process progress. For example: the controller was put in the position to reach integrated information more rapidly on the state of affairs of the organisation. But, for this other departments, such as logistical and production had to introduce more and faster information than strictly necessary for themselves to function. To minimise this system sensitivity, users had to introduce more disciplined work - in terms of correct, completely and on time data entry. Further it appeared that the outlined formalisation and standardisation had impact on cooperation. Particularly ERP users cooperated more digitally; ERP partially took over the mutual harmonisation. The personal, informal process harmonisation between people decreased as a consequence. In fact the social and cooperation relations became more digital and anonymousness.

#### *Increase of centralisation*

To reduce the indicated sensitivity of ERP, a thrust to centralise process control arose, and/or to leave tasks central. This drive was reinforced by the new, technological possibility which ERP offered to (central) decision makers concerning central - financial and logistical - control and command. It was possible to follow and control from a distance integrated processes and at detail level – actual time. This had two, reinforcing each other effects. First, the venture was able to learn from the experience of processes. ERP seemed to offer the possibility to double loop learning and with that for innovation, at least within the specified ERP context. The information to reach process adjustments or standard (adjustments) positions, was available within the venture mainly logistical and financial techno-staffs (i.e. staff positioned in the technostructure; Mintzberg, 1983). It was lacking both process executors and managers mostly on knowledge and skills and/or the access to the system to shape this learning process. Finances in particular have, because of this, attained more power. In the eyes of some the number governs. And secondly, it seemed as if ERP gave a complete picture of the shop floors, and therefore operational standard intervention could be considered from a distance which improved these

local situations. Such interventions, however, went mostly beyond the reality of a department, because local situations themselves had to adapt to ERP standard. Locally this cost some time to bring the situations again in accordance with the actual circumstances. As a consequence interventions did not always appear to have the desired result, causing a spiral to formalisation, standardisation and centralisation to arise. This caused also social tensions, like confrontation and defensive behaviour, between departments and between management and employees.

#### *Increase and decrease of specialisation*

ERP led to an increase of administrative operations and tasks (on the basis of random samples: 25 per cent), and to a larger dependence of ERP related employees. This was reinforced by the time-consuming system, mainly for non-continuous users of the system such as management. As a response to this many have transferred those tasks and operations to supporting and controlling colleagues. Thus at the same time an integration of activities (increase of specialisation) and a splitting of functions (decrease of specialisation) has appeared, as a result of which the number of regulating functions has not decreased. In some cases there are even talks of an extension. The extensions of ERP specialists were valued at 15 per cent. This does not mean that 15 per cent more officials were appointed. A part of this is in the expected (and hoped for) but unfeasible slimming-down.

#### *Decrease of hierarchisation*

The exchange of data has been taken over from bottom to top partly by ERP. The computerisation of the data flow relieves the hierarchy of a time-consuming task which makes the hierarchy partly superfluous; this was estimated at 10 per cent. The consequence was that more data had to be introduced in the system to reach the same degree of information exchange. On this phenomenon formalisation, standardisation and centralisation has already been indicated partially.

## **Discussion**

The case study has made it apparent that ERP software was demanding and far from neutral (Boersma & Kingma, 2005; Davenport, 1998). The implementation and usage of the ERP software had a bureaucratic effect on the organisation investigated. Furthermore, structure, culture, and power relations were affected by the ERP computerisation. In order to understand the degree of bureaucratic anchoring ERP yields, it is important to understand the causes of this effect. Three perspectives, namely a socio-structural, a socio-cultural and a socio-political perspective, are proposed as a means to understand the causes of the bureaucratic effect. (Doorewaard & Van Bijsterveld, 2001; De Sitter, 2000; Pruijt, 1997; 1996; Frissen, 1989; Markus, 1984; Feldman & March, 1981; Galjaard, 1979).

### *Socio-structural perspective*

ERP requires standardisation and formalisation in a structural sense in order to be operational (Govers, 2006; 2003; Davenport, 1998). The results of this study confirm this. However, these requirements say little about how ERP structures the social system of an organisation. In order to gain insight on this, we need to focus on how business processes are modulated into a social structure or on how these processes have already been modulated into a social structure. Focusing on ERP software can provide an indication of how functional modular structure is incorporated in several business functions such as finance, logistics, sales, human resources, and marketing. These functional modules can be activated separately or in combination with one another. The degrees of activation freedom are limited by not only the abilities within the module but also by how the modules are anchored in the ERP software (Jacobs & Whybark, 2000). This anchoring forms an interaction structure, which enables the modules and the connected business functions to operate integrally. Therefore, the ERP software regulates the possible relationships between the modules. It also limits and arranges this by means of the formal harmonisation between business functions. Deviation can only occur by means of reprogramming the an-

chors within the system. In other words, the interaction structure of ERP software is fixated based on a predefined functional differentiation within ERP (Kallinikos, 2004; Jacobs & Whybark, 2000; cf. DeSanctis & Poole, 1994).

### *Socio-cultural perspective*

The socio-structural perspective implied that the social structure could not be chosen freely by the organisation investigated. The ERP software established the framework that determined how and when this would happen. The organisation had to adapt the views of that which was regarded as 'good' processing and/or as feasible according to the ERP software. Basically the organisation was adapted to the ERP software rather than the software adapting to the organisation (cf. Davenport, 1998; Soh *et al.*, 2003). For this purpose, a new social reality had to be constructed within the boundaries of the software by different organisational functions. This started with the idea that behaviour is normative and programmable. Management and its techno-staffs were under the impression that people and processes can be organised efficiently. In other words, they believed that behaviour can be calculated by enforcing obedience to a standard. This idea that behaviour is programmable appeared to be an illusion. Individuals in local situations did not always and, occasionally, were unable to behave in accordance with this uniformity. Circumstances that had to be handled locally had their own variety and dynamics which were in no way linked to the computerised standard. In spite of this, a uniformity approach arose to enforce the standard (Govers, 2006; cf. Allen, 2005; Wagner & Newell, 2004). This, in turn, led to a spiral of formalisation and standardisation and thereby exerted additional pressure on people to adapt to the standards on how to execute and control business processes as determined by the ERP software.

In other words, the processes by which sense was created in the organisation were enforced *by, with and through* technology. With a technically stipulated ontology, ERP determined the way in which *organising* must be expressed in the organisation (cf. Weick,

2001). This was mainly done by means of logistical and financial control in accordance with 'manufacturing resource planning' and 'management accounting'. These are two pre-eminent, and by the bureaucratic conception stipulated, characteristics (Roberts, 1993; Bertrand *et al.*, 1990). ERP adds the following to these characteristics: integrality, digitally, massiveness, controllable complexity and high speed (cf. SAP, Baan, and Oracle). These are characteristics that offer expressions of substantial rationalisation, such as autonomy, creativity and flexibility, under the pretence of complete control (Frissen, 1989) and, thereby, input functional rationalisation into the process of creating sense.

After investigating the type of rationalisation utilized, we can contend that ERP computerisation itself is a structural and cultural expression and that the ambition and pretence of functional rationalisation is part and parcel to ERP computerisation. In an organisation where bureaucratic characteristics are present (which is the case in most organizations), this can lead to ongoing social exchange relationships with computerisation by which functional rationalisation is modernised in accordance with the bureaucratic conception considered appropriate by the ERP software. According to Castells, this is not surprising: "(C)ultural battles are the power battles of the information age" (Castells, 2000: 359).

Although we agree with Castells' position, one must be cautious and wary of the potential for technological reductionism (Baverman, 1974; Boersma & Kingma, 2006; Wood & Caldas, 2001; cf. De Mul, 2002). The rise of ICT and the coherent computerisation that results must be seen as a cultural expression that is not new but has been present for some time. ERP computerisation can be considered, within this, no more than a new phenomenon. Nevertheless, ERP software exercises, because of its omnipotence, a large influence on organisational values and standards. The results of this study and others support this (e.g. Boersma & Kingma, 2005; Kallinikos, 2004; Wood & Caldas, 2001). Benders *et al.* (2006; cf. DiMaggio & Powell, 1983) speak of technical isomorphism, wherein organisations tend to rely on the application of the standards determined by the ERP software.

This is termed “sticking to standards”. This, however, does not mean that ERP computerisation maximises bureaucratisation.

Technological reductionism is not the only potential pitfall. Technological determinism (cf. De Mul, 2002) can also be problematic. The degree of bureaucratisation in organisation is not automatically determined. It is also, according to socio-political perspective, linked to the use of technology.

### *Socio-political perspective*

The results suggest that the degree of centralisation increased in the organisation studied and that the management (especially its logistical and financial techno-staff) acquired additional power. The information instrument ERP appeared usable as a power instrument as early as the implementation phase of ERP. The techno-staffs were vital because they had possession of actual knowledge relating to the business processes that had to be synchronised with the software. With this, they not only acquired an informatics lead, they also were able to customise the software in ways they considered most convenient. It thus offered them the opportunity to anonymously obtain insight, understanding and control with respect to work processes and the process executants. Processes and people became ‘remote controllable’ (cf. Elmes *et al.*, 2005) in an extremely subtle manner. Direct, physical supervision in the form of a hierarchy decreased and was replaced by a central, virtual supervision, made possible by means of the standardisation and formalisation of work processes (cf. Mintzberg, 1983). At the same time, this standardisation and formalisation could be used to contend that the system required this kind of discipline rather than management. The ERP software was, in this way, classed as a powerful force instrument that had an asymmetrical influence on the balance of power. This is taking into account the national context of the investigated organisation. Hofstede (1994) characterises the Dutch culture as a culture with low ‘power distance’ and high ‘individualism’. In the organisational context, this means that the dependence of employees on central au-

thority is low and that the autonomy of employees is high. We can contend that the ERP software exerted influence in the organisation investigated in such a way that more centralisation and less autonomy were created (cf. Despres, 1996). In an organisation where bureaucratic characteristics are present, the management and techno-staffs have the most ruling power. The ERP can be used to maintain or develop their desired power structure. Looking at the nature of rationalisation, it can thus be stated that ERP computerisation provides new possibilities and opportunities with respect to modernising the functional-rational identity of an organisation that, in turn, generates new bureaucratic structures and cultures.

### **Alternative ERP approach**

Based on the foregoing, we must ask, to what extent can ERP software support debureaucratisation and thus business agility? We are convinced that this is indeed feasible. However, in order to create a situation in which ERP software supports debureaucratisation and business agility, the ERP software must be diffused by means of a variety approach instead of uniformity approach (Govers, 2006; cf. Allen, 2005; Wagner & Newell, 2004). Erroneously, many still believe that ERP requires *one universal, uniformed* standardisation and formalisation. This is incorrect. ERP does not require a uniformity approach at all. However, changing the approach from one that focuses on uniformity to one that focuses on variety is far from easy. A management misunderstanding exists and this is often strengthened by ERP vendors and consultancy firms (Govers, 2003). ERP software does have the capacity to deal with several standardisations and formalisations. As a result, we can contend that the barrier to a variety approach is a matter of willingness rather than ability (cf. Kerr & Slocum, 1981). Managers must employ and demand a different outlook and approach to ERP. The feasibility of this depends on the will to understand that business processes and changes cannot be centrally controlled and managed in a complex and dynamic environment (cf. Volberda, 2004; 1998). Additionally, with an ERP, it is difficult to execute process changes when processes have

been constructed to be dependent on each other using a uniformity approach. This creates a snowball effect (Senge, 1990; Weick 2001) in which the desired or required process change triggers unexpected and undesired effects in other processes (cf. Van Oosterhout *et al.*, 2006). The snowball effect is exacerbated by previously built-in compromises in the operational ERP system. Furthermore, due to existing technical, organisational and political mechanisms, the realisation of these changes is generally time-intensive and expensive. As a result, organisations are slow in responding to change. They thus lack 'timely adjustment' (Govers, 2006).

In other words, if limiting bureaucracy is vital for management from a strategic perspective, ERP must be used as a power instrument to embrace variety (cf. Ashby, 1969) rather than uniformity. The variety approach is required for two reasons: (1) only the same kind of variety requires the same kind of management control (e.g., a pilot does not prefer the control of a car to fly his plane); and (2) only the same kind of variety reacts in the same way to the dynamics that occur (e.g., a plane and a car react differently to wind and wind changes). These variety reasons or rules imply that organisations must not strive for one uniformed ERP computerisation but for several, smaller ones that are based on, for example, the product, the services, the customer and/or the marketing portfolio (Van Lieshout, 2002; Govers, 2003). This loosely coupled means of organising (cf. Weick, 2001) computerises tasks and functions of a specific process stream independently from other streams. For instance, the Belgium and Dutch market would be separately computerised. Based on an archipelago metaphor, Govers (2003; 2006) calls this 'archipel computerisation'. For each concrete situation, the dividing line between the different, independent computerisations must be based on the previously mentioned variety rules. An executive system must be set up on top of these computerisations, e.g. by means of data warehouse technology, in order to facilitate overall management in conducting their tactical and strategic responsibilities.

## **Conclusion**

The longitudinal case study discussed in this article demonstrates the bureaucratisation impact of ERP computerisation on an organisation. On the one hand, this impact was subtle and politics-driven. On the other, it was ICT (i.e. system-technical) driven. It was not the organisation and its corresponding management and techno-staff that demanded obedience and calculability but rather the conditions required by the ERP software, or so it seemed.

To be functional in the organisation, ERP indeed required formalisation and standardisation in order to effectively execute business processes. However, bureaucratisation is not an automatic outcome according to the socio-structural and socio-culture perspective of ERP software. Actual bureaucratisation depends on the commitment to and the usage of ERP software. This issue is part and parcel to the socio-political perspective of ERP software. The results did demonstrate an increased centralisation in the organisation investigated. Management and, in particular, the techno-staffs applied or could have applied this to reinforce their central control of the organisation. In turn, a spiral of increased formalisation and standardisation was generated. Indeed, ERP enforced this uniformity approach. However, ERP did not require the uniformity approach. Obviously, it is logical and appealing to use this approach because it provides the technical means to control financial and material information flows remotely. Nevertheless, this is a managerial and political choice. It clearly shows that ERP software can be put to use as a power instrument. The three perspectives mentioned above strengthened a functional-rational approach to organising and computerising. As a result, functional-rational values such as obedience and calculability were once again, with ERP software, anchored in a modern manner. At the same time, this also cleared the path for a process of creating sense and meaning in the organisation, i.e. substantial rationality, within the limits of the system and its uses. In short, ERP computerisation required system-technical formalisation and standardisation and subsequently offered, on functional-rationalised grounds, opportunities to centralise

the organisation in a subtle manner which, in turn, increased formalisation and standardisation. In the end, the conditions linked to ERP software had a bureaucratic effect on the organisation investigated.

Nonetheless, limiting bureaucratisation with ERP is possible. It is essential that managers distance themselves from the idea and incorrect assumption that ERP software can only be diffused using a uniformity approach. ERP software can also be diffused using a variety approach. To do this, several independent ERP computerisations must be used instead of one uniformed computerisation. This archipelago approach, called 'archypel computerisation', is tailored to deal with the dynamic circumstances of an organisation. Archypel computerisation is only possible if managers are willing to diffuse and use ERP software non-bureaucratically and with a socio-political perspective. In order to do this, managers will have to distance themselves from the idea that ERP can provide a 'central-command cockpit' with which business processes, people and changes can be controlled and managed. Despite the fact that the notion of a central-command cockpit is actually an illusion, distancing oneself from this way of thinking is not easy, as was demonstrated in this case study.

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