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Proposal for a differentiated

Information Strategy

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Proposal for a differentiated Information Strategy

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ABSTRACT: This paper investigates approaches to information strategy. We make a distinction between three types of control mechanisms, the rationality-mechanism, the integrating-mechanism and the libertarian-mechanism. Based on the manner in which architecture development comes into being and the nature of the architecture itself, we explain that a 'top-down' approach will be effective in a rationally controlled organization, whereas an opportunity generating approach will be more effective in an organization which is run differently. Once the different types of organizational control within an organization have been identified, one can establish where information system planning can no longer successfully take place and where, therefore, other instruments for architecture development must be employed. One of these instruments is a more infrastructural approach to the IT facilities.

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1 Introduction

1.1 Proposition

Employment of information technology is still on the increase. The application of IT in all sorts of social, political and business activities is ever broader and more penetrating; it appears to be increasingly understood that IT is an 'enabling technology'.

The degree of use made of the available means, scant knowledge and the length of time taken to obtain often limited success have caused employment and use of information technology to become pre-eminently a management subject. It is, after all, desirable for an organization to extract the maximum benefit from information technology. The control problems which thereby play a role are however not the same for every organization. Where activities and competitive relationships differ or where various external and internal relations can be separated, the demands made on the IT facilities will be subject to continuous change. The development of the IT facilities is thereby the focus of attention.

A strategic information plan, in which the structure and development of the IT facilities is outlined, rarely has a planning window of more than five years. The reason usually given for this is that developments in both business and technology make the advantages of looking any further ahead dubious. But it is also the applications themselves that make long term planning difficult. The design and construction of applications takes years and the lifespan of an application can easily be ten years or more. In practice this means that the planning window of large projects are only capable of giving a very limited picture of the situation as relevant to planning activities: the field of vision is even too small to map out the projected realizations of all the required applications.

The management of the organizations themselves still is in many cases hierarchical, but in recent years other management styles have been introduced. Different types of organization come into being, through which the problem of employing information technology in a suitable manner is differentiated. In a mass production environment, for example, the problems of application and integration are different to those of a large firm of lawyers or a hospital – the similarities between the different information systems may even end at the operation of the front gate and the word processing.

It appears impossible to find identical solutions for the development and structuring of the IT facility for different target areas and to make concrete long-term plans using the same investigation and analysis techniques.

1.2 Justification

In this paper we indicate which aspects of information strategy are relevant and what their relation is to the organization. We will do this by showing that there are important aspects of structure that are worthy of management attention for the organization as well as the IT facilities because they are of a constant nature and can determine success. We will also show the plausibility of a relationship between organization- and information structure and that this relationship should be part of information strategy.

2 Organizations and forms of management

2.1 Why a typology based on control- mechanisms?

In recent years the question has been raised of the extent to which the hierarchy is still satisfactory as a leading principle for organization structure – see for example Peters [1993], Mintzberg [1994], Quinn Mills [1991] or Pascale [1991]. In general, companies that use rationality as their main structure principle are well able to satisfy efficiency criteria. The extent of the ability of such a company to react flexibly to developments around it and what room there is for individual development of organization members is unclear. This is relevant for example for the construction of the IT facilities in the light of the increasing attention to the degree of staff development, the desirability of ‘end user computing’ and the structure of the ‘desk top’.

Other types of organization management were sought in the bibliography, which aim more for flexibility or satisfaction. Examples can be found in the cluster organization (Quinn Mills [1992]) and in the introduction of teams and markets (Ciborra [1993]).

On this point we can raise the question on what level we should start the search for complemented management-mechanisms. According to Jägers [1990] the following aspects are of mayor importance in the search of this new mechanisms:

- Relatively permanent
- Transparent
- Flexible
- Innovative

To find a coherent system of control-mechanisms it is necessary to keep in mind that there is an stratification in the way we design the organization structures.

On the strategic level we define the way control takes place. Based on the decisions on the top level we will have to focus on structuring questions to develop a coherent design for the organization. At the lowest level we will have to work out the operational issues to solve the day-to-day problems of the organization. In this article we will mainly focus on the control-mechanisms that form the basis of organization theory.

It is clear in any case that the use of hierarchy as sole leading principle of organization structure is no longer satisfactory. We may not, however, conclude from this that hierarchy is finished as a (leading) principle of structure.

Other control structures must be sought. These alternative types of control can be of varying degrees of importance in different sections of an organization.

This has already been recognized to a degree in existing organization typologies – Mintzberg [1975], for example, distinguishes the division structure as one of the organization types whereby no explicit pronouncements are (can be) made about the structure of the divisions.

2.2 Three types of control

In this article we will use an approach that is based on the principles of political philosophy [Gels 1996, de Geus 1989, Vroom 1992]. This approach offers, in our opinion, a good foothold for our argument. We describe these types of management briefly and indicate a number of inherent weaknesses.

(1) If authority is the dominant force in the practiced style of management in an organization or department, the staff will be inclined to act in a way that will bring about a reduction in uncertainty and instability. When changes occur, and by motivation of behavior, the relatively safe and formal path of rationalization will be given preference. This preference is also valid for the technocratic conception of reality, in which organizations and people are seen as useful instruments that must satisfy performance and efficiency criteria and are directed within a system of well-defined tasks and duties.

Rationality based control	
Organization wide	Car manufacturer
	Chemical company
Department-specific	Bookkeeping
	Programming dept. of application developer

In an organization that is arranged along these lines we can often speak of a restricted, or threatened individual freedom, and of rigidity and the threat of unmanageability. RATIONALIZATION is the control mechanism in this situation. Hierarchy is the most common organization structure used together with this control mechanism.

KEY WORDS: authority, rationalization, and directive.

(2) If, within the practiced style of management, the consultation culture is dominant behavior will be primarily directed at integration of changes and relationships. Security and stability will be sought in the attainment and maintenance of community. Creation and maintenance of good forms of consultation then also enjoys much attention. Personal contact and group consciousness play an important role. In (networks of) consultation group's decisions are prepared within a framework of guideline and responsibility is shared.

Integration based control	
Organization wide	Application developer
	Stand Builder
	TV-program maker
Department-specific	Marketing department of a car manufacturer

On one hand the organization derives certain mobility and flexibility from the framework of consultation and margins, on the other hand decision making can be slow. It is often difficult to know whether we can speak of pseudo-participation or of a situation which displays characteristics of collective compulsion.

In this situation we can characterize the control mechanism as INTEGRATION. Democracy and federalism are the traditional organization structures used together with this control-mechanism.

KEY WORDS: consultation and integration guideline.

(3) If autonomy is the dominant management principle right down to the lowest levels, there will be a high degree of freedom in dealing with and incorporating changes. Security and stability are learnt from professionalism and specialization. Continuity

Libertarian based control	
Organization wide	Specialist firm
	Monument maintenance company
	Consultancy firm
Department-specific	R&D team chemical company

is only assured by deployment and, therefore, the maintenance of a high level of development. Self-management and independence are then of great importance. Free access to sources of knowledge, the opportunity to gain more experience and the perfection of skills are essential. Characteristic of a situation in which freedom is carried through to the lowest levels of the organization are vulnerability in a hostile environment and the danger of insufficient capacity for co-ordination and adjustment. This situation can be characterized as a LIBERTARIAN control mechanism.

KEY WORDS: independence, deployment and advice.

2.3 Hybrids

It is important to realize that the view as sketched above shows that all of the differentiated types of management can be found in organizations. The importance of the various types will differ per organization. The level of importance can even differ per department. In this way an organization which operates in a dynamic market can have a marketing department which is primarily arranged to react flexibly to external developments whilst the complexity and scale of its production department force it to choose rationality as leading management principle there. To emphasize this, we have given both organization wide and department specific examples per management form.

The view of organization expressed here helps us to judge the structure and development of the information supply within organizations.

3 System architecture and infrastructure

3.1 Architectures – blueprints of the information supply

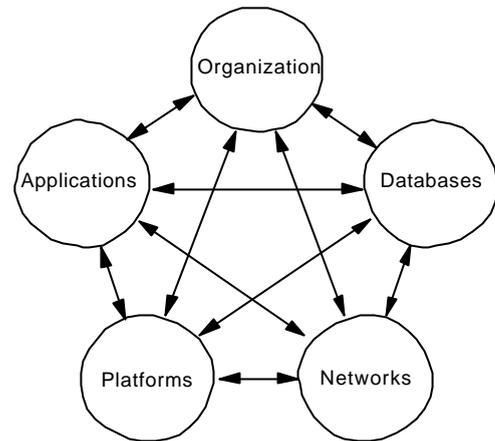
The planning of the IT facilities takes place in some or other form in every large organization, in order to ensure that the IT facilities serve the interests of the organization and are not determined purely by external factors. (see for example Andreu c.s [1992]) The IT facilities within an organization are continually developing. By broadening and intensifying the application of information technology in the organization and through the development of new technology and improved price/performance-ratios, there is in fact continuous adjustment and renewal. The management approach to this is not 'laissez-faire'. The renewal must of course take place along the right lines (Zachman [1987]).

This tendentiousness takes form in a number of specific architectures – blueprints of parts of the IT facilities – which are the most important product of the planning activity. The existing IT facilities are also described in architectures. Architectures are used in virtually all known planning methods. The most commonly used types of architecture are (Truijens [1990]):

- *Application architecture*, a description of the applications with which the desired IT facilities are realized;
- *Database architecture*, a description of the details and databases which maintain the required information;
- *Platform architecture*, a description of the various computer platforms and their basic equipment, necessary for the operation of the systems and databases;

- *Network architecture*, a description of the communication facilities necessary for the functioning of the applications and databases;
- *Organization of the IT facilities*, in order for the projected development to run as it should and for control of the running supplies.

It is important to determine the range of the architecture.



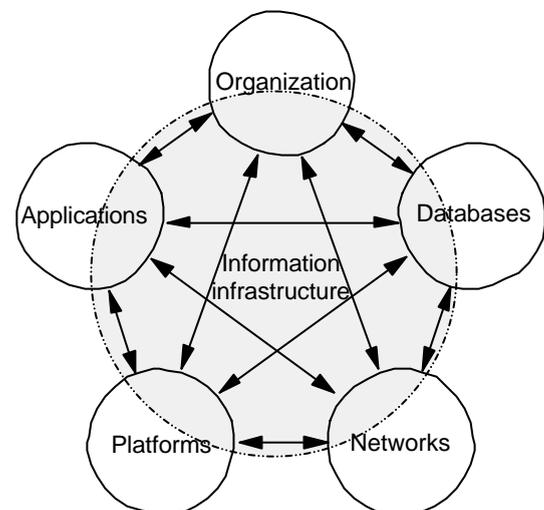
3.2 Information infrastructure

Despite continuous change, it is noticeable that some components of IT facilities have a relatively permanent character, a wide and general use and make a contribution to the basic functionality of many facilities. The more generic part of IT facilities can therefore be separated from the specific parts.

This same differentiation can of course be found in the blueprints.

For the purpose of sketching the IT facilities we differentiate therefore between two types of architecture: a specific system structure and a generic information infrastructure.

The specific structure can be drawn up with the help of traditional methods of information system planning – see Andrieu c.s.[1992] or Galliers [1991]. The generic structure must be sought elsewhere – see Gunton [1989] and Truijens [1990].



This nucleus of long living, general components gives a basic functionality, which can be titled information-infrastructure. The processing platforms (on which the ‘legacy systems’ function) are a more or less ‘de facto’ part of the infrastructure and communication protocols are also often included in the IT infrastructure. Data models and databases (for example with client and product information), certain systems or parts of systems can also remain constant for a number of years. Methods, procedure and company guide lines equally, are stable for long periods of time.

The various architectures that are supplied in information plans have – although they are not always explicitly named and have often implicitly grown – a core of general components as well as the

components of which the functionality points directly to specific demands and wishes. Because of this more or less permanent character the infrastructural components have a high level of coherence. Platform structure and database will form an inseparable duo for a number of years. Another example is the coherence between control systems and network protocols as well as the employed process- and data modeling techniques. A third example – to illustrate that infrastructural components are not only of a technological nature – can be found in system development, in which method, resources and project organization are adjusted to each other and are fixed for a series of development cycles, for the benefit of the quality and effectiveness of the development effort.

3.3 Information infrastructure and information strategy

Information technology does not come to us solely via specific applications and databases. There are ranges of generic facilities that have proven their worth. The degree to which direct and indirect support and its accompanying facilities are integrated and brought under management control is a question of strategy. This question, which refers to infrastructural facilities, is not satisfactorily answered by existing system planning methods (in the bibliography: ‘strategic information system planning’ or ‘business systems planning’).

The IT facility displays characteristics of the organization in which it functions. The basic components of the IT facility will have the same traits and display a connection which is characteristic of the organization and its activity. In this article we emphasize that information infrastructure can be dealt with without appointing specific applications and databases and analyzing their specific applicative, technical and organizational consequences. That is why information infrastructure is an instrument for management. The components of the various framework architectures that are expected to be relatively permanent as well as the specific information systems form, with that, a meaningful planning objective.

Making infrastructure candidates explicit and (for example) labeling them as company standard so that future functionality makes use of this basic facility is a management decision. It speaks for itself that this kind of decision is influenced, if not entirely determined by the control and execution structure of the organization for which these basic facilities are intended.

4 Relations between control types and some architecture aspects

4.1 Confrontation

Above we have explained that the rationality control type is strongly directed at rational ‘planning and control’ -the greatest part of the activities and coordination are aimed at efficiency and the IT facility is strongly influenced by this endeavor. A different type of IT facility fits when the integrating control mechanism is the dominant control type, since this mechanism is more flexible and service oriented. Top down development of architectures is less dominant. When the libertarian view, aimed at free professional development, is the dominant control type, management of the IT facilities is not and can not be organization efficiency oriented because this type of control usually lacks hard efficiency criteria. An increase in efficiency by the utilization of information technology here can only take place on user level.

A number of characteristics of the IT facilities for the different control types are given in two tables. The intention is to indicate which aspects of organization and architecture can sensibly be differentiated. As already mentioned: in practice the different control types occur neither in “pure” form nor across the whole organization. What is important to us is to show which aspects of strategy and architecture play a role and which types of control are required by the IT facilities.

4.2 Organization of the IT facilities

Indicated in brief below are the consequences of the organization structure for the construction of the IT facilities. We are concentrating on dominant aspects and accents.

The aspects reflected in the table flow directly from the nature of the differentiated control types.

Type of technology utilization and the manner of usage for example are subject to the dominant quest for efficiency: the applicative support will

follow the functional structure of activities and responsibilities and so consequently will its reporting. In a strongly function oriented environment we can expect the architecture development to have a ‘top-

		organization control type		
		<i>rational</i>	<i>integrating</i>	<i>libertarian</i>
IT facilities				
strategy development	<ul style="list-style-type: none"> • separation of management and staff • anchored in the top 	<ul style="list-style-type: none"> • cooperation between management and staff • anchored in teams 	<ul style="list-style-type: none"> • personal initiative • anchor: individual, free organization 	
structure	<ul style="list-style-type: none"> • pyramidal, vertical 	<ul style="list-style-type: none"> • participation model 	<ul style="list-style-type: none"> • self management 	
control concept	<ul style="list-style-type: none"> • functional orientation 	<ul style="list-style-type: none"> • processorientation on team basis 	<ul style="list-style-type: none"> • individual orientation on basis of skills 	
type of IT deployment	<ul style="list-style-type: none"> • registering • reporting 	<ul style="list-style-type: none"> • supporting • facilitating 	<ul style="list-style-type: none"> • opportunism • facilitating 	
use accent	<ul style="list-style-type: none"> • efficient • applicative 	<ul style="list-style-type: none"> • applicative • end-user computing 	<ul style="list-style-type: none"> • end-user computing • 'problem driven' 	
development approach	<ul style="list-style-type: none"> • long term plan 	<ul style="list-style-type: none"> • development plan 	<ul style="list-style-type: none"> • directed growth 	

down' character and lead to specific technical and applicative facilities. If a dominant functional direction is missing the development of more generic architectures is called for, but existing methods offer insufficient footholds for this – this is indicated as 'destination plan' and 'directed growth'.

The consequences for control of the IT facility are characterized here in brief.

	<i>rational</i>	<i>integrating</i>	<i>libertarian</i>
<i>characteristic information management</i>	<ul style="list-style-type: none"> • specializing • centralizing • control is leading 	<ul style="list-style-type: none"> • integrating • support is leading 	<ul style="list-style-type: none"> • small scale • little integration • end-user is leading

4.3 Architecture of the IT facility

The following table shows in short the consequences of organization structure for the IT facilities. Again it is the dominant aspects and accents which are important.

The table shows that in rationality controlled, functionally oriented organization where the struggle for efficiency is dominant, a 'single vendor' strategy is valid. Differentiation between (properties of) applications and databases is less relevant because they result from a similar 'top down' development and have one form of supervision.

This differentiation does become relevant in an environment in which there is a facility as well as a functional orientation and where the databases can be approached with general user resources and not only through specific applications. In surroundings in which job orientation is dominant and the functional orientation is subordinate, the division between data processing and data storage is even greater.

The table also shows that the drive for efficiency and the 'single vendor' strategy go hand in hand with 'proprietary' facilities. This is the situation we know in traditional computing centers, in which long term supplier dominance has lead to an efficient, specific and

		organization control type		
		<i>rational</i>	<i>integrating</i>	<i>libertarian</i>
architecture aspects	<i>systems</i>	<ul style="list-style-type: none"> • functional packages (finances, logistics) • batch systems • central databases 	<ul style="list-style-type: none"> • departmental systems • integration with OA 	<ul style="list-style-type: none"> • process and task oriented systems • specific software
	<i>databases</i>	<ul style="list-style-type: none"> • 'proprietary' OS • 'proprietary' DBMS • central planning, development / control 	<ul style="list-style-type: none"> • data-access utilities • local databases • data(base) synchr. • relational databases 	<ul style="list-style-type: none"> • application bounded databases • no datasynch.
	<i>computer platforms and desktop</i>	<ul style="list-style-type: none"> • single supplier • 'proprietary' OS for mainframe • departmental frames • desktop frames 	<ul style="list-style-type: none"> • different suppliers • 'open' frames • mainframe transport 	<ul style="list-style-type: none"> • no fixed supplier • taskbound facilities
	<i>communication and networks</i>	<ul style="list-style-type: none"> • 'proprietary' protocols: LAN & WAN • 'middleware' 	<ul style="list-style-type: none"> • 'open' standards • 'end-user computing' facilities, LAN 	<ul style="list-style-type: none"> • 'open standards • EUC, LAN • INTERNET

inflexible construction of the IT facility and in which the guarantee of continuity is derived from the guarantees of 'upwards compatibility' given by the house supplier!

The architecture aspects of IT facility management are summarized in the following table.

This table makes concrete a number of consequences of the difference in controlling and controlled activities. ‘Top down’ planning and the efficiency drive, for example, go together with strict regulation and control – less stringent monitoring leads after all to deviations which, especially in large scale operations, can mean a reduction in efficiency. Whereas maximizing output will only bear fruit if technical regulations and facilities do not unnecessarily restrict creativity.

The relationship between organizational control and information management is shown in the shown table. Essentially it establishes that ‘top down’ information system planning is only an appropriate approach for architecture development

	<i>rational</i>	<i>integrating</i>	<i>libertarian</i>
architecture aspects of information management	<ul style="list-style-type: none"> • strategic planning • top-down approach • company standards • efficiency drives • large scale operations • central, unshared authority • financial control 	<ul style="list-style-type: none"> • application planning • 'centered out' • company rules • service driven • departmental operations • shared authority • business control 	<ul style="list-style-type: none"> • infrastructure planning • 'bottom up' • company style • output driven • small scale self running operations • self management, self authorized • 'creativity' control

in limited situations. Besides this, information system planning only leads to suitable architectures if specific solutions are desired – the available methods are inadequate for more generic architectures.

4.4 Management of the IT facilities

The character of management of the IT facilities differs per control type.

- In the rationality control type, information management is largely determined by the developments, which were and are made possible. The traditional picture of the focus/fixation on technology is; the technical facilities get the organization, which suit them.
- In the integrating control type, information management takes place on a departmental level, albeit within a framework of agreements. The structure and content of departmental databases is partially derived from central databases and consequently there are synchronization agreements. Data control and data transport will be subjects to which organization wide rules apply.
- With the libertarian control type, management has an opportunity generating character. The professionals seek solutions in a creative and disciplined manner. Somewhat exaggerated: give the ‘whiz kids’ their toys, stop whining, and the result will be beautiful.

These differences in the character of information management will be expressed in the rigidity of the regulations with which the ruling strategy is controlled. In a rationality-based organization, pronouncements of strategy will often be directives which are established by upper management and from which deviation is not allowed. In a libertarian lead organization, recommendations will be the main means of ensuring that

existing knowledge and experience within the organization get a wider applicability when the opportunity arises. In an integration based organization, guidelines will often be used to offer freedom in certain areas. The difference in the character of information management is, admittedly, partly a consequence of the scale on which information management serves to take place: the smaller the operations and the lesser the influence on the nucleus activities, the less formally the information housekeeping needs to be run. But scale considerations cannot explain everything. Scale is equally not the most important consideration in the construction of information management. Conversely, the dominant control type does have a decisive influence on the character of the information management.

5 Conclusions and recommendations

5.1 Information strategy and architecture development

We have made it plausible that architecture development according to the traditional methods of information system planning does not lead to appropriate support for all organizations.

The requirements for the construction of the IT facility differ, as we have already seen, per control type. Where the demands are partially aimed at the support of 'end user computing', the development of specific architectures does not fully meet the requirements.

If generic support is demanded and information system planning does not lead to suitable support, information strategy, which creates categories for the development of generic architectures, is required.

Within the rationally run organization, the information infrastructure is dictated entirely by applicative and control demands, while within an organization with a focus on libertarian control mechanisms there is only an opportunity generating information infrastructure.

The integrating control mechanism is the middle path, by which the information infrastructure must not only connect with the 'formal' IT facilities but should also offer opportunities for specific functional development. This amounts to a specific package of demands, which is difficult both to define and to realize.

Opting for an IT facility construction that is dominated by applicative or infrastructural demands has consequences for the manner in which things are effected in execution and management.

Infrastructural demands can not be met using existing information system planning methods. Considering the long-term effects and the demands made on opportunity generating facilities, an (overall) strategy is needed.

5.2 Strategy problems per control type

Because the three differentiated control types all play a role – albeit in differing degrees – in every concern, it is necessary to identify the domains in which a certain typification is dominant, considering the architecture development and the differences in control strategy pronouncements.

The following summary can be made of the three differentiated control types.

- The rationally controlled organization is characterized by information management that -traditionally – has a house supplier, aims for efficient use of available capacities and develops ‘top down’ architectures. The prevalent efficiency drive results in central development of applications and databases and in directives for development, use and management. In this kind of organization the danger exists that applications are continuously developed and insufficiently renewed. Rationality run organizations excel in their ‘legacy systems because they do not excel in renewal. A second threat is discord in the IT facility. Because derivatives of the specific architectures do not merge well with personal computer use – the PC is inevitable! – an informal IT facility can easily arise parallel to the functional one. Common dilemmas can be characterized as those of integration and renewal.
- The organization that uses integration as the control mechanism, is typified by information management that is department oriented, has service and flexibility as its goal and gives freedom of movement within certain guide lines.

For the organization as a whole, sub optimization is a real threat; for the section of the organization that is focussing on integration, the loss of the connection to the IT facility of other parts of the organization is a real danger. A second danger lurks in the communication technology which is to be utilized, which will serve to provide the connection with other areas of the organization (for example on behalf of data synchronization with sections that focus on rationality) and with which high-grade integration must gain stature ‘on the desk top’.

- The libertarian run organization is typified by information management, which operates remotely and contributes to professional, task-oriented activity by means of creating opportunity-generating conditions. However great the personal satisfaction may be, the danger of wild growth is as large as life. Isolated development can also easily lead to an ‘information gap’ which hampers the transfer of results. Discontinuity in exchange processes forms therefore a second threat.

5.3 Issues for information management

Concerning control type, we have seen that there are clear distinctions to be made in information management dilemmas and their treatment. They can be dealt with using the insights that we have developed in this article. In conclusion we formulate our most important recommendations.

- Identify the parts of the organization where planning can not work well. Differentiate the planning approach per domain.
- Identify the influence on the infrastructural aspects in the IT facility, differentiating on the basis of the discussed control types – application oriented ‘top down’ development, an opportunity generating ‘bottom up’ or a ‘centered out’ approach.
- Do not neglect the middle layer of the organization -there is more integration in an organization than is generally realized.
- Pay attention to the way in which the organization develops, anchors and controls its knowledge in relation to the IT facility and its structure. A rationality control, which is too strong, will needlessly restrict the hitting power of the organization and nip innovative development in the bud.
- Thinking in terms of control type makes the identification of information management dilemmas easier and helps in their solution. In the end, what it comes down to is that the intended developments within an organization are given the correct directional impetus: The rationality approach in a situation where is a need for integration boils down to “accelerating down a dead end street”, an libertarian approach in an rationality oriented environment amounts to “the stimulation of chaos”.

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