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Management of Technochange in an Interorganizational e-Government Project

Abstract
This paper explores if and how enterprise architecture knowledge may support management of interorganizational technochange. An action research study on an eGovernment technochange project provides empirical data. Four issues of technochange are identified from the research site and presented; Solution concept communication, Stakeholder competencies, Goal ambiguity and finally the Collaborative form as such. Results indicate that enterprise architecture may support management of interorganizational e-Government technochange. In addition, collaborative competencies must be developed by respective partner as new collaborative arrangements grow. These collaborative competencies could be part of a future enterprise architecture for interorganizational technochange.

1. Introduction

When an organization is adopting new technology that is likely to trigger or require major organizational change, one may refer to it as Technochange. The concept of technochange is coined by Markus [22]. Markus argues that there is a significant difference between Technochange and traditional IT-project management, as well as between Technochange and traditional organizational change management [22]. Traditional IT-project management have a technical focus but lack adequate attention and tools for issues related to end product in use; organizational change management has a strong people focus during a change, but has little to say about how IT alters the problem of organizational change [22, 23]. Technochange is an integrated approach for managing organizational change in situations where IT is the main change driver.

Organizations are increasingly sharing IT resources as means for information and data exchange [14]. Interorganizational systems (IOS) have grown from the early 90s EDI solutions aiming at supply-chain optimization between stable business partners, into today’s (2007) dynamic infrastructures for information exchange. Loosely coupled services are orchestrated to meet tailored information needs from users within and around an organization [15]. Integration platforms and web technology are engines enabling this inter-operability between systems. Development, implementation and use of IOS require technochange.

Technochange are difficult endeavors that often fail due to a number of reasons [28, 8, 25]. There is a difference between typical IT projects, typical organizational change programs and technochange [22]. The technochange approach must be an integrated technical and organizational solution; simply treating technochange through IT project management complemented by organizational change management does not provide an adequate solution [20]. Since Technochange management requires a different approach, it also requires different managerial qualities.

“Research shows that multiorganizational infrastructure development projects are a completely different animal from traditional in-house projects (even those involving external organizations such as technology service providers and consultants). Consequently, project management skills and techniques that are perfectly adequate even for major intraorganizational projects may not be adequate for interorganizational projects.” Markus [23, p.25]

One of the reasons for the high rate of failure of technochange initiatives is a consequence from management ambitions to control and plan to a very high degree, blinding them from managing the “real issues” [5, 16, 22]. Studies show a large degree of uncertainty and unexpected outcomes from technochange initiatives [16, 22]; apparently, solely applying planning and control mechanisms is not the remedy for technochange failure.

There are multiple sources describing the uniqueness of technochange [22, 23], the high failure rate [28, 8, 25], and the potentially high rewards after successful completion. But there are few studies exploring how one should
The purpose of this paper is to improve the knowledge of technochange management by testing if Enterprise Architecture (EA) may support the practice of technochange management. The research site is an interorganizational e-government project, thus, a secondary purpose of the study is to present e-government technochange issues and solutions from this project.

Architectures are predefined conceptual frameworks regarding the inner and outer workings of a domain specific entity [34]. Several researchers have made significant knowledge contributions regarding the development and usage of Enterprise Architecture (EA). Zachman [34, 35] presents an extensive EA that positions stakeholder roles and development phase into a framework that specifies appropriate language and notation depending on where and whom you are. Zachman argues for a methodology that enables applying his framework. Others argue for the benefit and enhanced communication that usage of architectures enables [6, 1, 24, 30]. Ross [29] exemplifies how architectural capabilities relate to an enterprise ability to implement and make good use of IT. Smolander [30] investigates how different stakeholders perceive software architecture and presents this through four metaphors, namely Software architecture as; Blueprint, Language, Literature and Decision. Smolanders research illustrates how and when in the software development process, different stakeholders use software architecture as means for communicating their respective agendas. Smolander concludes his argument with suggestions for further studies regarding how to create representational forms that may satisfy these needs [30]. Above referred to studies, among many others, have focused on how One enterprise use Software architecture in their IT management, this study focuses on how Several enterprises may use EA in a technochange context.

The research site is an interorganizational e-government project aiming at creating a “portal-solution” where a number of e-services are to be available for the citizen. These services build on back-end collaboration between several public administrations. The project comprise of collaborative development of shared infrastructure for electronic communication, as well as development of new interorganizational routines and processes; and finally significant changes to some existing practices that will be replaced. The future infrastructure will be shared by participating organizations, development will be done by consultants, but project management remains in-house.

It is a technochange project since the solution requires significant technology- as well as organizational development.

An action research method has been followed; the researcher has been involved as an active member of the project team, continually supporting the project management. Qualitative data from 6 months fieldwork, 500 hours of participatory observation, has been categorized and analyzed.

2. Action research

Action research is an approach that has been increasing in popularity by IS scholars since the mid-'90s. Social and medical sciences have been using it since the -'50s. Many researchers have made significant contributions in the further development and application of action research towards the IS community [29, 16, 13, 30] to name a few. Action researchers assume that complex social systems can not be reduced for meaningful study, that human organizations that interact with information technologies can only be understood as hole entities, an finally, that the best way of understanding them is by introducing change and observe what happens [2]. The research behind this paper has followed Baskervilles guidelines for action research in the IS community [2, 3]. Baskerville [2] recommends a five step approach; 1) Diagnosing, 2) Action planning, 3) Action taking, 4) Evaluating, 5) Specifying learning. These steps have been taken in a first action cycle, and are reported and discussed in this paper.

Below figure (1) illustrates the research process and the main activities that occurred between the researcher and the practitioner.
3. Enterprise Architecture

Albert Einstein is given credit for having said “Problems may not be solved on the same level of consciousness that they were created on”.Enterprise Architecture (EA) moves up one level of consciousness to the model world. EA is the practice of applying a comprehensive and rigorous method for describing a current and/or future structure and behavior for an organization’s processes, information systems, personnel and organizational sub-units [34]. EA typically comprise of a method describing the steps to be taken for producing a series of models. To a large part, the method comprise of polices for how to create representational forms of the enterprise, in other words, instructions on how to draw models and how these models relate to one another.

If an enterprise is developed and managed according to well defined rules and plans, any change activity will experience substantially less difficulties. The benefits from working from an architectural approach is well explained, tested and evaluated by Zachman [34, 35] and Sowa and Zachman [31] who argue and present an extended information system architecture. In the following section, an extended EA (the Delta model) is presented.

3.1. The Delta model and methodology

The Delta model is any EA with three added elements, Stakeholders, Goals and Activities. By adding these three elements, the model becomes a pragmatic and powerful tool useful for management in order to keep track of complex Technochange initiatives. In any collaborative arrangement, problems between collaborating parties often occur due to differences in perspective regarding the issues at hand. Thus, any EA aiming to support interorganizational collaboration must capture and support the modeling of different layers/aspects of the collaboration as such, this does not only includes relevant technical and organizational levels, but also the situation where
different stakeholders of collaboration interpret a situation differently.

The Delta model is developed and tested to meet the need for multiple views. It is the main result from research collaboration between Göteborg University and the industry conducted between 1998 and 2001 [10]. The model has been found useful in a number of research activities [10; 11; 19]. For a more detailed presentation of the model, read [12].

The Delta model comprise of four elements:
- Enterprise images, current and future architectures
- Stakeholders, who is involved in, or affected by the system?
- Goals, what are the goals?
- Activities, how are the goals to be achieved?

And their corresponding six relationships R1 – R6, see Figure 1 below.

![Figure 2. Delta model](image)

3.1.1. Enterprise images

refer to the current and future architecture of the enterprise. The difference between current and future state is the delta that is to be closed by Technochange activities. In many cases, an enterprise does not have an explicit architecture. In this case fragmented models, charts and diagrams are common ways to describe this element; thus, it may be referred to as Enterprise images rather than architecture. Examples of enterprise images are RUP diagrams of a current invoice procedure, or an organizational chart describing organizational levels after an upcoming reorganization.

3.1.2 Stakeholders

refer to any actor whom are in any way involved in-, or has a relation to the enterprise, and thus may influence it directly or indirectly. Examples of stakeholders are a Steering committee for a project or future users of an IT system in production.

3.1.3 Goals

refer to defined future states of a specific entity. They may be formal or informal. They may regard the enterprise or another enterprise. There are often multiple goals, sometimes in harmony, sometimes in conflict. Examples of goals are: increase of sales with 10% or develop the cheapest balloon on the market.

3.1.4 Activities

refer to the actual activities that is being done comprise. It may be done in formal temporal manners, Projects, or in individual initiatives outside the formal organization. Often the main activities are the activities that are to change the current state of the enterprise, to a desired future one.

3.1.5 Delta Methodology

The Delta methodology is a set of open suggestions that supports the practitioner of technochange by (1) relating the specific situation to the Delta model, and (2) using the model as means to cope with the situation at hand by relating specific issues to corresponding elements in the model. Below follows a general description, it is to be seen as inspiration for management as they invent their own methodology.

1. Model current and future enterprise in a way that is understood by stakeholders (R1), make them react to the enterprise models, make necessary changes (R1)
2. Ensure that involved stakeholders accept and work for defined goals (R2)
3. Compare future enterprise with existing goals, change either or both if necessary (R3)
4. Plan activities that will change current enterprise to (wards) future enterprise (R4)
5. Ensure that involved stakeholders accept and support these activities (R5)
6. Ensure that activities does not counteract but rather support other goals (R6)
7. Continually monitor any change in any element, if change = start all over.

4. The project

The project is an interorganizational collaboration between three large public administrations (PA) in Sweden. Motivation for running the project spring from multiple sources; political, public as well as industrial. The project is partly founded by participating organizations and partly from a public research financier. The goal of the project is to create a portal solution where PAs e-services may be accessed from a single point, a true one-stop-shop [4, 20]. Involved PAs have no or low previous experience in e-collaboration [17], but traditionally, they have been very good at developing and using IT in their own organizations. In order for the project to be successful, involved PAs must in addition to agree on a solution, also change their current internal processes and strategies in order to conform to the larger scope that the project stipulates [19].

5. Results

The results chapter is organized according to the five-step action research approach that has been followed; (1) Diagnosing, (2) Action planning, (3) Action taking and (4) Evaluating. Step (5) Specify learning is presented in a separate chapter six. For an overview of the research process, see Figure 1.

During the action cycle, numerous issues where identified and categorized in the Delta-model and further, discussed and managed. These issues have been aggregated into four overall issues; Solution communication, Stakeholder competencies, Ambiguous goals and Collaborative form. These four issues are presented separately for each action research phase.

References (R1 – R6) are continually provided in the text to show where in the Delta model that respective issues springs from.

5.1 Diagnosing

The following four overall issues where identified;

1. Solution communication, Problems to visualize and discuss potential solution concepts, technical as well as organizational
2. Stakeholder competencies, Many stakeholders (some unknown) all with different experiences and competencies from working in IS projects
3. Ambiguous goals, Conflicting, unclear and ambiguous goals
4. Collaborative form, The collaborative form (inter-government IS project) lack supporting structures, explorative work difficult to manage and plan

Figure 3. The four issues inserted in the Delta model

Above figure (3) illustrates how the issues may be positioned in the Delta model.

5.2 Action planning:

Solution communication

The challenge with explaining and communicating alternative views of the current and future state of the enterprise spring from the many stakeholders different experience and (in) ability to interpret conceptual models (R1). Many stakeholders did not understand the project manager’s pictures of current practice, but thought they understood. This resulted in difficulties for them to even see the need for an alternative solution since they did not accept the motive or actual state of affairs. This resulted in an ambition to communicate potential future enterprise images better and clearer (R1).
Unclear images of the enterprise are the result of relatively vague steering documents formulating the end-goals (R3). They are open for interpretation on numerous critical aspects, this leaves project management with the additional work of specifying necessary parts of the steering documents before they may start to use and follow them. The reason for the vague steering documents is a combination of an inexperienced steering group (R1) and a politically sensitive project context. (R3)

It is difficult to manage activities “goal-oriented” since the goals and future image of the enterprise is ambiguous (R3). The management team is used to goal oriented projects in more stable circumstances; the change towards other methods/means is difficult (R6). A result is that the project now views a “Well defined and concrete view of the future enterprise” as the main deliverable from the pre-study, rather then something that exists and may be used for planning purposes (R3).

Stakeholder competencies
A fair number of influential stakeholders have little or no experience in working in IS projects, this has consequences. The stakeholders act unpredictable, not always in line with what is perceived to be in their organizations best interest (R5). In addition, they probe issues they recognize, regardless of the importance of the issue, this makes larger meetings time-consuming and ineffective (R5). The stakeholders have a fairly accepting attitude towards collaborative work planning, mostly agreeing (R2). This does not mean that they have accepted or understood the contents of the work, or the implications of the result (R1). As these implications become apparent down the road, work halters and issues needs to be re-managed by the management (R1, R2, R5).

Ambiguous goals
To a large extent the same as Solution communications.

Collaborative form
The collaborative form as such (interorganizational e-government project) is relatively new. There are no existing structures to support or relate the work to (R4). Internally, involved stakeholders have difficulties to motivate participation, since costs associated with the project are difficult to take (R5). In addition, there are many internal projects at the respective agency that influence the project. Agencies do not have clear procedures for project prioritization when there is a conflicting interest between internal and external projects (R6).

5.3 Action taking:

Solution communication
The project management used simpler pictures in their attempts to visualize the enterprise, they also gave more time to sit down and talk about competing views (R1). In addition, project management started to actively identify unknown variables, labeling them unknown, rather than treating unknown issues as known or almost known (R1 – R6). The action followed the planned action.

Stakeholder competencies
The project management started treating stakeholders more individually, based on their planned role, influence and abilities in the project (R1, R5). In addition, extra questions where asked in order to double and triple check that it was understood what was being decided (R2).

Ambiguous goals
The project management moved towards planning and acting in a “design to cost” fashion rather than the initial goal oriented approach (R3). The shift towards hard deliverables (even if the are considerably less fancy) gives concrete focus on the work at hand (R6), and removes lock-ups from perceived problems down the road, such as whom will manage and finance the ready solution (R4). This action was not explicitly planned for, and not sanctioned by the steering committee.

Collaborative form
The project management must create action room before they act. This must be planned for. Also, reports from lessons learned from the project shall be communicated to an agency responsible for government e-collaboration, so that they may speed-up standardization and collaboration guidelines (R4). Competing internal partner-projects have been included in the project as a means of taking control of them (R6), a fairly aggressive approach that was well planned for.

5.4 Evaluating:
Solution communication
It is by the project management considered very beneficial to start communicating with rich-pictures as early as possible. In many cases, one may suspect that the pictures may be interpreted as political or sensitive, but this is often not the case. Draw, model, communicate! Plan a lot of time for this.

Stakeholder competencies
There are hidden stakeholders with hidden agendas in the e-government world. Find them. Talk to them. Communicate ambition with project and explain how it does not undermine individual agencies/functions. This is a difficult and slow process, hard to evaluate progress.

Ambiguous goals and Collaborative form
The move towards “design to cost” was very successful. It has not as of now spilled down to updates of formal documents, but remains the de facto approach. Difficult to change previously accepted formal documents, the project should have been planned more as an explorative project and less as a “normal” IS project. Now, project management is stuck with a project structure that is dictating what papers to produce and an informal approach on how to organize and manage the actual work content.

6. Specify learning

This chapter is step 5 (Specify learning) in the action research cycle. Previous steps (1 - 4) are to be found in results chapter 5. This chapter is divided into (6.1) learning from the issues and (6.2) learning from working with the model.

6.1 The issues

Solution communication
All wisdom from mans history regarding what to learn from managing change starts with descriptive representation of what you want to change [34]. Ross [29] argues for the development of architecture competencies in enterprises. This study supports their argumentation by illustrating a concrete need and inability to communicate, and the consequences from this. An EA for interorganizational collaboration should include simple models of overall collaborative concepts.

Stakeholder competencies

Technochange initiatives involve numerous stakeholders within and around the organization. Marcus [22] describes on a high level, the problems that may spring from these. This study gives concrete examples of how multiple stakeholders affect a technochange project at several levels (strategic, operational, technical and organizational).

Ambiguous goals
Goal ambiguity is a consequence from practicing IT management in a technochange project. Besson and Row [5] describe how the need for control and planning may have negative effects. This study supports their argumentation by showing how ambiguity and uncertainty springing from several stakeholders directly influences management ability to control the project and push forward.

Collaborative form
Inter-government collaboration that springs from a void (in terms of collaboration) is challenging to achieve, it helps if focus can stay on technically oriented tasks and let development dictate when it is time for decisions regarding organizational issues. In other words, develop technology and let the technology say when it needs an organization. Decisions regarding organizational development and change tend to be easier if you can relate them to a technical artifact that exists. On the other hand, when organizational-development related decisions lag, technical development activities are forced to work under conditions where there is a lot of uncertainty; who will run the solution? How will governance be implemented? What will happen to existing affected systems and practices? The management solution for working in this decision void is to work under assumptions regarding future collaborative arrangements and develop technology accordingly; not optimal, but doable. Markus [22] argues for an iterative approach where a method close to prototyping is used. This has several advantages; enables management to continually test what has been developed, gives instant feedback from future users, build knowledge regarding the need to change, and supports the change process as such.

6.2 The model

The results-section illustrates how the Delta-framework may aid management in establishing structure on loose issues. The
management team adopted a pragmatic view of the model-usage meaning that they expected the researcher to have the role of relating/ translating issues from the project into the EA (The Delta model) to the model. Once this was done, the management team was very successful in elaborating and driving discussions regarding issues to concrete project decisions.

It is not yet clear whether the Delta framework is a first step towards an interorganizational technochange architecture, but hopefully future usage will provide further insight. However, the need for pragmatic knowledge and tools for management of interorganizational technochange is clear in this project.

It is a challenge for the future to develop and package new knowledge of technochange support so that it both satisfies the technochange managers need for assisting structures (maybe EA) as well as agility during concept development. This study has attempted to satisfy these needs by applying a framework and working actively with users of the framework, ensuring that not only a framework is tested, but also that capabilities to use and understand it.

There are many methodological approaches towards management of technochange; any approach testing new ideas in an actual technochange setting is probably in the right direction.

7. Conclusions

An EA for interorganizational technochange has been found useful for identifying and managing issues in the eGovernment technochange context under study. Identified issues are also found by other researchers. This study highlights four issues; (1) Communication of solution concepts, (2) Multi-stakeholder views, (3) Ambiguous goals and finally (4) Collaborative form. The framework and methodology used enabled project management to identify these issues at an early stage; this gave management the time to act in order to manage issues as they arose.

If it is a common situation in the public administration not to make necessary organizational decisions until after enabling technology is developed, their technochange projects should be planned accordingly. This means a change towards a more flexible and agile approach for setting up e-driven collaborative arrangements, less substantial descriptions of end product and more procedural descriptions on how to work. The collaborative capabilities of participating organizations will dimension the degree of actual collaboration; ensure that the gap between dreams and reality is not too wide.

8. Acknowledgements

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