

# Modelling the Resistance of Enterprise Architecture Adoption

## Linking Strategic Level of Enterprise Architecture to Organisational Changes and Change Resistance

Nestori Syynimaa<sup>1,2,3,4</sup>

<sup>1</sup>Informatics Research Centre, Henley Business School, University of Reading, Reading, U.K.

<sup>2</sup>School of Information Sciences, University of Tampere, Tampere, Finland

<sup>3</sup>Enterprise Architect, CSC - IT Center for Science, Espoo, Finland

<sup>4</sup>Founder, Gerenios Ltd, Tampere, Finland

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Abstract: During the last few years Enterprise Architecture (EA) has received increasing attention among industry and academia. By adopting EA, organisations may gain a number of benefits such as better decision making, increased revenues and cost reduction, and alignment of business and IT. However, EA adoption has been found to be difficult. In this paper a model to explain resistance during EA adoption process (REAP) is introduced and validated. The model reveals relationships between strategic level of EA, resulting organisational changes, and sources of resistance. By utilising REAP model, organisations may anticipate and prepare for the organisational change resistance during EA adoption.

## 1 INTRODUCTION

During the last few years Enterprise Architecture (EA) has received increasing attention among industry and academia. An effective EA is critical to business survival and success (TOGAF, 2009). Indeed, in 21<sup>st</sup> century EA will be determining factor that separates the successful from the failures, the survivors from the others (Zachman, 1997). EA has some important strategic outcomes, such as better operational excellence and strategic agility (Ross et al., 2006). Despite the benefits to be gained, EA is not widely adopted in organisations (Schekkerman, 2005; Ambler, 2010; Computer Economics, 2014). This might be caused by the fact that EA has been found difficult to adopt. From theoretical point of view, EA adoption is an instance of organisational change aiming for realisation of EA benefits. However, about 70 per cent of organisational change initiatives fail (Hammer and Champy, 1993; Beer and Nohria, 2000; Kotter, 2008).

This study aims for increase the understanding of the dynamics of EA adoption. To be more specific, we are seeking an answer to the question: *Why is Enterprise Architecture difficult to adopt?*

### 1.1 Definition of Enterprise Architecture

Enterprise Architecture (EA) has multiple definitions in the current literature. The concept of *Enterprise Architecture* consists of two distinct terms, *enterprise* and *architecture*.

Definition of *enterprise* seems to be quite constant in the EA literature. Enterprise can be anything from a local team to a multi-level organisation of a global corporation (TOGAF, 2009; ISO/IEC/IEEE, 2011; Dietz et al., 2013; PEAf, 2013). It is a social system with an assumed purpose (Proper, 2013; Dietz et al., 2013) having a common set of goals (TOGAF, 2009). As the term *enterprise* is usually used as a synonym of a business or company, later in this paper we will use the term *organisation* instead of it. *Organisation* covers both businesses and public sector and thus suits better to be used in this paper.

Similarly, definitions of *architecture* and *architecture description* are more or less constant. Architecture is a structure of the enterprise and an architecture description its representation (ISO/IEC/IEEE, 2011). To be more specific, architecture is seen as a *formal description* of an *enterprise* at a certain time (Zachman, 1997; TOGAF,

2009; ISO/IEC/IEEE, 2011), either from the current state or from one or more future states (CIO Council, 2001; Gartner, 2013).

Definitions of *Enterprise Architecture* are more diverse, but they also have some similarities. What is shared among most of the definitions is the concept of *managed change* of the *enterprise* between the current and future states for a purpose (GERAM, 1999; CIO Council, 2001; Pulkkinen, 2008; Gartner, 2013). According to EA specialists, this purpose is *to meet goals of stakeholders and to create value* to the enterprise (Syynimaa, 2010, see also PEAf, 2010).

Aforementioned definitions can be summarised to the following definition used in this paper. Enterprise Architecture is; (i) a formal description of the current and future state(s) of an organisation, and (ii) a managed change between these states to meet organisation’s stakeholders’ goals and to create value to the organisation.

### 1.2 Enterprise Architecture Adoption

The word *adoption* can be defined as “the action or fact of adopting or being adopted” where adopt refers to “choose to take up or follow (an idea, method, or course of action)” (Oxford Dictionaries, 2010). Similar concepts are *implementation*, “the process of putting a decision or plan into effect; execution” (ibid.) and *institutionalisation*, which is to “establish (something, typically a practice or activity) as a

convention or norm in an organization or culture” (ibid.). Following these definitions, in the EA context adoption can be defined as the process where organisation starts using EA methods and tools for the very first time.

As a consequence, EA adoption is causing changes to the organisation. The organisation is adopting a new way to communicate (to describe) its current and future states, and a new formal way to develop the organisation to achieve its stakeholders’ goals. Thus, we will adopt *organisational change* as the underpinning theory to explain EA adoption.

As noted earlier, organisations can be categorised as systems. Lee (2010) states that systems may evolve from one state to another deliberately by design, or in a natural uninformed way (the default). Van de Ven and Poole (1995) have recognised four ideal-types organisational development theories to explain organisational change processes (Figure 1). These are *Life Cycle*, *Evolution*, *Dialectic*, and *Teleology*. *Life Cycle* theory sees change being imminent; organisation is moving from a start-up towards its termination through certain phases. Each of these phases is necessary, so the change is following always the same steps. Environment may influence this change, but it is not a driving force. *Teleological* theory sees that the change takes place because the organisation is trying to achieve a certain goal or purpose. Although this theory is also cyclical, fundamental difference is that there is no certain sequence of events to be followed. Moreover, the or-

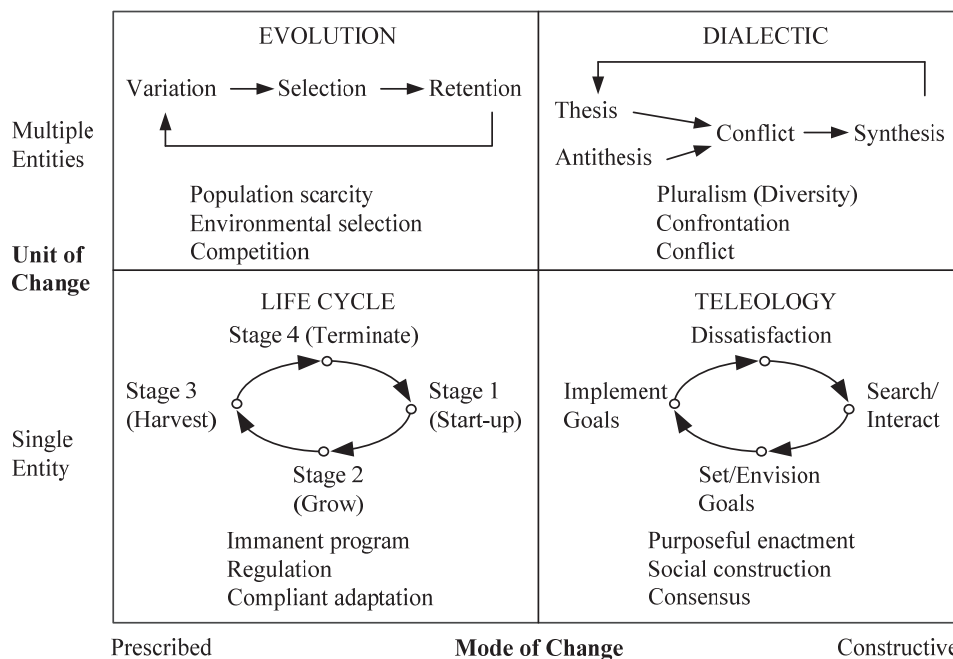


Figure 1: Process Theories of Organisational Development and Change (Van de Ven and Poole, 1995).

organisations do not “terminate”, but are changing indefinitely. *Dialectical* theory assumes that organisation exist in world of continuous conflicts. The change takes place when two or more opposing forces gain power enough to confront the status quo. *Evolutionary* theory sees change as a method to survive; competing from the same resources causes elimination of some of the organisations.

The most used theories in the current change management literature are life cycle and teleological theory (Van de Ven and Poole, 1995; Kezar, 2001). It can be argued that the latter one, teleological theory, explains the best EA adoption. First of all, EA is adopted in a single entity: an organisation. Secondly, EA adoption is constructive, as it is aiming to a specific goal e.g. EA adoption.

According to Csibra and Gergely (2007) there are two ways to predict future events in teleological change via goal attribution. These are an *action-to-goal* and *goal-to-action*. The former can be interpreted as a question: *What is the function of EA adoption?* In the same way the latter can be interpreted as a question: *What action should be taken to achieve EA being adopted?* A summary of differences of these two interpretation action can be seen in Table 1.

Table 1: The Functions of Teleological Interpretation of Actions (Csibra and Gergely, 2007).

Primary function	Type of inference	
	‘Action-to-Goal’	‘Goal-to-Action’
On-line Prediction	Goal prediction: Predicting the likely effect of an on-going action	Action anticipation: Predictive tracking of dynamic actions in real time
Social Learning	Discovering novel goals and artefact functions	Acquiring novel means actions by evaluating their causal efficacy in bringing about the goal

EA adoption can be of both types. If the organisation has a problem it tries to solve with EA adoption, it would be action-to-goal type; function of EA adoption is to solve the problem. If, on the other hand, organisation’s goal is to adopt EA, it would be goal-to-action type. In this research we are interested in which actions are taken while adopting EA so the type of inference is goal-to-action.

Another dimension of predicting future events in teleological change is the primary function of the prediction (Csibra and Gergely, 2007). There are two functions, *on-line prediction* and *social learning*. The former is aiming for prediction of either the goal or action based on ongoing actions. The latter aims to learning and finding of novel goals or means actions.

In this paper, we are interested in increasing the understanding of the EA adoption so the primary function is social learning.

## 2 RESEARCH METHODOLOGY

In order to model Enterprise Architecture adoption, the literature related to EA and organisational change was reviewed. Based on the literature review, an EA adoption model was formed to explain the resistance during EA adoption.

Model’s validity is a primary measure of its utility and effectiveness (Groesser and Schwaninger, 2012). Therefore its validity needs to be tested using an appropriate validation method. Our model contains merely causal relationships and can therefore be validated using structure verification tests (Barlas, 1996). For instance in a *major behaviour patterns* test, the model’s accuracy to reproduce real-life behaviour is tested (Barlas, 1996).

Our model is validated against empirical data acquired from a real-life EA-pilot. The validation is performed by analysing the empirical data using a *directed content analysis* approach. This approach is similar to the Grounded Theory approach by Strauss and Corbin (1990). The major difference is that the codes and keywords are derived from theory or from relevant research findings instead of data (Hsieh and Shannon, 2005). Therefore the validity of our model can be tested by analysing data by using the model as a source for codes and keywords.

## 3 ENTERPRISE ARCHITECTURE ADOPTION MODEL

In this section we will describe the formulation of our conceptual model of EA adoption. First the three individual components of the model are introduced. The first component, *the strategic level of Enterprise Architecture*, is based on a selected Enterprise Architecture literature. Second and third components, *organisational change* and *change resistance*, respectively, are adopted from general organisational change literature. After introduction of the components, the conceptual model of EA adoption is presented.

### 3.1 Strategic Level of Enterprise Architecture

Enterprise Architecture is a relatively new phenome-

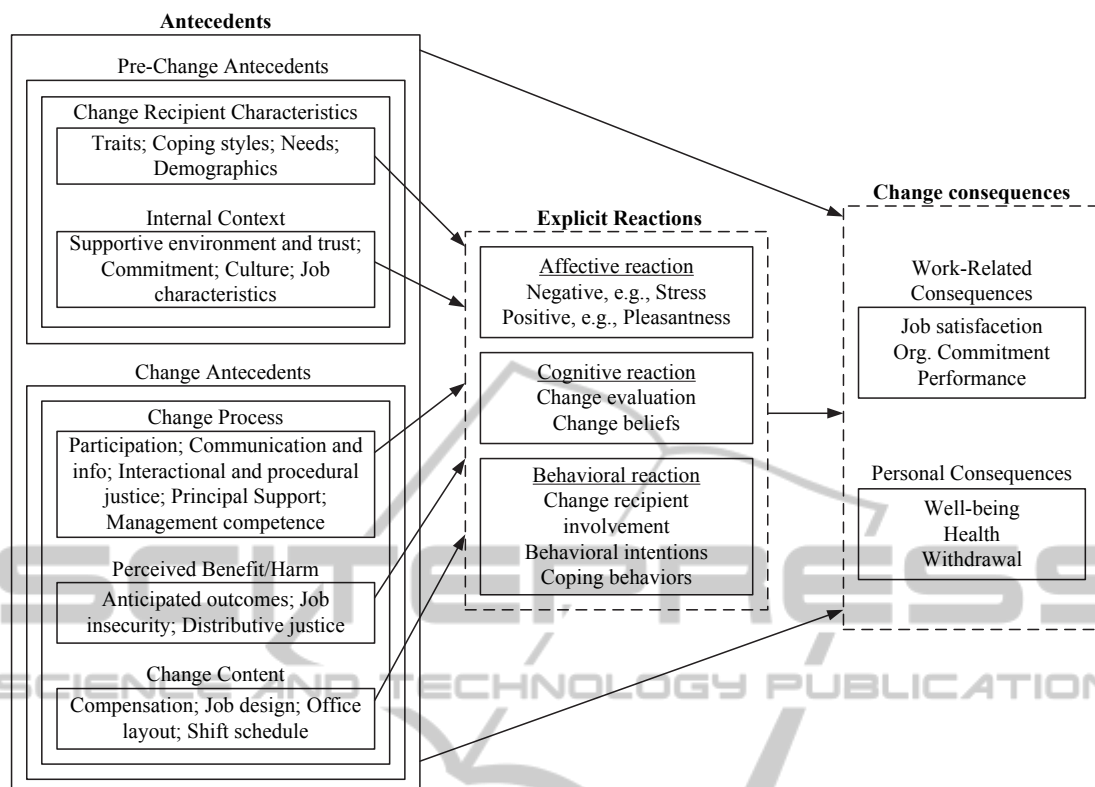


Figure 2: Antecedents, Explicit Reactions, and Change Consequences of Organisational Change (Oreg et al., 2011).

non, having a multiple schools of thought. Lapalme (2011, 2012) has recognised three ideal schools from the current EA literature; *Enterprise IT Architecting*, *Enterprise Integrating*, and *Enterprise Ecological Adaption*.

Enterprise IT Architecting school is aiming to alignment of organisation's IT assets and business activities. The school often describes EA as "the glue between business and IT" (Lapalme, 2012, p. 38). From a strategic point of view, EA is merely a tool to fulfil business objectives without questioning them in any way.

The goal of Enterprise Integrating school is to execute organisation's strategy by maximising organisation's coherency. Thus the school views EA as "the link between strategy and execution" (ibid., 2012, p. 40).

For Enterprise Ecological Adaptation school EA means designing all organisational facets, including bidirectional relationship to its environment. This school is interested also in what is happening outside of organisation's borders, and is actively trying to change also the surrounding environment. Thus EA is described to be "the means for organisational innovation and sustainability" (ibid., 2012, p. 41).

Each of the three EA schools of thought can be

seen being on a different strategic level. At the lowest level, EA is used merely as the glue between business and IT. On higher levels, EA is seen more as a means to executing organisation's strategy, but also as way to systemically change the environment of the organisation.

Strategic level decisions and choices are affecting the whole organisation. Organisations may take different tactical stance to achieve their strategy (Casadesus-Masanell and Ricart, 2010). This means that strategic decisions likely causes more changes than the tactical ones. As such, it can be argued that the higher the strategic level of EA, the more changes the organisation will face during the EA adoption.

### 3.2 Organisational Changes

Oreg et al., (2011) have formed a model of change recipient actions (Figure 2) based on a literature review of 79 quantitative organisational change studies between 1948 and 2007. Their model suggests that change and pre-change antecedents are linked to individual's explicit reactions and change consequences. Also explicit reactions are linked to change consequences. This model gives us a good starting point for our model of EA adoption. As noted



earlier, EA adoption is an instance of teleological organisational change. Therefore it can be assumed that pre-change and change antecedents will result in organisational and personal consequences, either directly or indirectly by explicit reactions, also in EA adoption.

Organisational changes can be categorised to four types (Cao et al., 2000; 2003). These types of organisational change are; (i) *changes in processes*, (ii) *changes in functions* (structural change), (iii) *changes in power within the organisation* (political change), and (iv) *changes in values* (cultural change). This categorisation gives us a tool for classifying anticipated consequences and results caused by EA adoption.

### 3.3 Change Resistance

Every change, no matter how big or small, will face resistance. However, the higher the impact of the change the higher is the resistance (Bovey and Hede, 2001). Change resistance can be defined as “any phenomenon that hinders the process at its beginning or its development, aiming to keep the current situation” (Pardo del Val and Martinez Fuentes, 2003, p. 152). Following this definition, resistance during EA adoption refers to any phenomenon hindering the adoption. Resistance can be intentional or unintentional, can be recognised by target, or can be recognised by observer (Hollander and Einwohner, 2004). Another concept closely related to resistance is inertia, which can be defined as “a tendency to do nothing or to remain unchanged” (Oxford Dictionaries, 2010). In other words, for some reason, organisation resists changing the *status quo* of the organisation. One example of inertia is a *structural inertia*, which “refers to a correspondence between the behavioural capabilities of a class of organizations and their environments” (Hannan and Freeman, 1984, p. 151). In the other words, the organisation has high structural inertia when the speed of reorganisation is lower than the speed of environmental conditions change. In our EA adoption model, conceptually we do not make difference between change resistance and inertia.

Pardo del Val and Martinez Fuentes (2003) have recognised two types of resistance related to organisational change; *inertia during the planning stage*, and *inertia in the execution stage*. Reasons behind the former type of inertia are (i) distorted perception, interpretation barriers and vague strategic priorities, (ii) low motivation, and (iii) lack of creative response. Reasons behind the latter type of inertia are (iv) political and cultural deadlocks, and

(v) other reasons. In the context of EA adoption, resistance can occur during the planning stage of the adoption and during its execution. Complete list of sources of resistance in the planning and execution stages can be seen in Table 3 and Table 2, respectively.

Table 2: Sources of Change Resistance During the Execution (adapted from Pardo del Val and Martinez Fuentes, 2003).

Category	Source of Resistance
Political and Cultural Deadlocks	Implementation climate and relation between change values and organisational values, Departmental politics, Incommensurable beliefs, Deep rooted values, Forgetfulness of the social dimension of changes.
Other Sources	Leadership inaction, Embedded routines, Collective action problems, Capabilities gap, Cynicism.

Table 3: Sources of Change Resistance During the Planning (adapted from Pardo del Val and Martinez Fuentes, 2003).

Category	Source of Resistance
Distorted Perception	Myopia, Denial, Perpetuation of ideas, Implicit assumptions, Communication barriers, Organisational silence.
Low Motivation	Direct costs of charge, Cannibalisation costs, Cross subsidy comforts, Past failures, Different interests among employees and management.
Lack of Creative Response	Fast and complex environmental changes, Resignation, Inadequate strategic vision.

### 3.4 EA Adoption Model

The conceptual model of Resistance in EA adoption Process (REAP) can be seen in Figure 3. The model is based on the EA and organisational change literature. Logical reasoning of the model is as follows. Enterprise Architecture can be used on different strategic levels (Lapalme, 2012). The selected strategic level sets boundaries to EA adoption, e.g. what kind of objectives are set for the adoption and thus what kind of organisational changes may result (Cao et al., 2003). In other words, the strategic level of EA influences the objectives of the adoption. These objectives (change antecedents) are influencing the resulting changes directly and indirectly via explicit reactions of people (Oreg et al.,

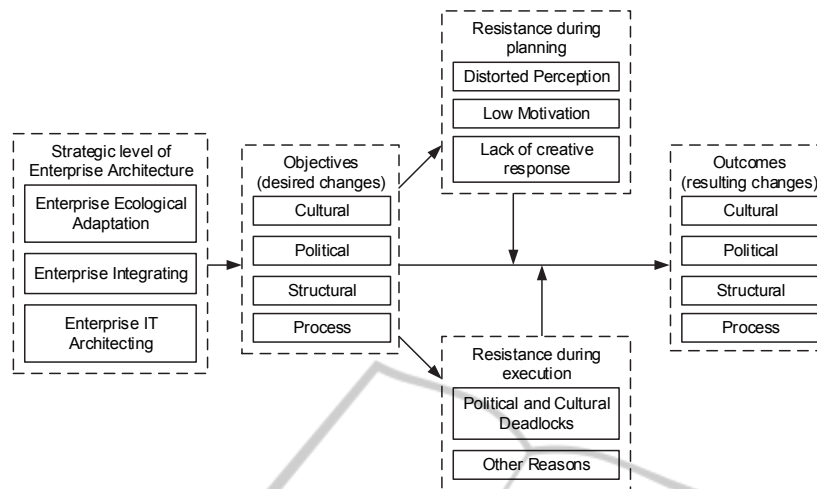


Figure 3: Conceptual Model of Resistance in EA Adoption Process (REAP).

2011). During the planning and execution phases of the adoption, organisational resistance (reactions of people) may distort adoption and thus influences the outcomes of the adoption (Pardo del Val and Martinez Fuentes, 2003).

### 3.5 Validation

#### 3.5.1 Enterprise Architecture Pilot

In this sub-section our model is validated using empirical data collected from a real-life EA pilot (see CSC, 2011). The EA pilot was conducted in 2010 among 12 Finnish Higher Education Institutions (HEIs), which of two merged in the beginning of the pilot. During the pilot, EA was adopted by participating HEIs.

Demographic data collected from the public websites of the participating institutions can be seen in Table 4. Pilot participants represented 29 % of Finnish HEIs. Nine of the participating institutions were Universities of Applied Sciences (formerly known as Polytechnics) and two Universities.

Table 4: Pilot Institutions.

HEI	Students	Employees	Location
1	8 100	800	Southern Finland
2	2 000	200	Northern Finland
3	2 900	300	Northern Finland
4	5 200	400	Southern Finland
5	4 800	600	Northern Finland
6	7 500	600	Southern Finland
7	16 000	1 200	Southern Finland
8	4 800	400	Western Finland
9	3 000	300	Northern Finland
10	15 900	2 900	Northern Finland
11	10 000	800	Southern Finland

HEIs were organised to six groups each focusing to a certain problem domain. These groups were *Education, Adult Education, Merger, Consortium, Quality Assurance, and Network*. Quality Assurance (QA) and Adult Education (AE) sub-projects were merged during the pilot.

Table 5: Pilot Groups.

Group	Institution(s)
Network	1, 4, 6
Education	7
Consortium	3, 5, 9
Merger	11 (12)
QA & AE	2, 8, 10

#### 3.5.2 Data Collection

The data was collected using semi-structured interviews as a part of a PhD research. Themes for the interviews were derived from the factors affecting EA adoption. These factors were identified from the literature during a Systematic Literature Review conducted following the instructions by Kitchenham (2007). The review included 35 studies on EA adoption. Identified factors were categorised under three categories; *Organisational* factors, such as organisational capabilities, *EA related* factors, such as EA specific skills, and *environmental* (contextual) factors, such as possible external pressure. Following instructions by Kvale (1996), questions seen in Table were formed for interviews.

Interviews were performed between June and October 2010 by phone and were recorded for transcribing. Total number of 22 individuals were interviewed from three different roles; CIOs, rectors (principals), and Quality Assurance staff.

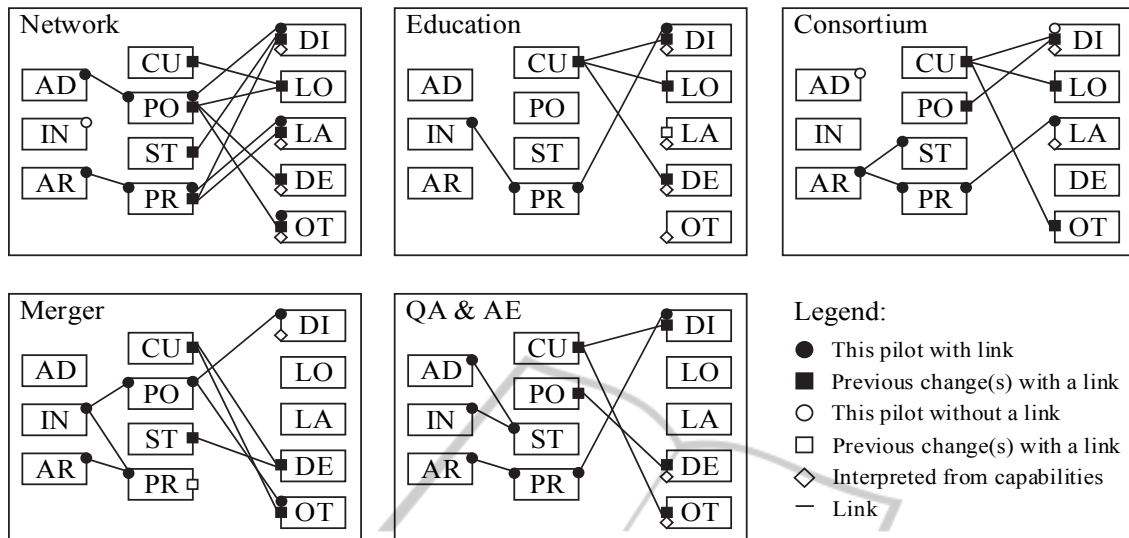


Figure 4: Group Level Analysis.

### 3.5.3 Data Coding

Coding was performed using NVivo software package; Version 9.2.81.0 (64-bit). Transcriptions of the interviews were automatically organised as *nodes* using NVivo's *Auto code* feature so that each question formed a node. Each of these nodes contained all answers for the particular question from all interviews.

Table 6: Interview Questions (cont.).

Tell me about EA pilot, explain how was the used framework selected? Does the framework require any modification to suit your purposes? Explain. On which kind of principles is the EA pilot based on? Explain in your own words EA and related terms.
Explain your and your organisation's EA experience. Has there been any training during the pilot? Which parts of EA, if any, you think your organisation has most challenges? Have you used contracted specialists/consultants during the pilot?

Table 6: Interview Questions.

Think about some major change(s) your organisation have faced during the past few years. Describe such a change and how it was conducted. Which challenges, if any, the change faced.
Describe the process how new information systems are defined, acquired or implemented, and introduced in your organisation.
Describe how new development initiatives are introduced in your organisation. Who or which party is driving such initiatives? How important this is for the success of the initiative?
Describe on what basis are development initiatives given resources in your organisation.
Describe how EA is organised in your organisation.
Describe how communication is organised in your organisation. How about between external stakeholders?
About EA pilot, explain what are your or your organisation's expectations for the pilot. How are they related to your organisation's strategy?
Which kind of expectations from other stakeholders have you faced/know?
Explain how EA pilot or similar initiatives are related to the government level programs. How are such programs coordinated? What are the power relationships in such coordination?

Table 7: Categories Used in Analysis.

Main category and source	Sub-categories
Strategic level of EA (Lapalme, 2012)	Enterprise IT Architecting, Enterprise Integrating, Enterprise Ecological Adaptation.
Objectives (Cao et al., 2003)	Processes, Structural, Cultural, Political.
Resistance during planning (Pardo del Val and Martinez Fuentes, 2003)	Distorted perception, Vague strategic priorities, Low motivation, Lack of creative response.
Resistance during execution (Pardo del Val and Martinez Fuentes, 2003)	Political and cultural deadlocks, Other reasons.

The actual coding of each node followed the same process. Each answer were coded by searching for occurrences of the codes listed in Table 7 First each answer was analysed from the strategic level of EA point-of-view, next from changes point-of-view, and finally from the resistance point-of-view.

## 4 RESULTS

Illustrated summary of analysis on the group level can be seen in Figure 4, where the analysis of each group (see Table 5) are combined to a single diagram. Boxes on the left represents strategic levels of EA, boxes in the middle the types of organisational change, and boxes on the right categories of sources of resistance. The legend for used abbreviations can be seen in Table 8.

Black and white circles represents findings from the analysis of the questions related to the *goals and objectives of the EA pilot*. A white circle indicates that the particular concept is found from the data. Solid black dot indicates that it is found from the data and *linked* to another finding. For instance in the Network group it can be seen that there is evidence in the data suggesting that the level of EA is seen as *Enterprise Integrating*. However, the same *respondent* has not mentioned any particular change, so there is nothing it could be linked to. It can also be noted that there is a link between *Enterprise IT Architecting* and *Process* change. In this case, the respondent has expressed both the strategic level of EA, and the actual change to be achieved. In some cases, such as in the Network group, there is also a link between the change and a source of resistance, supported by the data. Black and white squares represents findings from the analysis of the questions related to *past changes and challenges*, and diamonds to *possible sources of resistance* interpreted from answers.

Table 8: Abbreviations of Categories Used in Analysis.

Strategic level		Change type		Resistance	
AD	Enterprise Ecological Adaptation	CU	Cultural	DI	Distorted Perception
IN	Enterprise Integrating	PO	Political	LO	Low Motivation
AR	Enterprise IT Architecting	ST	Structural	LA	Lack of Creative response
		PR	Process	DE	Political and Cultural Deadlocks
				OT	Other Reasons

The summary of the findings is illustrated in Figure 5. Dotted arrows indicates *logically deduced influence*, as described in the REAP. Solid arrows, in turn, indicate *empirically validated influence*.

Next we will briefly explain and discuss results in textual form. As suggested by REAP model, all strategic levels of EA were present in the data. However, there were no evidence of the adoption

aiming for cultural changes of the organisation. Therefore *Cultural* change was removed from the results. One possible explanation for this is that as EA is used for the very first time, it is “safer” to focus on easier changes first. After all, as it can be seen in Figure 4, previous cultural changes in organisations have caused resistance in four out of five resistance categories, as has political changes.

Sources of resistance were found in all five categories, as suggested by the REAP model. However, only 10 out of 24 sources were found from the data. This leaves 14 sources of resistance (see Table 3 and Table 2) which were not faced in the EA pilot. One explanation for this is that such sources of resistance might not been faced in Finnish HEIs at all. More likely explanation is that those sources of resistance were not met in this particular pilot but would likely be faced in other settings. For instance during the executing of cultural changes, political and cultural deadlocks are most likely faced. As noted earlier, there were no cultural changes executed nor planned during the EA-pilot.

The REAP model is a qualitative model, e.g. it captures the resistance emerging from the data, but does not judge any source of resistance being more important than other. However, it should be noted that most of the resistance faced during the planning phase of the EA-pilot were related to understanding of EA concepts (Distorted Perception). Other studies have also noticed the lack of EA knowledge in the Finnish public sector. For instance Lemmetti and Pekkola (2012) argues that current definitions of EA are inconsistent and thus confusing both researchers and practitioners. This is also supported by Hiekkänen et al., (2013); EA is underutilised due to lack of understanding it properly. In general, poor communication have been found to be one of the factors contributing to EA adoption failures (Mezzanotte et al., 2010). Moreover, value of EA is directly influenced by how EA is understood in the organisation (Nassiff, 2012).

## 5 CONCLUSIONS

In this paper we formed a model to explain the process of Enterprise Architecture (EA) adoption. A teleological organisational change was adopted as an underpinning theoretical view to EA adoption. The model of resistance during EA adoption process (REAP) was formed based on the literature. Our model revealed previously unexplored relationships between the strategic level of EA and objectives of EA adoption. Also relationships between these



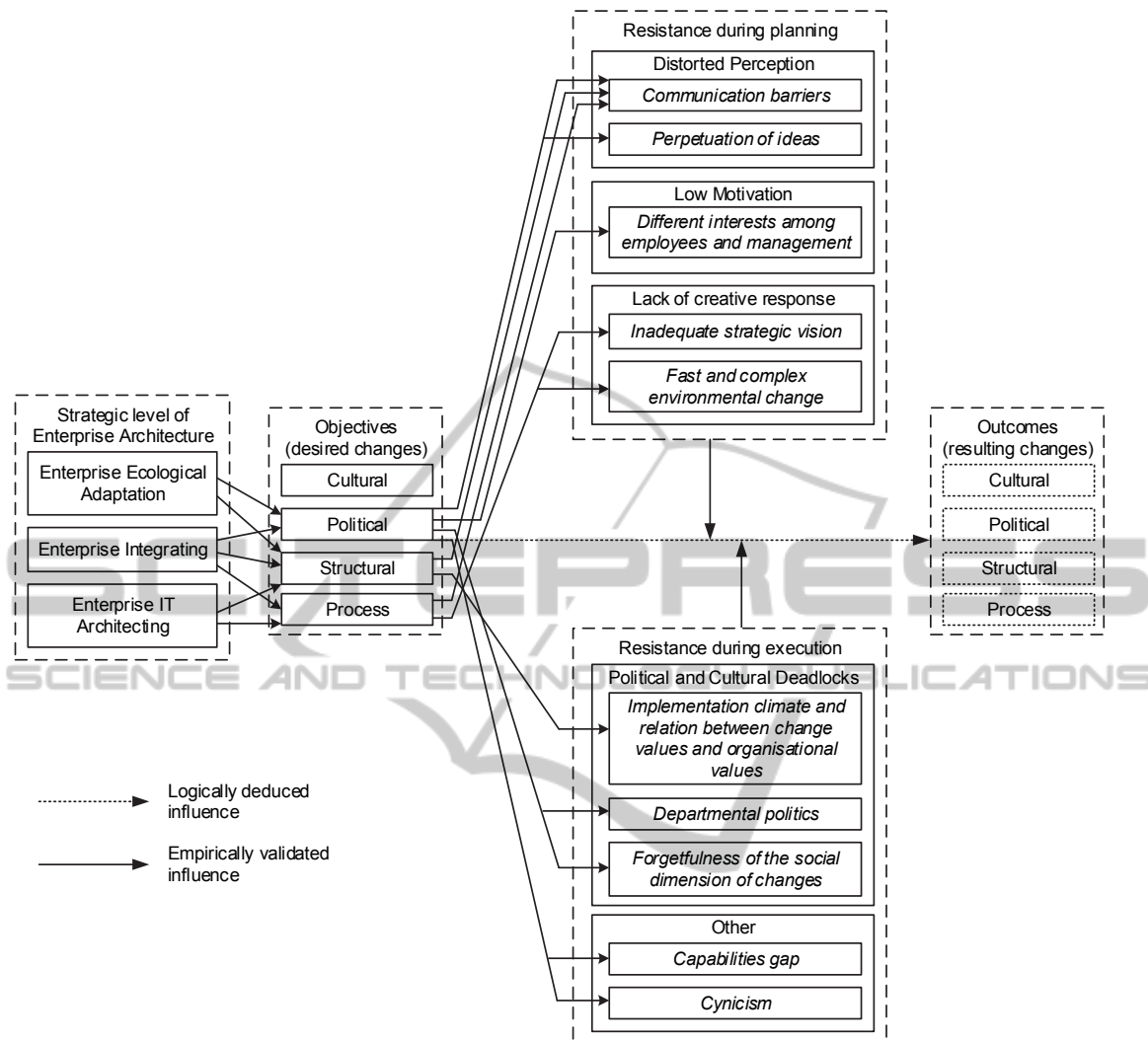


Figure 5: Results of Data Analysis.

objectives and various sources of organisational resistance were identified.

As it can be interpreted from the analysis, the REAP model can be used to categorise the adoption process. Moreover, as stated by Barlas and Carpenter (1990) a valid model can be assumed to be one of the many possible ways to describe a real world. Thus it can be argued that the model is valid in this context, e.g. it does reproduce real life behaviour found from the EA-pilot.

### 5.1 Implications

The results of this study have implications to both science and practice. For science, REAP model provides a model to explain the organisational resistance during the EA adoption. We have

demonstrated that the resistance depends on the changes the EA adoption is causing. As such, it contributes to the organisational science.

For the practice, the REAP model provides a tool which can be used to anticipate possible sources of resistance. When the relationships between the strategic level of EA, resulting changes, and sources of resistance are known, one can prepare for and minimise the resistance during the adoption.

### 5.2 Limitations and Future Work

The empirical data used to validate the model was gathered from an EA pilot conducted among 12 Finnish Higher Education Institutions. This limits the generalisability of the results as such a qualitative data is contextually-bound. However, similar

challenges have been found also from other settings (Kaisler et al., 2005; Pehkonen, 2013; Seppänen, 2014) which supports our findings. REAP is based on general non-HEI-specific literature, and therefore it is likely explaining resistance during EA adoption also in a wider context. Therefore we are encouraging researchers and practitioners to apply REAP model in other settings to increase its validity and generalisability.

Author acknowledges that the REAP model is one possible way to describe EA adoption. This means that REAP is not necessarily comprehensive, i.e. there may be sources of resistance that are not captured by the model. Therefore we are encouraging researchers also to improve the model.

Analysing the empirical data with the REAP model revealed that most of the planning phase resistance was caused by the lack understanding EA knowledge. Thus one direction for the future research could be finding ways to overcome this type of resistance.

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