

Multi-Level Analysis of Complex IS Change: A Case Study of eCustoms

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Abstract

Although much efforts have been devoted to understanding IS change processes that take place in a single organization, there is very little understanding about the change processes that affect IS decisions and developments across organizations. In this paper we provide a conceptual framework to analyze and explain complex multi-level IS change. To demonstrate the use of the framework we apply it to analyze changes in the domain of eCustoms, as in this domain we find rich examples of multi-level IS changes. The framework combines the work on “motors of change” by Van de Ven and Poole with Pettigrew’s notions of “vertical” and “horizontal” levels of analysis. Based on our case analysis we conclude that the conceptual framework proves to be a useful lens through which to analyze complex multi-level IS change. We propose extensions of the framework by identifying different interaction types between the changes and we outline directions for further research. In this respect, this paper can be seen as a contribution to the existing IOS research on change.

Keywords: motors of change, multi-level change, IS, eCustoms

Introduction

Information systems (IS) are continuously being used in increasingly complex inter-organizational setting, which requires that the existing approaches for analysing Inter-organizational systems (IOS) and related change processes are revisited and revised to reflect this new reality. eCustoms is an example of a new and very complex IS phenomenon, which urges us to push our understanding of IS and the related change processes to a next level. Inspired by the developments in the area of eCustoms, in this paper we propose a novel framework to analyze complex multi-level IS change.

In our empirical study of IS change in the domain of eCustoms, we were confronted with a phenomenon that is substantially different compared to what has been studied in the IOS field today. Unlike many existing IOS studies, which focus on the use of IOS for business-to-business interactions among limited number of business partners in a supply chain, in eCustoms we saw a

much more complex environment. First, in eCustoms IS is used not only for the interactions between businesses participating in the cross-border supply chains, but also to support the interactions between businesses and government, as well the interactions between different governments. The scale of eCustoms change is tremendous and the impact of IS change becomes apparent in case of disruptions and break downs. For example, in Australia the introduction of the import module of the Integrated Cargo System led to a major disturbance for industry and government. Goods were not cleared but remained sitting in the docks, and the government's efforts were questioned in Parliament (Marshall, 2006; Van Stijn and Bjørn-Andersen, 2007).

The situation in EU is much more complex than in Australia, or many other countries or economic zones, as the EU has a more complex governance structure. For EU-wide systems, legislative and IS requirements are defined at the EU level, as captured in the latest EU Customs 2013 program¹. Next, all 27 member states have to implement the legislation and systems nationally. Subsequently, affected businesses in all member states are required to develop interfaces towards these national systems, which in the case of large multi-nationals again means added complexity. Thus, eCustoms change is ongoing and has impact on businesses, international supply chains, national governments and international policy makers. It is therefore of major importance for the parties affected by eCustoms change to get a better understanding of these change processes, in order to be able to intervene in an informed manner, rather than wait unprepared.

In this paper we argue that eCustoms is a very complex multi-level IS phenomenon with a distinct nature, compared to what has already been addressed in the IOS literature; to our knowledge the existing IOS literature provides only limited insights in how to understand such change processes (see Section Two for the further theoretical discussion). To address this gap, in this paper we propose a conceptual framework to analyze complex multi-level IS change. The framework combines the "Four motor framework" that Van de Ven and Poole (1995) with Pettigrew's concepts of vertical and horizontal levels of analysis. The framework provides a theoretical contribution to the field on IOS, as it helps to advance our understanding of complex multi-level IS change processes such as eCustoms. The paper also adds value for practitioners; understanding the multi-levelled context and the changes that occur would allow practitioners to better grasp the complex environment in which they operate, which would allow them to make informed choices for strategies and actions.

The remainder of this paper is organized as follows. In Section Two we review existing theories and we propose our theoretical framework to study complex multi-level IS change. Our research methodology is presented in Section Three. In Section Four, we demonstrate how our theoretical framework can be applied to analyze examples of complex multi-level IS change, where the subject of our analysis is eCustoms change in the Netherlands. The paper ends with conclusions and recommendations for further research.

Theoretical Foundations

In this section we present a review of existing IOS literature on multi level change, followed by a discussion on approaches to IS change. We then introduce our conceptual framework for studying complex, multi-level IS change.

¹ For details on the *Customs 2013* program see http://eur-lex.europa.eu/LexUriServ/site/en/com/2006/com2006_0201en01.pdf, last accessed August 31, 2007.

Literature Review

1. The multi-level perspective in the IOS literature

Looking at the available IOS literature we found that many studies were limited to the IS use by a limited number of business partners in their direct business-to-business interactions. Such studies are not very insightful for understanding eCustoms change, as they are not addressing the complex interactions that we observe between businesses, national governments, economic zones. We found, however, some very interesting studies in the IOS literature, which recognized that in order to understand the change processes that take place, it is important to look beyond the micro level IOS interactions between the individual organizations (Gregor and Johnston, 2000; Gregor and Johnston, 2001, Johnston and Gregor, 2000, Reimers et al., 2004). It was recognized that in order to understand the change processes it is necessary to look at macro level (the industry level) and the remote environment.

Although the above-mentioned studies illustrate the need to move towards a more sophisticated analysis of IOS development by taking a broader perspective of an industry and remote environment, the levels proposed (i.e. enterprise, industry, remote environment) are limited to explain what we observe in the area of eCustoms. First of all, eCustoms change does not affect only one industry, rather it affect multiplicity of businesses that operate in different industries, as long as they have to deal with cross-border trade. Thus, an industry focus will not be very helpful to understand the IS enabled cross-border trade developments. Second, in the above-mentioned models the government is treated as part of the remote environment; however what we see in eCustoms is that government plays a central role and thus needs to be treated explicitly. Furthermore, we are not talking about one government, but the IS developments are influenced by multiplicity of governments operating at different levels (e.g. national, EU, US) and the interactions between these governments. Thus, we cannot look at the environment as a black box, rather we need to make explicit these different developments in order to reason about how they influence the decisions about IS. Thus, although the idea for multi-level analysis is very appropriate for analyzing eCustoms change, further research on defining the adequate levels is required.

2. Approaches to IS change

Apart from acknowledging that eCustoms change affects multiplicity of levels, we argue that we need to get a better understanding of the change processes that take place at the different levels and interactions between them. Such analysis will help the affected parties to better understand such change processes, which will enable them to reason about possible strategies for intervention in an informed manner.

Based on a review of the IS change literature (e.g. Markus and Tanis, 2000; Markus et al., 2000; Pollock and Cornford, 2004, Soh and Sia, 2004) we made a number of observations. First of all, most of the IS change literature is in the context of a single organization, be it also a large-scale multinational. However we need to go beyond the boundaries of a single organization and look into a network of organizations. Second, when we look at IT-enabled change we can roughly distinguish between studies that take a planned approach toward change. These include IT-enabled business process reengineering, strategic IS planning. Such approaches to change see change as a result of deliberate planning and prescribed action. As a reaction to this planned and prescribed view, in the IS literature we see a stream of studies on IS change, that focus predominantly on the emergent nature of change. There change is seen also as unintended, indivisible, sometimes hidden and not necessarily positive (Boudreau and Robey, 2005; DeSanctis and Poole, 1994; Orlikowski, 1996; Sarker et al., 2006). From the current developments that we observe in the eCustoms context in the EU, however, we consider that it is important to give equal tribute to both the planned and the emergent nature of change. In eCustoms we see elements of both planned and emergent change. The plans for IS change that the EU provides become embedded in the long-term EU agenda and subsequently get translated into the strategic agendas of the Member State Administrations and businesses respectively. At the same time we see emerging developments that

are not aligned with these plans, for instance driven by bottom-up initiatives to develop eCustoms innovation (Rukanova et al., 2007).

3. Observation

Based on the discussion above we can conclude the following. First of all, although the IOS literature provides us with valuable insights into the need to look beyond the micro-level organizational interactions, the proposed levels that we identified in the IOS literature are not entirely suitable to analyze eCustoms change. Second, in the IS literature we see often the discussion of change as either planned or emergent, but in eCustoms we see examples of both and thus we need a theory that will treat these changes as equally important. Third, in eCustoms we need to understand how the changes at the different levels develop and interact with each other. We were not able to identify a theory that combines such analysis. Thus, in our exploration we looked beyond the IS literature on change and we explored the field of organizational change studies.

A Conceptual Framework for Studying Multi-Level Change

1. The motors of change

Building on the results of their literature study in the field of organizational change studies, Van de Ven and Poole (1995) derive a typology of change distinguishing four basic change mechanisms, or “motors”. The authors argue that a combination of these elementary motors could provide explanations for complex change. We argue that this framework can help analyze complex multi-level IS change.

The motors are positioned along two dimensions: mode of change and unit of change. The mode of change reflects the way change is understood as either prescribed or constructed, which captures both the planned and emergent nature of change. The unit of change reflects whether the change concerns a single or multiple entities. The four motors of change (evolutionary, lifecycle, teleological, and dialectic) are positioned within these two dimensions (see Table 1 for descriptions of the motors).

Table 1: Motors of change (Van de Ven and Poole, 1995, pp. 520- 521)

Motors	Description
Evolutionary	An evolutionary model of development consists of a repetitive sequence of variation, selection, and retention events among entities in a designated population. Competition for scarce environmental sources between entities inhabiting a population generates this evolutionary cycle.
Life-cycle	A life-cycle model depicts the process of change in an entity as progressing through a necessary sequence of stages. An institutional, natural, or logical program prescribes the specific contents of these stages.
Teleological	A teleological model views development as a cycle of goal formulation, implementation, evaluation, and modification of goals based on what was learned by the entity. This sequence emerges through the purposeful social construction among individuals within the entity.
Dialectic	In dialectical models of development, conflicts emerge between entities espousing opposing thesis and antithesis that collide to produce a synthesis, which in time becomes the thesis for the next cycle of a dialectical progression. Confrontation and conflict between opposing entities generate this dialectical cycle.

We identified two earlier efforts to bring this typology from the organizational field to the IS field. Cule and Robey (2004) built their analysis of IS-change by borrowing only two motors, the

teleological and dialectic. They argue that the framework provides an integrated perspective that connects change at interdependent levels, that is, an individual (single unit) and organization (multiple units). Nordheim and Päiväranta (2006) borrow all the four motors of Van de Ven and Poole to understand enterprise content management. Although the studies of Cule and Robey (2004) and Nordheim and Päiväranta (2006) aim to answer different research questions compared to us, they both present an attempt to bring the motors of change from the field of organizational change to the IS field in order to explain some aspects of IS change. Similarly, we consider that the typology provides a useful perspective to investigate complex IS change as eCustoms. It captures both the planned and emergent aspect of change but instead of putting one above the other, treats them as equally important. Furthermore, each motor defines a generic change process along which changes driven by this motor develop. This provides us with mechanisms to reason and further classify the change processes that we observe and differentiate between them.

2. Putting the motors of change in motion

The motors of change provide a typology, which is useful to understand the various basic types of change processes. However, an analysis based only on this characterization could become very static and fragmented. We will need a way to understand the heterogeneous context in which eCustoms change takes place, as well as the relationship between the different change processes. We concur with Pettigrew's contextualist approach that a study of change needs to place this change in its historical, processual, and contextual setting, an approach that according to Pettigrew is not used regularly (1985a, 1985b; see also Pettigrew and Cameron, 2001)². Pettigrew's (1985; 1987; 1990; 2001) work offers several insights to think through in order to address this issue. Pettigrew suggests a contextualist analysis of a process such as change draws on phenomena at vertical and horizontal levels of analysis and the interconnections between those levels over time. The vertical level addresses the interdependence of the units of analysis to explain a phenomenon (Pettigrew, 1990). An example is the impact of socio-economic change on the interest-group behavior. "The horizontal refers to the sequential interconnectedness among phenomena in historical, present and future time..." (Pettigrew, 1990, p. 269).

Looking back to the literature of IOS, this relates to the idea of multi-level analysis (e.g. Gregor and Johnston, 2000). While in the IOS literature we have the levels of enterprise, industry and external environments as levels that need to be considered, as discussed earlier, these are not directly relevant for the context eCustoms. Thus, in our analysis we preferred to incorporate the more abstract concepts proposed by Pettigrew in our framework, as this will allow us to explore and identify empirically the levels that are relevant for our analysis.

3. The combined approach

Figure 1 below is a visualization of our proposed analytical approach to study eCustoms change.

² Meanwhile, it should be stressed that there are eminent examples of reported research that can be characterized as contextualist (e.g. Orlikowski, 1996 and Walsham, 1993).

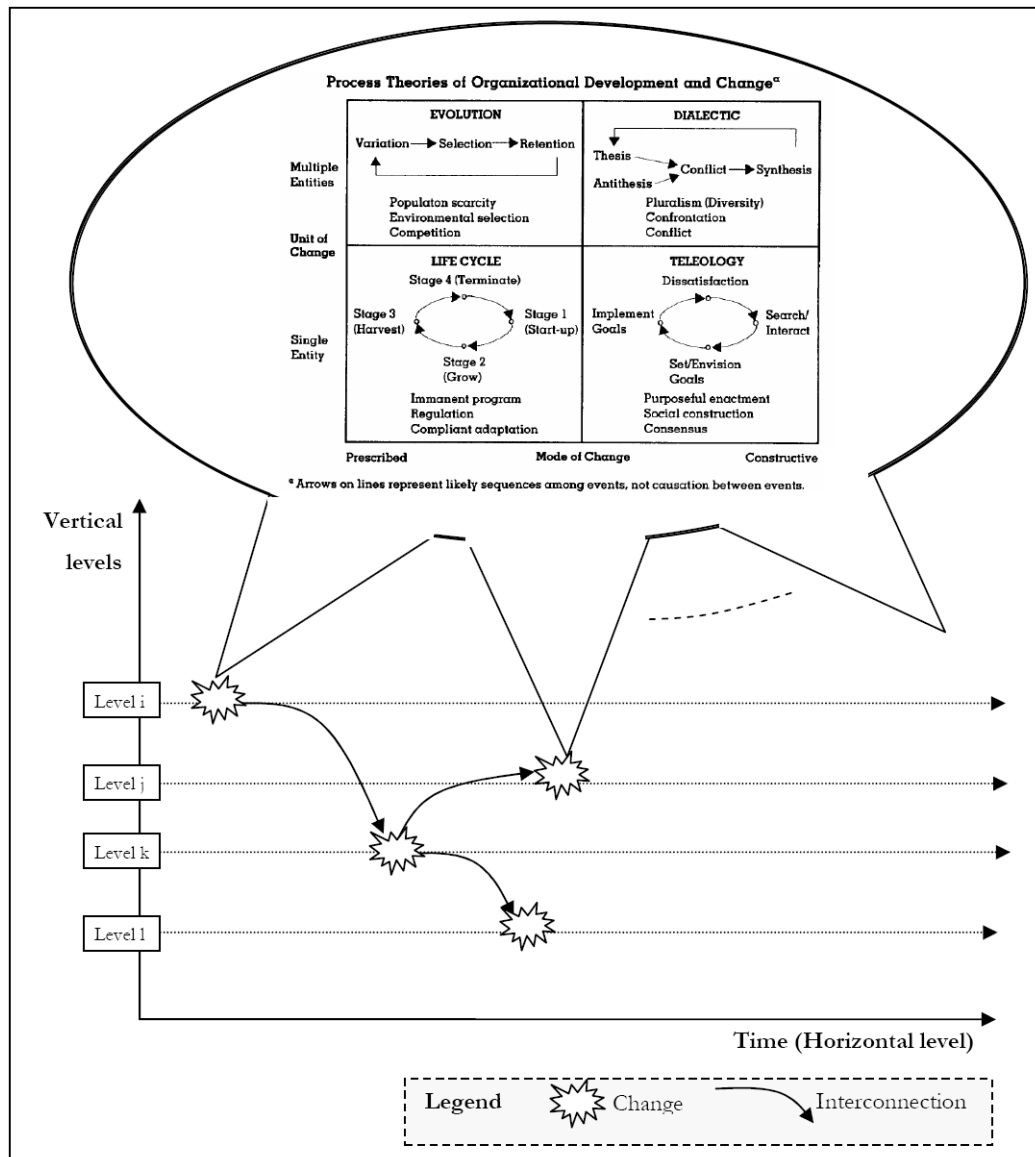


Figure 1: Visualization of the proposed analytical approach³ to study eCustoms change

It combines the four basic motors of change of Van de Ven and Poole (1995) with Pettigrew’s horizontal and vertical levels of analysis. The vertical level captures contextual characteristics like multiple countries (international dimension) and multiple legal systems that play a role in eCustoms initiatives; the horizontal level captures the interactions of the different contexts in past, present and future; and the interconnections capture how changes at one level affect other levels. The elementary motors (evolutionary, lifecycle, teleological, dialectic) help us to characterize the types of changes that take place at each level and in future research could strive to provide grounds to reason what type of intervention is appropriate for a specific type of change. As Van de Ven and Poole argue, although the motors are elementary, they can help to explain very complex change. By analyzing which motors are running at which levels and how these interconnect over time we aim to explain very complex eCustoms change processes.

³ The motors of change presented in the upper part of Figure 1 are adopted from Van de Ven and Poole (1995), p. 520

Methodology

In our analysis we build on the interpretative and contextualist tradition that has become more and more established in IS research (Orlikowski and Baroudi, 1991; Klein and Myers, 1999; Walsham, 1993). In line with that, we search for explanations of eCustoms changes, where we do not propose a positivistic test of our conceptual framework, nor set out to use our framework as a predictive model. This reflects our conviction that change is not to be understood as a set of deterministic causal relationships, but rather as a continuous process of interactions between people, information systems, and contexts.

Our focus: Dutch Tax and Customs Administration

The study presented here is part of the EU-funded ITAIDE research project, which aims to propose innovative solutions for cross-border trade. Four European Living Labs provide the real-life settings in which the eCustoms solutions are developed. The Dutch “Beer Living Lab” focuses on the export of excise goods and the key players are a large beer producer based in the Netherlands (BeerCo), two large technology providers, a Dutch university and Dutch Tax and Customs Administration (DutchTCA)⁴. DutchTCA is an example of a specific local actor in the EU’s eCustoms developments. While the key players from the BeerLL (Beer Living Lab) are based in the same country, they also involve a broad international EU network.⁵ The Netherlands is of special interest because of its trade position within Europe due to which historically, DutchTCA has been under constant pressures to change. Because of its very high dependency on trade the Dutch government feels the same urgency as the EU to improve competitiveness as well as control. As such, the case provides us with a rich context to study eCustoms change.

Data Collection and Data Analysis

The field research was conducted in the period from January 2006- September 2007. In total 32 interviews were conducted and 24 brainstorming or working sessions were attended. The brainstorming sessions typically included Tax and Customs experts from DutchTCA, Customs, Tax and IT experts from BeerCo, Technology experts from the technology provider’s side and researchers. The working sessions contained sub-groups of the experts taking part in the brainstorming sessions and they were formed to perform specific tasks. Additionally we reviewed documents ranging from EU policy documents, EU documents on export of excise goods, internal reports of DutchTCA, project reports from the BeerLL, to mention a few. We were able to closely follow the progress of the BeerLL, with several authors actively involved in different roles.

Given the many eCustoms changes that took place, essentially since the earliest days of computers, we analyzed those changes that our informants reported as being most important. Our focus on multiple changes over time and in dynamic contexts means that we also have to accommodate for the complexity of having shifting units of analysis. We attempted to deal with this challenge in two ways. First, we kept the Customs in the Netherlands as our focal point to describe the changes that occurred. Second, we visualized the network and interactions.

Case Analysis

The goal of this section is to present the findings of the case analysis, which was performed using the conceptual framework presented in section two.

⁴ See www.belastingdienst.nl/english/ for more information on DutchTCA.

⁵ The ITAIDE project provides a platform to bring different parties from several member states together, which amongst other things, facilitates a further investigation in the transferability of the eCustoms solution based on a rich processual and contextual understanding of eCustoms changes. Furthermore, based on our explorations, we aim to provide guidance in terms of the strategies that different players could follow to influence these processes.

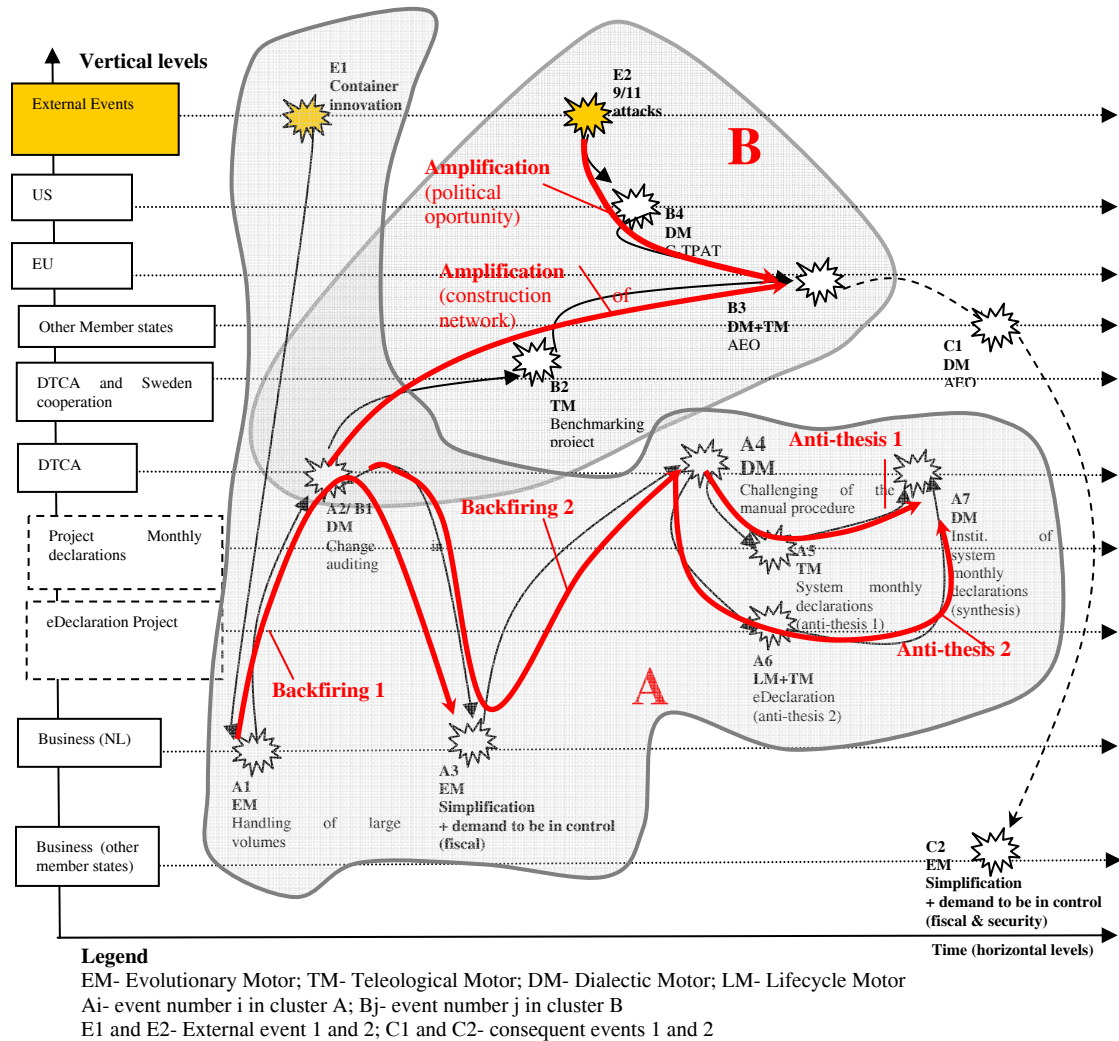


Figure 2: Analysis of the events in Cluster A and Cluster B

The analysis aims to illustrate the applicability of the framework for analyzing complex IS change processes (whereas we use eCustoms as an example) and does not aim to present an exhaustive account of the eCustoms change processes that took place. Rather, we identified two clusters of related events (Cluster A and B) and we illustrate how our conceptualizations can be used to analyze and explain these developments. The changes that are discussed in Cluster A and B are visually represented in Figure 2 and are further explained in the subsequent sub-sections.

Change from Physical Inspections to Administrative Audit (Cluster A)

In this section we describe a set of changes which illustrate the shift from physical inspection to administrative audit, we demonstrate how our framework can be applied to reason about these changes and we discuss the implications for IS.

1. Description

Due to the invention of the container and opening of the European Container Terminal in Rotterdam⁶ in 1966, it became possible for businesses to handle large volumes and to improve their process performance significantly. The improved efficiency of businesses consequently affected DutchTCA. Traditionally, the operations in the Customs were focused on fiscal matters like collection of duties and relied on physical controls. After the introduction of containers, it was no longer possible for DutchTCA to rely only on physical checks for control due to the large volumes and DutchTCA had to look for another control mechanism (i.e. administrative control).

Also the changes in the audit approach of DutchTCA triggered changes on the business side, as the new approach also led to shift of responsibilities. It was no longer the responsibility of the customs officers to be physically present at the warehouses to control the flow of goods. Now the companies were given licenses and trade simplifications and it became their responsibility to prove that they were in control.

One specific type of license was the license for submitting monthly import declarations and the related changes. The general rule is that companies need to submit a declaration for every transaction; companies which had a license for monthly declarations were allowed to follow a simplified procedure and provide the declaration once per month. Although DutchTCA made a strategic decision to provide the companies with these licenses, the consequence was that enormous volume of paper documents were received by DutchTCA at the moment of audit. As the large number of declarations were delivered on paper, it was impossible to audit these declarations.

Two different initiatives took place in DutchTCA to address this problem as to how to cope with the large volumes of paper. First, one auditor developed an IT system for monthly declarations to facilitate his work. This system was subsequently adopted by other auditors on a voluntary basis. This system however was not developed professionally but as a “side activity” of the auditor; it was not an official system of DutchTCA. DutchTCA realized that there is a problem with auditing the huge volumes of paper and that the only system that was available was the system for the monthly declarations developed by the auditor. A decision was made that DutchTCA would launch a project called eDeclaration⁷ to develop an official system for handling of the monthly declarations. As the project progressed, the scope expanded, a lot of money was invested, and there were a number of issues that could not be resolved at that time. We will not go into the details however the final decision was that the project was stopped. After that the unofficial system that was developed by the auditor became the official system. There are still plans to develop another system to replace it but these plans have not materialized yet.

2. Analysis of Cluster A Using the Framework

Figure 2 summarized the analysis of the events from Cluster A, using the conceptual framework presented in Section Two.

The container innovation (marked with the label “E1” in Figure 2) is a key event for the subsequent changes that we discuss, for the purpose of this analysis, however, we treat it as a black box. The container innovation has influenced changes on business level and has created opportunities for businesses to handle efficiently large volumes. We consider that the change at a business level of handling large volumes (change labelled “A1” in Figure 2) is best explained using the evolutionary motor. To recall, an evolutionary motor deals with competition between entities for scarce resources and the typical sequence for evolution is via variation, selection and retention cycles. Companies which used containers could be more efficient and in this respect gain a competitive advantage compared to their rivals who failed to adopt this innovation.

⁶ See <http://www.ect.nl/> (last visited September 10, 2007)

⁷ eDeclaration is pseudonym that we gave to the project

The change in the business level, in turn, put pressure on DutchTCA to change as well (change labelled “A2” in Figure 2). DutchTCA was no longer able to control the large flow of goods with physical controls and was under pressure to change. DutchTCA proposed to use administrative audit and as a result, a new approach for fiscal control for companies emerged. For this change, we consider the confrontation between the old way of controlling (physical control) and the new approach proposed to control the large volumes (administrative control) as essential. Such confrontation is best captured in the dialectic motor and is not obvious in the other three motors. The physical control (the thesis) was confronted with the administrative control as a new way of auditing (the anti-thesis) to come to a situation where the combined approach (the synthesis) emerged and became institutionalized in DutchTCA.

The change in auditing at DutchTCA also led to changes at a business level (“A3” in Figure 2), as it allowed companies to apply for licenses for trade simplification. This change at the business level can also be well explained by the evolutionary motor. Companies that have licenses can enjoy the benefits of trade simplification, which will make them more competitive than companies that do not have licenses. However, in order to receive these licenses, businesses needed to take the responsibility to implement the necessary requirements to demonstrate to the authorities that they have their processes under control. Thus, although companies that obtain licenses will enjoy trade simplification, they will also get extra responsibilities.

Looking across the levels our analysis illustrates that the changes in the business level (handling of large volumes) initiated changes in the DutchTCA level (change in auditing) which “backfired” with some time lapse on the business level, on the one hand providing simplifications and on the other hand also putting extra responsibility on businesses to be in control (see the solid arrow in Figure 2, labelled “backfiring 1”). We will call these interactions across levels backfiring interactions.

It is noteworthy that with respect to the licenses for monthly declarations, the simplifications that DutchTCA provided to business initiated another backfiring interaction, this time on DutchTCA (see Figure 2, labelled “backfiring 2”). The companies which received licenses were usually large companies with large transaction volumes, which meant that enormous volume of paper documents were received by DutchTCA at the moment of audit. As the large number of declarations was delivered on paper, it was impossible to audit these declarations and DutchTCA did not have an information system in place to handle these large volumes of data and as a result DutchTCA ended up being overloaded with huge amounts of paper declarations. Thus we see a clash (“A4” in Figure 2), a dialectic motor, at the level of DutchTCA, where there is a need for a new electronic procedure (anti-thesis) to replace the old manual procedures (the thesis) for handling monthly declarations.

In order to understand the changes that subsequently took place in DutchTCA, we needed to zoom into DutchTCA and provide further sub-leveling (see the dashed rectangles in Figure 2). For the development of a system for handling the monthly declarations, in DutchTCA we identified in the case two competing approaches: the bottom-up approach initiated by the auditor (see the solid arrow labeled “anti-thesis 1” in Figure 2) and the top-down approach followed in the eDeclaration project (“anti-thesis 2” in Figure 2). The change (“A5” in Figure 2) related to the development, implementation and maintenance of the system for monthly declarations and related procedures initiated by the auditor is best described by a teleological motor. For the teleological motor, social construction and consensus are central characteristics. The auditor who developed the system constantly interacted with his colleagues, collecting feedback and improving the system based on that. The eDeclaration project, discussed in section 4.1.1 on the other hand (“A6” in Figure 2) started as a top-down, planned initiative. These types of change processes are best explained by a lifecycle model, due to their prescriptive nature. However, the eDeclaration project also exhibits elements of the teleological motor, as the management plans were distorted and the goals needed to be revisited and redefined, with the ultimate decision to stop the project.

If we further analyze the two competing approaches (“anti-thesis 1” and “anti-thesis 2” in Figure 2) for development of a new procedure and related systems for handling the monthly declarations, we see in this case that ultimately, the eDeclaration project was stopped and the system developed

by the auditor became institutionalized. As such the latter system replaced the old manual procedure in DutchTCA. This resolution can be seen as the synthesis of the dialectic motor (see “A7” in Figure 2). In this cluster we see that although a dialectic motor can indicate the need to change the current established order (the thesis), the development of the anti-theses can be done by changes that are driven by teleological motor (via social construction and collaboration) or by a combination of motors (in our case lifecycle and teleological motors). Finally, we see the establishment of the new practices at DutchTCA via the synthesis of the dialectic motor. This cluster also illustrates that to be able to understand some of the changes that take place, it may be necessary to zoom into some of the levels, as we did with DutchTCA.

3. Implications for IS

Although the systems at the business level are not explicitly discussed they are immanently present and are affected by the changes that take place. The changes in auditing that were introduced by DutchTCA allowed for trade simplifications for licensed companies but at the same time introduced extra costs for these companies. In the administrative audit, companies’ IT systems play a key role for providing an audit trail that is used by DutchTCA for periodic audits. In order to provide a license to a company, DutchTCA thoroughly audits the company’s procedures and IT systems to determine to what extent the company has its systems and procedures under control and what additional changes need to be introduced before a license is granted. This illustrates that the change that occurs on one level (DutchTCA) can influence the requirements for the IT systems at another level (business level).

Looking into the two parallel developments of the system within DutchTCA (the system of monthly declarations and the eDeclaration system), we observe similarly to other studies of IS change (Orlikowski, 1996) that planned efforts may fail and emergent efforts for system development may at the end be institutionalized. This observation fits very well with the notion of drift, discussed by Ciborra (2001), where management plans are often distorted by other organizational developments. Moving from the individual level (DutchTCA) and looking at the interactions between levels (DutchTCA and Businesses), we can relate the notion of drift to the multi-layered backfiring interactions that we observe in Cluster A. One difference compared to drift in a single organization is that in the multi-leveled context, the changes can be seemingly unrelated and disconnected. They can involve different projects at different levels for instance, and a single change may not exhibit much drift with regard to a single project (e.g. the change in auditing at DutchTCA can run smoothly). The drift however in this case occurs through the interaction between changes at different levels (the simplification that DutchTCA provided to business generated drift in relation with DutchTCA’s own procedures and their ability to handle large volumes of paper). In the setting of backfiring, there is also a different control issue. The span of control of the internal management becomes more limited, as control becomes multi-layered across levels as well. Indeed, our example implies that DutchTCA is not an actor that has full control over its systems and the requirements that these systems should fulfill; other levels can also influence decisions about systems.

Security Concerns and Partial Institutionalization of the Audit Approach in the EU (Cluster B)

The changes discussed in cluster B (see Cluster B in Figure 2) reflect on the need for increased security and related certifications (which stem from the threat of terrorism) and how this created grounds for partial institutionalization of the audit approach (developed with cooperative efforts of DTCA and Sweden) in the context of AEO certification in the EU.

1. Description

We discussed the change of auditing that occurred in DTCA (Cluster A). Sweden had developed a similar way of thinking about auditing. Due to the similarities, the two administrations engaged in

cooperative efforts. They conducted benchmarking studies and developed some common grounds for auditing. While Netherlands and Sweden both use the audit approach this does not mean that this is a common practice in other EU countries. With the development of the Single European Market we see a tendency for more harmonization of practices across member states. Member States which are not able to push their demands into these EU policies may end up with practices that are quite different than those, which have historically evolved in that Member State. The benchmarking project between Netherlands and Sweden is an example of how countries with similar approaches may decide to collaborate in order to provide grounds for further institutionalization of their approaches. In addition, other changes also provided favorable grounds for partial institutionalization of the audit approach developed in the collaboration between DTCA and Sweden in the EU. We will discuss the influence of terrorism below.

The attacks on 9/11 presented a ground-shaking event; countering the threat of terrorism rose high on the political agenda and this influenced the cross-border trade as well. It triggered increased security measures in the US. Related to that, a certification procedure focusing on security called C-TPAT⁸ was introduced to deal with such threats in international trade. Through this initiative, businesses ensure their own integrity as well as their supply chain partners' security practices and in return they are assigned "low risk" status, resulting in fewer physical inspections. The security certification concerning cross-border trade initiated at the US has influenced the EU as well. Comparable to the C-TPAT certification, the EU started implementing similar measures under the label of Authorized Economic Operator (AEO). Currently, the AEO certification in the EU has elements of either fiscal or security-related facilitation, or combination of both. In the EU, we see that the introduction of the AEO concept created grounds for partial institutionalization of the audit approach developed by DTCA and Swedish Tax and Customs. The guidelines, currently used for AEO certification in the EU are to a large extent based on the practices of Sweden and the Netherlands. It is important to point out again, that the contextual situation strengthened the need for these customs guidelines to be widely used in Europe.

2. Analysis of Cluster B Using the Framework

Cluster B contains two sets of changes that have influence on shaping the Authorized Economic Operator concept at EU level (see Figure 2). On the level of DTCA in Cluster A we have already discussed the change in auditing. As we discussed for Cluster B, Sweden developed a similar approach to auditing like the Dutch and the two countries cooperated in conducting a benchmarking project (see the change labeled "B2" in Figure 2). At the level of cooperation between the countries, the changes can be explained with the teleological motor, where the two countries work together towards the achievement of a common goal, i.e. attempting to institutionalize their audit approach across the EU.

In the upper part of Figure 5 we have the 9/11 attack as an external event (E2 in Figure 2), which triggered the need for new security procedures at the level of US. This can be seen as a change driven by a dialectic motor, where the old security procedures (thesis) are challenged and new security procedures are established, resulting in synthesis. The C-TPAT certification ("B4" in Figure 2) can be seen as part of this synthesis. On the EU level ("B3" in Figure 2) we see two motors running (dialectic and teleological). Inter-government collaboration between the EU and US can be seen as driven by a teleological motor to achieve the common goal of increased security. Following up on the developments in the US, we can see the AEO concept that is currently being introduced in the EU as part of the larger effort of governments of different economic zones to ensure security. The cooperation of DTCA and Sweden to move their audit approach forward in the EU is a change that can be characterized as dialectic, as the two countries want to promote their approach for auditing and risk assessment against the other emerging or existing approaches.

⁸ C-TPAT stands for Customs-Trade Partnership Against Terrorism. For further details on C-TPAT see http://www.cbp.gov/xp/cgov/import/commercial_enforcement/ctpat/.

Looking at the interactions between the different changes, we can make a number of interesting observations. First of all, we see two *amplification effects*, i.e. changes in one level bring even bigger changes on another level. We see these amplification effects in the cooperation DTCA and Sweden and in the cooperation between US and EU in the area of security. Furthermore, we can gain further insights into the interactions if we try to understand how the audit approach managed to get partial institutionalization in the AEO concept. To do that we find it useful to interpret the findings by using some elements of the collective action model for institutional innovation by Hargrave and Van de Ven (2006).

The collective action model “examines the construction of new institutions through the political behaviour of many actors who play diverse and partisan roles in the organizational field or network that emerges around a social movement or technological innovation” (Hargrave and Van de Ven, 2006, p. 868). The collective action model builds on the dialectical theory of change. Two constructs from the collective action model seem useful to explain the interactions that we observe in Cluster B. These are what Hargrave and Van de Ven call (1) *the construction of the networks*, and (2) *political opportunity* which is part of what they call the enactment of institutional arrangements. In that context the construction of the network discusses the organizing forms and resources that are employed to pursue change. The enactment of institutional arrangements refers to the efforts of activists to challenge and alter “political opportunity structures”. The political opportunity structures are further seen as formal and informal political conditions that encourage and discourage the movement activity (Campbell, 2002).

Coming back to the interactions that we see in Cluster B, we can interpret the collaboration between DTCA and Sweden as *construction of networks* to institutionalize the audit approach in the EU. The developments in the area of security can be seen as *political opportunity* for partial institutionalization of the audit approach developed by DTCA and Sweden. Thus with such an analysis we are able to map political moves and changes that span several levels. This illustrates that changes at some level, which may seem remote and unrelated can affect each other (in this case in an amplifying fashion).

3. Implications for IS

The changes in cluster B do not directly relate to IS but they have a strong indirect effect on them. First of all, as discussed earlier DTCA and Sweden now rely on the audit approach to control the companies and this approach puts specific requirements for the companies' IS. We also discussed that in the EU there is a tendency of defining EU-wide practices and guidelines, as for example the guidelines for AEO certification. This means that administrations in member states, which do not practice the audit approach at the moment, may need to start using such approach. This is illustrated as “C1” in Figure 2 to point out possible consequences of the developments in Cluster A and B on the future developments and policies in other EU member states. Related to that, this will ultimately put new requirements on the systems of the businesses in that member state (see “C2” in Figure 2). In member states which still heavily rely on physical inspections, in the future we can see a development path concerning the interaction between government and business and the consequences for IS similar to the one that we observed in the Netherlands in Cluster A. This is important implication in the EU for transferability of practices, developed in one context to other contexts. While for the member states developing the practices, the institutionalized EU legislation may be in line with the historical developments in that member state, for other member states this may require major changes in practices and systems. This also has strategic implications: if member states, where there is a large volume of trade for example, want to preserve their practices, they have to engage in collective action to institutionalize their practices, as well as their approach to IS use in these practices.

Conclusions

The main problem addressed in this paper is how to understand IS change that spans over multiple organizational levels. To address this problem, we provided a conceptual framework and we demonstrated how it can be applied to analyze eCustoms change in the Netherlands as an example of a complex multi-level IS change.

The paper aims to make the following contributions to theory. First, we contribute another case study (in addition to Cule and Robey (2004) and to Nordheim and Päivärinta (2006)), which illustrates how the motors of change from the field of organizational change can be applied to explain IS phenomena. Second, we extend the motors of change framework with the vertical and horizontal levels of analysis as proposed by Pettigrew, which results in our combined theoretical framework. In contrast to earlier studies, this allows us to capture both context and dynamics for our investigation of a series of changes both parallel and sequential (rather than looking into one IS project). Third, based on the case analysis, we identified interaction types such as “backfiring” and “amplification” that are result of the fact that changes take place at different levels and at different times. As such these interaction types can help to reason about more complex interdependencies between changes across levels and identify interdependencies which otherwise seem unrelated. We also included in our analysis a preliminary discussion on how the notion of drift could be taken up to understand multi-level IS change. As such our study contributes to the further development of the IOS research by providing a framework to reason about complex, multi-level IS change.

Our conceptual framework is of help for practitioners because it facilitates reasoning about complex and multi-level IS change such as eCustoms. Defining intervention strategies based on an analysis of eCustoms change is an area for further research.

We identify the following areas which can be explored in further research. With respect to the motors, further research is needed to zoom into the specific motors and define possible ways of intervention. For example, there is already some work available to understand changes driven by the dialectic motors and what strategies for intervention might be useful (Rukanova et al. 2007; Van Stijn and Bjørn-Andersen, 2007). These attempts are still at an early stage and need further development. Future research may also look into what theories may be useful to understand changes driven by the other three motors and what this means for intervention strategies.

In this paper we have also identified a number of interaction types, which can help to reason about series of changes across levels and further research can focus on gaining further understanding of the nature of such interactions. We can explore whether there are specific motors that dominate a specific interaction type or identify new interaction types. Furthermore, as the interactions provide higher-level abstractions to reason about change processes, it may be interesting to look into possible linkages between interactions and how such linkages can help to understand complex multi-level IS change.

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