PROPOSAL FOR AN OPERATIONAL MODEL TO GUIDE IMPLEMENTATIONS
OF ENTERPRISE INFORMATION SYSTEMS

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ABSTRACT

This paper presents a Model for Implementation of Information Systems (IS). Its focus is on the organisational aspects of an IS implementation, where the objective is to make sure that the to-be IS users will use the to-be IS; hence aspects of hard-ware, software, and other of the information technology are not accounted by this model. The key challenge addressed here is the many reported failures of IS implementation as derived from the organisational challenges rather than purely information technology. The proposed model is build on the so-called Organisation Information System paradigm that regards an organisation and its IS as one conceptual unit rather than considering the IS as an adjunct to the organisation – the latter typical for the conventional Management Information System paradigm. Therefore, the IS implementation is contextualised within a process for the development of organisations, and proposes the “Effect-Behaviour-Resource-Influence Loop” as a mechanism of change, of the changed organisation. In this, it is the influence of the resources – human and machines – that changes the behaviour that in turn leads to the change of effects, toward the desired state. Further, the proposed Model for Information System Implementation provides also three needs of an organisation to be subjected of an IS intervention; these are the “change Motivation”, the “change Capability”, and the “change Ability”. The proposed model is an outcome of a set of case studies of IS implementation, conducted in an Action Research mode, and informed by selected theoretical bodies as well as the empirical challenge to successfully implement and IS. The key contribution of this model is its empirical experience and its comprehensive approach to an IS implementation, rather than an analytical focusing on a few variables only. However, the proposed model is still in its hypothetical phase of theory development, and is in a need of both further cross-fertilisation with various theoretical bodies with the subject as well as further empirical experience, where validations and modifications are made.
1. INTRODUCTION

We propose an operational model that characterise some key aspects successfull information systems (IS) implemention. Over the years, numerous of investigations, both academic and professional, have reported a significant amount of IS implementation failures (e.g. Lyytinen & Hirschheim, 1988), where a variety of causes have been suggested, ranging from hardware and software-code, via functional IS modeling and design, IS architectural design, and ending with the users, their working activities and culture. In the present account, the latter mentioned aspects are focused: how to generate an IS implementation that results in the desired new organisational operations? – i.e. that the IS users conduct the desired activities and use the provided IS for that conduct. Hence, solely technological aspects of IS implementation are outside the scope of this proposal.

Further, while the various available studies investigate the IS implementation failures in terms of one or several causal variables; they do not provide a comprehensive prescription for how to successfully carry out such an implementation (Lyytinen & Hirschheim, 1988; Ginzberg, 1990). The focus of the present proposal, on the other hand, is the concrete set-up of practical actions needed in order to succeed with an IS implementation, something that is a rare contribution, e.g. Ginzberg (1990).

The here proposed Model for Information System Implementation is suggestive and still in its hypothetical stage of theory development, and induced from a dozen of IS implemention, hence more empirical exposure is needed for its validation and further development.

The next section accounts for the methodological approach utilised in the formulation of the here proposed model. Thereafter, this model is presented, including its various sections and parts. The section thereafter presents the key contribution of the model, as understood here and also suggestions for its further development.

2. METHODOLOGY

The here presented Model for Information System Implementation is an outcome from a set (twelve) of cases of actual Information Systems implementations, conducted within a major company and its various affiliates in the Nordic region. This implementation concerned a deployment of a new so-called Customer Relationship Management information system, to support the organisations’ marketing and sales operations.

The study was conducted in an Action Research mode, which is today a well-established approach to inquiries to be carried out in social settings (Lewin, 1947; Blum, 1955; Foster, 1972; Clark, 1972; Susman & Evered, 1978; Hult & Lennung, 1980; Argyris et al. 1982; Eisenhardt, 1989). Although there are a variety of approaches in Action Research, its central feature is that the researcher is immersed in the research situation itself; it is a situation that is natural in the sense that it has not been artificially created for the research purpose only, as is commonly the case at laboratories used within the natural sciences. In such a situation, the researcher assumes two distinct roles, one as a natural participator in the situation, the other as a research worker investigating the situation at hand. This means that Action and Research are conducted at the same time. From a meta-theoretical point of view,
Action Research rests upon underpinnings from phenomenology and more recently from constructivism, rather than logical positivism or critical rationalism.

The here employed approach to Action Research is based on the action research program developed over the last 30 years at Lancaster University, in the UK (Checkland, 1991; Checkland & Holwell, 1998). The Lancaster approach comprises three central components:

- An *Area of Interest* (A) that is to be investigated; in the present case it is the Medical Department.
- A *Framework of Ideas* (F) about A that may include theories and hypotheses; in the present case it is the tested postulates, as derived from of Interactive Planning and its context, as well as the leading question regarding medical operations (all specified below).
- A *Methodology* (M) to investigate A with the help of F. Figure 1 illustrates the relationship between these components.

![Figure 1. Illustrates the main components of the action research approach used for development of the Framework for Constitution of Modeling Processes. A Methodology (M) is used to apply a Framework of Ideas (F) to an Area of Interest (A).](image)

The Framework of Ideas was informed both by experienced empirical issues, needs and challenges of IS implementation and by theoretical bodies. The core of the primer was to have a comprehensive guide for the successful information system implementation. The theoretical components employed were the Organisation Information System Paradigm – shortly accounted in the next section, the Systemic Enterprise Theory (SET) and the Technology Acceptance Model, which is also shortly accounted below. In short, the SET (Eriksson, 2004) provides a set of categories (or constructs or ontologies) of an organisation and its operations, and their interrelations. This is a descriptive theory aimed to account for the richness of an enterprise and support generation of insight of any enterprise. Without defining, the key enterprise constructs include: consumer, output, processes with their activities and channels, rules, inputs, suppliers, goals, and various resources, such as active actors – people and machines – and organisational decision-structure, culture, and other. These constructs informed the formulation of the Effect-Behaviour-Resource-Influence Loop, presented below.

### 3. THE MODEL FOR INFORMATION SYSTEM IMPLEMENTATION

This section presents the here proposed Model for Information Systems Implementation. It starts off with a declaration of the object of change as an organisation with its Information System rather than as an Information System only. Next, the subject that executes the implementation is characterised in terms of the key
phases of an organisation development, where the implementation is part of. Thereafter the changed object is characterised again in terms of the here proposed Effect-Behaviour-Resource-Influence Loop, that accounts for the changing mechanism within an organisation. Finally the here proposed Model for Implementation accounts for three key organisational needs to be fulfilled in order to ease up the implementation: the Motivation, the Capability, and the Ability.

3.1. Conception of the Implemented Object as an Organisation

The here proposed Model for Information System Implementation rests upon the precepts provided by the so-called Organisation Information System (OIS) paradigm (Landry & Le Moigne, 1977; Le Moigne, 1986; Le Moigne & Sible, 1986; van Gigch & Pipino, 1986; van Gigch & Le Moigne, 1989; van Gigch & Le Moigne, 1990). This, in turn, builds upon H.A. Simon’s conception of organisation as an information processing behaviour (Simon, 1976a, 1976b) and the design of the artificial where an organisation and its information system are regarded as design objects (Simon, 1969). One of the key messages of the OIS paradigm stipulates the conception of an organisation and its information system as one conceptual whole. This to be contrasted to the conventional Management Information System paradigm, where an IS is conceived as an adjunct to the organisation (Le Mogne & van Gigch, 1990). This switch of conception of the object of concern – from solely an IS to an organisation and its IS – has implications for the conception and execution of an IS implementation, which will be articulated in the following sections.

3.2. Conception of the Implementation: Key Phases

The first implication of the conception of the object of implementation as an organisation and its IS regards the methodological conception of organisational development. In most cases, development and implementation of an IS aims to contribute to the development of the organisation and its operations, whether in some minor and limited aspect or a major development. The question therefore emerges: how to develop an organisation and its operations, in a systematic manner? While there are numerous of contributions available, provided both by academics and practitioners, the development of the here presented Model for Information System Implementation was conducted in the context of the Idealized Design methodology, as conceived by R.L. Ackoff (1981). This is not the place to present this methodology extensively, the key working phases of organisational development will suffice to be presented, as they provide the context or frame for the here presented Model for Information System Implementation. According to Ackoff (ibid.), Idealized Design of organisations should include the following five key phases: (1) identification of the Current Situation of the organisation, (2) design of the Desired Situation of the organisation and its information system, (3) derivation of the Implementation Plan for the new organisation, (4) Execution of the implementation plan, and (5) Evaluation and Adaptation of the implemented organisation and its information system. While the here proposed model relates to all the mentioned five phases, its content addresses particularly the (3) formulation of an Implementation Plan, (4) the Execution of that plan, and the (5) Evaluation of that execution. Further, the here proposed model presupposes the existence of (1) conception of the Current Situation and the (2) design of a Desired Situation, however it does not contribute conceptually with regard
how the two latter mentioned should be conducted, as it is outside its scope. Figure 2 illustrates the five phases mentioned.

![Figure 2. Illustrates the five phases of organisational development as proposed by R.L. Ackoff in his Idealised Design. Phases (3), (4), and (5) provide the key context for the implementation of an organisation and its IS. This represents the change actors’ (subject-systems’) activities in order to change the organisation (object-system).]

### 3.3. The Effect-Behaviour-Resources-Influence Loop

While the above mentioned phases of an organisational development and therefore change, account for what the actors that conduct the change – here the changing-subject – have to do, the second key question is how does the change work within the organization to be changed – here the changed-object. To this end, a conception of an organisational change mechanism has been elaborated, as derived from the above mentioned Systemic Enterprise Theory (here its enterprise constructs and their relations: consumer-output-processes-resources). This mechanism conceived the organisational change in term of its: Effects, Behaviour, Resources, and Influence, and the interrelations between these; in short the EBRI-loop.

#### 3.3.1. Performance Effects

Starting with the Effects, it is assumed here that organisation change initiatives seek some performance effects to be reached, which motivates the very change initiative. By performance effect it is meant any property of the organisation or its environment, in terms of the desired value of that property, after that the change is conducted. For example, an organisation change may aim for lower costs, higher revenues, higher degree of customer satisfaction, higher level of product margins shorter process lead-times, fewer day of seek absence among its staff member, or lower rate of IS malfunctioning experienced by the staff, among many others.

The experience has shown that if the desired performance effects are not defined explicitly and in a well justified manner, the ability to reach that desired situation of the change initiative is lowered significantly.

A second experience is even if the desired performance effects are well defined in a justified fashion, the very conduct of the organisational change may generate new knowledge and insights when the organisation in its change unfolds or is disclosed, which may justify re-formulation of the set performance effects desired.

#### 3.3.2. Organisation Behaviour

For an organisation, in order to generate any performance, it must have a behaviour that gives rise to some results. Behaviour is here understood in terms of the working processes and their workflows that are executed by an organisation’s Resources, in this context understood as their Actors. Two principal Actors are distinguished here: the human-actor and the machine-actor. The primer account for the staff members or employees of an organisation, that conduct various tasks and activities that are part of
the mentioned processes. The machines may be robot systems, manufacturing systems, and information systems. These execute various functions, and process information, which are part of the mentioned processes.

An example of a process is the invoice-payment that may be constituted by a set of activities, such as reception of an invoice, verification of the invoice received, approval of the invoice verified, etc. In this, the human-actor secretary may execute the verification; a functional manager may execute the approval, while an enterprise resource management system may execute the reception activity, as well as store the verification and the approval.

One importance of the behaviour of an organisation is to understand it as an intermediate link between the desired performance effect, on the one end, and the actors that generate the behaviour, on the other end. A second experience is that if the behaviour, here processes and their activities, tasks and IS function, are miss-conceived for the purpose that is aspired, than there is significant risk that the resources that execute these processes, here the human and machine actors, will not success very excellent, no matter how well their capabilities are.

3.3.3. Organisation Resources

The next component of the here proposed organisation change-mechanism are the organisational Resources. While organisational resources may be of various types, such as production, material, facilities, financial resources, in this context the focus is only upon the mentioned Actors that execute behaviour of an organisation, by means of the processes, and their constituting activities, tasks, and functions. The two types of Actors distinguished here – human-actor and machine-actor – may be characterised in various manners. This characterisation may be in terms of the type of (i) outputs or results an actor is supposed to generate; the type of (ii) activities, tasks or functions that an actor is supposed to conduct; the type of (iii) physical capabilities an actor is supposed posses, the type of (iv) cognitive capabilities an actor is to supposed to manifest, and finally the type of (v) affective properties and actor is supposed to posses – these latter is relevant only for the human-actors.

The importance of the five mentioned distinctions of actors’ characterisation comes from the fact that it is by means of influencing these characteristics that a change in organisational behaviour may be generated, and thus the desired performance effects. The second importance of these five characteristics is depending on the organisational situation faced, they show different degree of relevance and instrumentality in the aspirations for changing depending on the type of organisation and its current situation. Some examples will illustrate this.

Example of outputs generated by actors may be an approved invoice by the actor functional manager, or invoice status by an information system. By derivation, examples of activities conducted by actors may be then conduct of an approval of an invoice, and retrieving the status information of an invoice. Example of physical characteristics may be a staff member’s ability to lift 50 kg loads or a robot systems speed in its production arm. Then example of cognitive capabilities of a human actor may be the ability to speak fluently various languages or to calculate differential equations. This ability of a machine, such as an IS, may include processing speed, and memory capacity. Finally, the affective characteristics account for the attitudes and values of human-actors, which influence their conduct of activities, and thus the organisational behaviour and the performance effects.
Depending on the organisational setting and the very actors, these characteristics may have different relevance for the conduct of organisational change. For example, when the organisation is a research and development unit of a major corporation, the characteristics of high relevance to influence are the outputs to be generated by the employees and the cognitive capabilities inherent in these staff members—e.g. number of new molecules designed in a pharmaceutical laboratory. In this example, the physical capabilities typically lack relevance as well as the exact activities to be conducted, as the latter may not always be pre-planned in a research process. On the other hand, in the production facilities of a car manufacturing plant, the key characteristics would include physical capabilities as well as the activities to be executed.

3.3.4. Influencing

The fourth component of the here proposed organisation change-mechanism is its Influencing; it is understood here as the driver for the generation of the desired change. The logic of this change is that it is by influencing the actors of an organisation, in the right direction, that these actors may conduct the right activities and hence processes, which in turn will give rise to the desired organisational behaviour, which then generates the desired performance effects. There are various tools that can be utilised in order to generate the change of the actors.

A central tool for the change of human-actors is the education and training that aims to provide them with the relevant capabilities to execute the relevant tasks and activities. The same capabilities are established within machine-actors by means of engineering, such as software engineering aiming at providing an IS the desired functionalities and information content.

Yet another tool for the influencing of human-actors is the exposition of relevant signals. An example of this may be the leaders of an organisation that use a new IS in their daily work, and thereby giving good example for the employees of the organisation, which is a motivating factor.

Two other motivation generating tools are the incentive systems and the regulation systems, or policies. Incentives may be conceived in terms of various bonus systems, based on salaries, for instance, if a worker uses a new IS implemented, as intended, then she or he may be given another monthly salary. Regulations on the other hand are stipulations for desired behaviour, which may ultimately lead to corrective measures when the stipulated behaviour is not conducted; example of a rule for sales representatives is to report all customer interactions conducted into the new IS.

3.3.5. Interrelations and Management

The EBRI-loop presents four interrelated complements of the change mechanism of an organisation: the desired performance effects, the organisational behaviour needed to generate these effects, the resources needed to execute this behaviour, and then the various influence tools to make the resources act as intended.

A typical challenge of the execution of this EBREI-loop successfully, is the analytical ability to identify the right aspects of the four components and secure the validity of their interrelations. A second challenge is the resources needed to execute the EBRI-loop, ultimately counted in financial terms. As these resources are typically
limited, the question emerges: which influencing tools should be used in order to success with the change, given the available resources? Yet another related challenge is that any organisational change, and particularly implementation of an IS, causes some operational disturbances, which may lead to an overall lower performance of the organisation, such as lowered revenue rates. The question in this respect is to identify these disturbances prior the change and handle them in a deliberate manner.

Yet another challenge, experienced too frequently, is the fall-back syndrome. This implies that when the behaviour and effect of an organisation has been advanced from state one to state two, as desired, the organisations tend to fall back to the state one soon after state two was reached or just before, particularly when extra stress is put upon the organisation, such as tighter budget constraints, which may be caused by the costs of the conducted organisation and IS implementation.

Finally to mention in the context of the ERBI-loop, there is a need for yet another key activity to be conducted, it is the management activity of the EBRI activities. This includes their monitoring, analysis and evaluation, design, signalling, and again monitoring, etc. As the experience shows that complex implementation seldom will be realised exactly as the initial plans stipulates – whether due to insufficient planning or to emergence of unpredictable conditions – there is a need to continuously re-evaluate and re-plan the whole implementation work, with the assumption that it is better to adjust the plans to the actual situation rather than the vice versa…

3.4. Implementation Needs

The above discussed Influencing tools already suggest that there are some specific needs to be fulfilled in order to conduct a successful implementation of an organisation and its IS. The here proposed Model for Information Systems Implementation stipulates three such generic organisational needs, that constitute organisational conditions for implementation; these are the Motivation, the Capability, and the Ability – in short the MCA-Condition.

3.4.1. Ability

Starting with the latter, the Ability, it refers to the operational space within the organisation that is required in order to be able to execute the work needed to do the implementation of the organisation and its IS. As mentioned above, the implementation may imply operational disturbances in terms of the conduct of its daily operations, when the actors – human and machine – must execute non-routine implementation activities, such as education, training, tests of IS:es, etc, which means that the ordinary activates may not be conducted. Experience has shown that it is not unusual that an involved worker may need to allocated 20-60 % of the working time on the non-routine implementation activities, and hence reduce the time available for the routine operations. This temporal operational disturbance must be planned for and a budget need to be assigned, which here refers to the Implementation Ability of the organisation.

3.4.2. Capability

Capability refers here to an organisation actors’ capability to executed desired tasks and functions, hence give rise to processes and organisational behaviour. In human-
actors, the capability may be characterised in terms of the relevant skills and knowledge of task conduct, and the relevant value set needed promote the execution of those tasks. In terms of IS, the capabilities refer typically to the right functionality, the right information, and the right performance. The establishment of the relevant capabilities was discussed above, and is typically made by means of education and training for human-actors and by deliberate engineering for machine-actors. Starting with the primer, the two key processes to secure that organisation’s staff members have the right capabilities is recruitment of people that already posses the desired capabilities or internal development of people, through mentioned education and training processes. Experience has shown that a key challenge of any non trivial IS implementation is to secure that the to-be users of the new IS have the right capability of using the new IS.

3.4.3. Motivation

Motivation is a key characteristics of people in the organisation, hence the to-be users of the to-be implemented IS. It refers to peoples’ willingness to change their behaviour in order to conduct the desired activities. Various incentive structures, policies and regulations, as well as strong entrepreneurial leadership, may influence and drive the motivation, which in turn will drive the behaviour. Further, the recognised Technology Acceptance Model provides a set of key variables that explain why Information Systems will or will not be accepted and thus utilised by their intended users. In this, there are two key variables that has showed particular relevance for this acceptance, these are the perceived usefulness of an IS and the perceived ease of use of an IS (e.g. Davis, 1989; Legris et al. 2003).

The overall role of the three organisational MCA conditions is to enable a successful execution of the above discussed EBRI-loop for organisation change.

4. THE CONTRIBUTION AND NEXT STEPS

The here proposed Model for Implementation of Information Systems represents an empirically driven conceptualisation of actual experiences conducted in more than ten cases of IS implementation. Secondly, this conceptualisation has a comprehensive, or holistic, and qualitative approach to the IS implementation, rather then analytical in the sense where two or a couple of variable and their interdependences are investigated and justified by means of statistical methods. In this holistic aspiration to IS implementation, the proposed model builds on the Organisation Information System proposal, where the organisation and its IS are regarded as one conceptual unit.

On the other hand, at this moment the proposed model can only be regarded as suggestive or hypothetical and asks for further empirical experience in the search of its confirmation or the opposite. Therefore, further research actions must include empirical use of this model in a controlled manner, where its various components are either validated or suggestions for modifications are generated.

Secondly and related, the here proposed model has not been informed by the various theoretical analytical contributions to the IS implementation, which require their identification, critical review and then allocation within the here proposed model, in order to further develop it and then test in new empirical contexts of IS implementations.
REFERENCES


Foster, M. 1972. An introduction to the theory and practice of action research in work


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