The role of Technological Artefacts and Enterprise Architecture in Enterprise Transformation

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June 2014

Keywords: Enterprise Transformation, Enterprise Architecture, Enterprise Transformation Assessment, η Framework.

Abstract: Nowadays Enterprise Transformation (ET) is a common procedure for most, if not all, organizations. There is not enough emphasis on managing the human, behavioural and cultural aspects of the change and motivating stakeholders to buy into the change. We identified the common mistakes that can occur during ET, while perceiving that there is much that organizations can gain from a comprehensive value management throughout projects. Our research addresses the role of Enterprise Architecture (EA) and Technological Artefacts in ET, while advocating that organizations do not have any feasible instrument which allows them to understand the overall ET occurring during their projects – hence the problem of entering the five aggravation stages of transformation need. We study several relevant concepts and related work that became the cornerstones of this Master Thesis, namely regarding Enterprise Engineering, Governance and Transformation. Our proposal focuses on the main product of this Master Thesis - the η Framework which aims at enabling a holistic vision of ET related to the adoption of Technological Artefacts. The research methodology used to conduct this research was the Design Science Research Methodology and the demonstration of our proposal was performed in two real organizations. Two distinct strategies were applied to do the corresponding evaluation: (1) interviews to academics and practitioners, as well as (2) submission of a scientific paper to an International Conference. Finally, we concluded that our research and corresponding framework achieved satisfactory results, while meeting the Moody and Shanks Quality Management Framework criteria and the four Österle principles.

1 INTRODUCTION

Successful adoption of Technological Artefacts depends on implementing the appropriate change (including governance or management of IT) in the appropriate way. In many enterprises, there is a significant focus on the first aspect - core governance or management of IT - but not enough emphasis on managing the human, behavioural and cultural aspects of the change and motivating stakeholders to buy into the change [1] [2].

It should not be assumed that the various stakeholders involved in, or impacted by, new or revised Technological Artefacts will readily accept and adopt the change. The possibility of ignorance and/or resistance to change needs to be addressed through a structured and proactive approach. Also, optimal awareness of the implementation program should be achieved through a communication plan that defines what will be communicated, in what way and by whom, throughout the various phases of the program [1].

Sustainable improvement can be achieved either by gaining the commitment of the stakeholders (investment in winning hearts and minds, the leaders’ time, and in communicating and responding to the workforce) or, where still required, by enforcing compliance (investment in processes to administer, monitor and enforce). In other
words, human, behavioural and cultural barriers need to be overcome so that there is a common interest to properly adopt change, instil a will to adopt change, and to ensure the ability to adopt change [1].

In a change process, some mistakes can happen that sometimes are not even identified. Several errors may occur in relation to the leadership of a change. The most common mistakes that can occur during ET are [3]:

- Investment allow excessive complacency;
- Lack of a sufficiently powerful guiding coalition;
- Underestimate the power of vision;
- Inefficiently communicate the vision;
- Allow new obstacles to vision;
- Failure to create short-term wins;
- Declare victory prematurely;
- Neglect the incorporation of changes to the solid culture.

Research surveys in over 200 international organizations show that there is much that organizations can gain from a comprehensive value management applied throughout the transformation lifecycle, mainly because a large percentage of stakeholders are still not satisfied with their current approach on [2]:

- Identifying value and benefits (68%);
- Investment business cases and benefit plans (69%);
- Managing the delivery of benefit plans (75%);
- Evaluation and review of value realized (81%).

**In short, the ultimate question is: What makes one organization succeed in their ET and others fail?**

A fundamental aspect is to be a proactive organization and perform a transformation analysis to investigate the effects that the transformation drivers have on the organization as well as the associated opportunities and risks. For companies in aggravated stages, however, an analysis and crisis assessment is an integral part of the appraisal. It is important to understand that a sustainable ET cannot be brought about without removing the causes of all crisis situations [2]. We are able to outline the different stages of ET need, which can also be considered as aggravation stages (briefly explained in Table 1).

<table>
<thead>
<tr>
<th>Stages</th>
<th>Indicators and Consequences</th>
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| **Stage 0**: (Pro-)active scanning and transformation according to external factors | - Observation and change in view of market trends, economic, societal and environmental developments  
- High flexibility in terms of time and options as well as low pressure to company |
| **Stage 1**: Lack of transformation awareness and transparency | - Lack of knowledge and transparency for ET need creates basis for future problems like a lack of stakeholder commitment  
- However, negative impacts not visible yet |
| **Stage 2**: Lack of stakeholder commitment | - Stakeholders are not visible and lack of stakeholder commitment can result in wrong personnel choices for key positions  
- Personal circumstances and conflicts at the management level can lead to the blockading of necessary transformation initiatives  
- However, no business impacts yet |
| **Stage 3**: Lack of transformation strategy | - Enterprise starts losing customers due to lack of necessary ET  
- Decrease in turnover, increase in inventory and stocks  
- Decomposition of overtime and short-time work  
- High backlog for workforce or financial resources through failure to invest or false investments  
- Dissatisfaction and loss of key employees can also be a result – loss of core know-how |
| **Stage 4**: Lack of business success | - Unclear operating results – total costs are not covered (still positive profit contribution)  
- Ongoing lack of positive business results weakens execution power of leadership team  
- Important Problems are ignored or vanished |
| **Stage 5**: Lack of liquidity | - Capital consumption and negative cash flow  
- Entrance to bankruptcy (variable costs are not covered negative profit contribution)  
- The company culture as an important system of common values often gets destroyed |
Our research focuses on the role of Enterprise Architecture (EA) and Technological Artefacts in ET, while also advocating that organizations do not have any feasible instrument which allows them to understand the overall ET occurring throughout their projects – hence the problem of entering the five cascaded stages of aggravation that affect organizations to succeed in their ET (or fail).

1.1 Document Structure

Design Science Research Methodology (DSRM) has been used as the research methodology for our work developed. In order to better express the contents of our dissertation in DSRM terms, we opted to structure the whole document with a direct relation to the DSRM steps.

Firstly, in Section 1 it was presented a brief introduction of the general context related to this Master Thesis and the work methodology that we have adopted.

Section 2 introduces the problem of this Master Thesis and the research questions derived.

Later, in Section 3 encompasses the Related Work and relevant Concepts, which are the Theoretical and Practical Background related to this Master Thesis. Furthermore we address important topics, namely: Enterprise Architecture which is encompassed in Enterprise Engineering, the framework COBIT 5 and the Organizational Configuration Map that are related to Enterprise Governance, and finally the Business Transformation Management Methodology (BTM²) and several Change Management Models that are relevant to properly deal with Enterprise Transformation.

In Section 4 we present our proposal concerning to the role of EA and Technological Artefacts in ET – focusing our η Framework.

Afterwards, in Section 5 we present experiments where we applied our proposal, followed in Section 6 by an evaluation of these results.

To conclude, Section 7 describes the lessons learned from these experiences and a summary of the main conclusions we can take from our research.

2 PROBLEM

In this section we define the problem of this Master Thesis and the research questions derived. We conclude that there is not enough emphasis on managing the human, behavioural and cultural aspects of the change and motivating stakeholders to buy into the change. In addition, we identify the common mistakes that occur during ET, while perceiving that there is much that organizations can gain from a comprehensive value management.

This Master Thesis addresses these identified issues that affect the ability of organizations to successfully achieve ET. Our research focuses on the role of Enterprise Architecture (EA) and Technological Artefacts in ET. Furthermore, we advocate that organizations do not have any feasible instrument which allows them to understand the overall ET occurring throughout their projects – crucial to avoid the progression through the aggravation stages 1-5 presented in Section 1 - Introduction.

2.1 Research Questions

In order to better organize our Master Thesis, we outlined three Research Questions (RQ) to steer our research concerning the role of Technological Artefacts and EA in ET. Therefore, this Master Thesis aims to answer:

- RQ 1: What is the role of EA in ET?
- RQ 2: What is the impact of Technological Artefacts in ET?
- RQ 3: How can organizations manage and deal with overall ET occurring throughout their projects?
3 CONCEPTS AND RELATED WORK

During this Master Thesis, we studied several relevant concepts and related work that became the cornerstones of this Master Thesis, which are presented in this section.

EE advocates that an enterprise is a designed, engineered, and implemented system, where EA allows to create an overview of the structure of an organization, its business processes, their application support, and the technical infrastructure, while expressing the different aspects and domains in corresponding architectures, and also their interrelations. The main motivation for the use of EA in this Master Thesis is due to the fact that it allows organizations to prepare and deal with ET. Changes are inevitable and those that require an immediate response to ensure the competitiveness of organizations in a world increasingly tough and dynamic. These changes always involve Governance and knowledge of the organization itself, which is the basis for defining and planning ET.

EG focuses on developing a coherent and consistent overall enterprise design, which is crucial for the strategic and operational success. Moreover, it is responsible for the design guidance, integrating the various enterprise skills, knowledge and Technological Artefacts, enabling the enterprise to achieve fundamental qualities in the current dynamic environment, such as adaptability, flexibility, integration and optimization. COBIT 5 appears as a comprehensive framework which assists enterprises in achieving their objectives for the governance and management of enterprise IT. Although it started as an IT Governance Framework, nowadays it guides enterprise development in a holistic manner. We studied its five Principles and also the seven categories of Enablers that help organizations to achieve their objectives. In addition, the Organizational Configuration Map also enables a real time steering within the organizational context. This is relevant because it gave us the vision of which are the enterprise dimensions - later influencing our ET dimensions.

Finally, in what concerns to ET we studied the BTM². This is a recent methodology, which provides a holistic and integrative perspective on the organizations and the entire complexity of its ecosystem, allowing to adequately deal with ET. Moreover, the Transformation Lifecycle provides an overall map of the change territory and allows understanding of the iterative nature of ET. Since the introduction (or alteration) of an IS typically has a powerful behavioural and organizational impact, we studied and compared several Change Management Models.

4 PROPOSAL

In this section we presented our conclusions on the role of Enterprise Architecture (EA) and Technological Artefacts in ET.

On the one hand, we discussed how EA enables organizations to steer and support ET and other purposes by providing an instrument to make informed decisions as well as to ensure compliance of the transformation to these decisions, at all three levels of ET. In addition we present the key applications of EA, namely: Situation Description, Gap Analysis, Strategic Direction, Tactical Planning, Operational Planning, Selection of Partial Solutions, Solution Architecture, and Organizational Self-Awareness.

On the other hand, we presented the η Framework which aims at enabling a holistic vision of Enterprise Transformation (ET) related to the adoption of Technological Artefacts. We also advocate that this framework is a tool which allows organizations to adequately understand and measure the role of a Technological Artefacts on the transformation of their organizations.

We discussed the three interrelated components of our framework: (1) Stakeholders and corresponding classification according to their level of influence and attitude towards an artefact; (2) ET which encompasses five dimensions, namely Governance Changes, Business Model Changes, Business Process Changes, Structure
Changes, and Resource Changes; and (3) Benefits classified according to their different degree of explicitness and hence importance to each stakeholder.

In order to assess ET in a feasible way, we proposed mapping every single change with its corresponding benefit. Subsequently, these pairs of changes and benefits are assigned to a group of “Change Owners”, who are responsible for ensuring that ET is measured and successfully achieved. The selection of these “Change Owners” relies on their level of influence and primarily on their attitude towards the artefact, where promoters and enthusiasts are fundamental to promote the artefact and engage with other stakeholders in order to gain their support.

Later we summarized the four phases of ET Lifecycle (Envision, Engage, Transform, and Optimise phase) along with the corresponding steps in each phase required to properly apply the η Framework. In addition, we stated that ET is an iterative process, which implies that our framework must be applied and updated on a regular basis.

Finally, we conclude that both EA and η framework aim at enabling a holistic vision of ET, while providing means to successfully steer and coordinate it.

![Figure 1: EA and η Framework with corresponding ET Levels and Instruments.](image)

5 DEMONSTRATION

We applied the prototype based on the η Framework to two real organizations:

- General Secretariat of the Ministry of Justice (Secretaria-Geral do Ministério da Justiça - SGMJ);
- Portuguese Bar Association (Ordem dos Advogados - OA).

The framework was used in both cases to assess the impact of a Document Management Solution - Edoclink by Link Consulting, which was briefly presented. Since we did close the meetings with SGMJ in order to finish its case, we only explained the complete case of OA.

Regarding the OA case, we talked about the topics addressed in the meetings, namely the two main assessments made to Stakeholders and the achievement of expected changes and corresponding benefits. Throughout this chapter we also show figures illustrating our work developed and the results obtained in our prototype. Furthermore, we captured the big picture of ET occurring in OA, which was enabled by the adoption of a Technological Artefact.
The final result of the ET assessment in OA can be summarized as follows:

- **Stakeholders**: Almost every identified stakeholder supports this artefact and its use in OA. Only one stakeholder gave initial resistance. Since it has a high level of influence, it is classified as an Opponent. The main reason for this resistance it was because this system could lead to her loss of influence in OA. This issue led to a disciplinary action. Further details are not discussed in this dissertation in order to maintain employee’s privacy;

- **Changes**: Since the artefact is a Document Management System, it was already expected the highest impact on the Resources dimension. This is followed by several changes in Governance and Structures. Then finally a few changes in OA’s Business Processes and slight impact in the OA’s Business Model (more specifically, the relationship with its clients);

- **Benefits**: On the one hand, all expected Financial and Quantifiable benefits have been achieved, though they have not been adequately measured. On the other hand there was one Measurable and two Observable benefits who have not been achieved yet. Although this perspective of classifying the benefits according to their degree of explicitness allow us to understand how we are able to effectively evaluate them, it is also true that a quick glimpse at the overall achievement of benefits (i.e. Benefit Dimension depicted in Figure 5.1) does not bring too much added value. Therefore we also used a different approach, where we classified the identified benefits according to the four different dimensions of the BSC (Balanced Scorecard). The result of this classification is depicted in Appendix A (in English). This way we can conclude that the artefact has already enabled the organization to achieve nearly all expected benefits, which are highly related to the learning and growth of the organization itself, but also several improvements in its internal processes. Additionally, all Financial and Customer related benefits have also been confirmed.

Notice that by mapping benefits according to four dimensions of the BSC, we obtain a feasible way of supporting the BSC and take the most advantage of an effective organizational performance measurement and a tool to implement Enterprise’s Strategy.

To summarize the current state of the overall realization of ET (i.e. by comparing the AS-IS with the TO-BE state based on the realization of the pairs in our mapping between changes and benefits), our prototype shows that 88% of the pairs Change-Benefit are Completed, 8% are Uncompleted, and 4% are not applicable.

6 EVALUATION

In our research the evaluation is based on two distinct strategies, since it was done after the development of the artefact (i.e. Ex Post) in Naturalistic and Artificial way. In the first case we did the demonstration on a real organization and we have evaluated the proposed artefact. Furthermore, the used process (P) was interviews, which were based on (C) the eight principles of MSQMF. On the second case, we submitted a scientific paper to an International Conference concerning the η Framework (P), which allowed to get positive appraisal of the scientific community (C).

In our Naturalistic approach, we gathered Practitioners Feedback in the SGMJ and OA cases, while Academic Feedback was obtained after presenting our research in a postgraduate class related to Information Systems with specialization in Enterprise Engineering. Moreover, we acknowledged the main positive aspects of our framework, as well as the major improvements suggested.

After analysing the answers of the questionnaires and the feedback gathered, we inferred the results for the MSQMF criteria: Completeness, Simplicity, Flexibility, Integration, Understandability, Implementability, Integrity, and Correctness. These results and analysis allowed us to conclude that the proposed framework achieves acceptable results and meets the MSQMF criteria.
Table 2: DSR Evaluation Strategy Instantiation.

<table>
<thead>
<tr>
<th></th>
<th>Ex Ante</th>
<th>Ex Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naturalistic</td>
<td>N/A</td>
<td>P: Demonstration to experts, academics, and professionals, who gave</td>
</tr>
<tr>
<td></td>
<td></td>
<td>their feedback through a questionnaire</td>
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<tr>
<td></td>
<td></td>
<td>C: Österle and MSQMF principles</td>
</tr>
<tr>
<td>Artificial</td>
<td>N/A</td>
<td>P: Submission of scientific paper to an International Conference</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: Scientific Community appraisal</td>
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</tbody>
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In addition, we presented the evaluation of our research (obviously focusing on the η Framework) using the four Österle principles. These principles are fundamental to evaluate researches that use DSRM and also have a great support by the scientific community. We concluded that our research and corresponding framework also achieves acceptable results and meets the Österle criteria.

6.1 Main Feedback

On the one hand, the main positive aspects obtained related to the η Framework are:

— **Holistic approach to ET**: assessment of the real impact of an artefact on the organization, while measuring changes and benefits achieved;
— **Stakeholder engagement**: interesting approach to stakeholders, with a simple way of managing and empowering them to act on ET;
— **Simplicity**: The ease of applying the framework even in different scenarios and organizations realities (from small projects to extensive projects), as well as the ease of updating it makes this framework a feasible tool for organizations to properly deal with ET;
— **Adaptability**: each organization may pick their classification criteria for each of the three components of the framework, according to their specific needs.

On the other hand, the main aspects asked to be improved in the η Framework are:

— **Benefit Management**: The classification of benefits into four different types depending on their degree of explicitness tends to be of little relevance to some of the inquired. In this case we showed that we could use another approach that fitted better their concerns, such as the mapping into to the four different dimensions of the BSC – This improvement was easily made thanks to the simplicity and adaptability of our framework;
— **ET progress**: Although this problem is related to technology chosen to develop our prototype (Microsoft Excel), there is a lack of vision related to the progress made during ET. In our specific case, we could only have this feature in the prototype by having multiple files, each one related to a single point in time.
7 CONCLUSION

Over the course of this dissertation there were several aspects that were raised which are important to mention. These aspects resulted from the application of the DSRM process to this research, mostly in the problem identification step, the objective definition step, the design step and the evaluation step. We will structure this section according to these steps.

Firstly, we concluded that there is a lack of emphasis on managing the human, behavioural and cultural aspects of the change and motivating stakeholders to buy into the change. Since stakeholders are an engine that propels ET, it became quite obvious that we would need to find a way of motivating them to commit to the desired changes through a clear and understandable benefit-driven approach.

With the previous conclusion in mind, the creation of the η Framework was based on the three main components: Stakeholders, Changes and Benefits. The next important question to be addressed was: How do they relate with each other? We concluded that by setting a simple mapping between changes and corresponding benefits (both enabled by the adoption of an artefact) we were able to apply an intuitive cause-effect approach, which would be much more effectively used to communicate with stakeholders and gain their commitment. In addition, we understood that besides having an instrument of Stakeholder Management, it would be much more valuable to enable a Stakeholder Engagement approach. Therefore we added the concept of Change Owner. This allows the active participation of stakeholders in ET – allowing them to have the chance to influence the decision-making process, instead of just being forced to agree with decisions that have already been made.

During our demonstrations, it was interesting to notice that the η Framework naturally became an instrument to ease communication between the organization that adopted the artefact and also the one that developed/sold it. Furthermore, both organizations were able to collaborate with each other in order to capture the big picture of ET and identify bottlenecks – while focusing on the three fundamental components we talked earlier.

In fact, in one of the cases we saw that the IT Project had already been concluded – with the artefact fully operational. Nevertheless, the artefact was not being used at all. This was due to the majority of stakeholders, who simply refused to start using it. In other words, although the IT Project had already been concluded, the ET was way far from being successfully completed. And worse than that: without the responsible team for the adoption of the artefact understanding why they had failed, while instinctively blaming other stakeholders for building resistance without any rational reason.

Later, in the evaluation phase we obtained several positive feedback with numerous people becoming interested in our framework as well as giving their support for us to continue to improve our research. Obviously we have also gathered some pertinent suggestions of improvements. Nevertheless, there were a few who did not quite understand what problem we were tackling or even if our framework was a feasible and engineered approach to solve it. This resistance is something quite natural - in fact is one of the main reasons we ought to continue researching and improving ET-related instruments with Change Management being taken into account. Our ultimate goal is to increase overall awareness and commitment to a Benefit-driven approach for ET led by Stakeholders.

In last, we learned that both EA and η Framework are themselves artefacts of ET – making significant changes per si in organizations, while enabling corresponding benefits.
REFERENCES


APPENDIX A: Final result of the ET Assessment in OA Case.