Extended Abstract

Information Systems’ Requirements as a Guide for Organizational Steering

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Abstract: Organizational environments are evermore turbulent, demanding that strategy, and hence organizations themselves, continuously change. Adding to this, the widespread and pervasive use of computer based artifacts within our society and within organizations, and the fact that they all influence each other, demands that computer based artifacts also continuously change. How may we deal with this turbulence and with the demand for continuous change? There are a series of proposals for solving this problem such as agile software methodologies, incremental strategy making, agile organizational structures or Organizational Engineering. But these proposals lack integration with each other and/or are unable to represent and predict the organization’s continuous flux and emergence. To deal with these challenges, this work presents an explicit process for continuously steering organizations (based on rapid observation/intervention cycles), supported by a framework (based on structuration theory), which models the organization’s continuous flux through the influences originated from the various entities and practices that constitute and surround organizations. To support both top-down steering and the observation and prediction of emergence within the organization, the process and the framework are integrated with management strategy, organizational design, organizational change and the engineering of computer based artifacts, due to the interrelations between these various subjects (with a strong focus on the interrelation between Engineering and Organizational Design/Sciences). These proposals grant practitioners and researchers alike a fast, focused and integrated awareness of the relevant organizational change, while supporting the enabling of the desired organizational change, bringing us much closer to truly describe and accomplish organizational steering.

Keywords: Organizational Design and Engineering, Organizational Engineering, Organizational Design, Requirements Engineering, Organizational Change, Organizational Steering
# Introduction

Society has suffered constant change since man’s existence and recently, Information Technology (IT) has gained a widespread use within our society leading to profound changes in our life and work style (1). These widespread and profound changes that Information Technology (IT) has provoked within organizations evidence the fact that technology (in general) and people mutually influence each other (since the beginning of their existence).

Due to this, when an Engineer conceives an artifact, that artifact will influence, and possibly change the organization, and when an organizational designer specifies how he desires to change an organization, he must consider how this change shall influence the existing artifacts, and how these artifacts shall influence the desired change. Therefore, the Engineering disciplines that produce computer based artifacts (CBAs), and the disciplines that design organizations also mutually influence each other. This “intertwining” created the need for the discipline of Organizational Design and Engineering (ODE) (2).

This work extends the research carried out at the Centre for Organization Engineering at INOV/INESC in Lisbon, Portugal, and I shall use the following definition of ODE: the application of social science, design science and computer science research and practice to the study and implementation of new Organizational Designs, including the integrated structuring, modeling, development and deployment of CBAs and people (2). More specifically it extends the research related to organizational steering proposed in (2). Organizational steering emphasizes continuous analysis, which considers the entangled interplay of people and CBAs in organizational change. It involves continuous short interventions that include: observing the organization and executing small adjustments based on these observations. Similar proposals may be found in strategy-making and strategy-execution, such as (3), and in Software Engineering, such as agile methodologies (4)(5). But these proposals aren’t integrated. This leads us to this work’s research questions:

1. What are and how may we represent the various concepts that must support the organizational steering process?
2. How may we represent an organization’s tendency to change and the rationale that underlies that change in order to describe an organization’s (eventual) change?
3. How may the organizational steering process be integrated with the strategy-making, strategy-execution process and software development processes?
4. How may we find the relevant limits of the organizational steering context, in order to avoid the need to consider the whole organizational context and allow for rapid observation and intervention cycles?

## 1.2 Research Methodology

To accomplish the proposed objectives I have divided the necessary work into five phases:
1. **Understanding and synthesizing** the various disciplines within the current literature which are relevant to the satisfaction of the objective and that present alternative methodologies for accomplishing change within organizations.

2. **Integrating** the various studied perspectives. When a given number of concepts need to be integrated to solve the problem and no integration is possible, make this integration a part of the problem.

3. **Defining a solution to the proposed problem** and all its parts. The solution should be capable of being integrated within the domain of ODE, and should be applicable along with the organizational steering process.

4. **Validating and improving the solution** through the use of historic case studies.

5. **Discussing the results.**

   The solution was validated by analyzing case studies (the M-Tel case study (6) and the Epsilon case study (7)) because the boundaries between the research phenomena and its context aren’t clearly evident (due to their shared phenomena and mutual influences), and the size of the research sample demanded by other methodologies would be too large (8). The analysis verifies:
   1. Does the information provided by the ADMITO Framework support the modeling of all the relevant concepts and occurrences referred in the respective case studies and needed to accomplish organizational steering?
   2. Does the ADMITO Framework model the organizational flux including deliberate and emergent changes and their rationale?
   3. Does the organizational steering process and ADMITO Framework fit with and model the aspects related to the definition of the organization’s strategy, its implementation and its emergence?
   4. Does the organizational steering process and ADMITO Framework fit with and model the aspects related to software development (both agile and traditional), including the CBAs, their requirements, their users and their interconnections?
   5. Does the ADMITO Framework allow the practitioner/researcher to focus and model solely the relevant aspects of the organizational context by modeling solely relevant entities, interconnections, and influence links?

2  **Related literature**

   This chapter presents this work’s related literature. Presenting the constructs (9) necessary to develop and validate the proposed solution and its alternatives.

2.1 **Requirements engineering**

   CBAs (artifacts that run on a Turing machine) are developed and implemented within organizations to satisfy a given set of requirements (conditions over the events and states of the environment). Requirements may be functional (requirements that specify the functions or services
of the system) or **non-functional** (requirements that represent system qualities or properties of the system as a whole)(10). CBAs are implemented within an **environment** (part of the world with which CBAs will interact and in which their effects will be observed) (11). But CBAs aren’t separated from their environment. **Shared phenomena** (events and states common to the CBA and environment) exist between them and the environment (10) (11), which create the mutual influences between the CBA and the environment.

It is **Requirements Engineering** that attempts to cope with the challenge of the elicitation, modeling and documentation of these requirements (10) (12). Examples of requirement engineering methodologies are (13) (14). Traditional Requirements Engineering lacks intentionality, in other words they don’t capture the rationale for requirements’ existence, and for the existence of the CBA itself. **Goal-Oriented Requirements Engineering** (GORE) attempts to solve this problem (10) by capturing and analyzing stakeholder intentions (the reason why the CBA should exist). But all that it models are static states of the organization without any indication to what is the perceived tendency for change and its rationale, how the organization actually changed after changing the CBA, nor how people perceive it (which influences their actual behavior (15)).

### 2.2 Software development methodologies

Let us now analyze how we can create and change CBAs. Traditionally Software Engineering went through a rigid process favoring extensive modeling and planning. But this led to very long iterations (16), rendering the process inadequate for dealing with problems that were continuously changing - very frequent in software engineering because CBAs E model (17).

Due to these limitations, Agile methodologies were proposed. **Agile Methodologies** are software development methodologies that emphasize simplicity, continuous learning, easy (face-to-face) communication among team members, satisfaction of stakeholder requirements, rapid response to change and constant communication with customers through rapid feedback cycles. Besides this they recognize the limitation of planning in a turbulent environment (5) (4). These methodologies cope well with unpredictability and change by using short software development phases and rapid feedback loops. Albeit this quality, they mostly ignore the organizational aspects and the organizational sciences body of knowledge while focusing solely on the software system. This may lead developers to completely ignore the continuous impact their system may have within an organization, and the impact the organization may have on the system.

### 2.3 Strategy

Section 2.1 presented a description of Requirements Engineering, and as we have seen, CBAs are created for a reason. This reason may be derived from an organization’s strategy. **Strategy** has many definitions. (18) define it as the “competitive moves and business approaches” that a company’s “managers are employing to grow the business, attract and please customers, compete successfully, conduct operations, and achieve the targeted levels of organizational performance”. On the other
hand, (19) defines strategy in five ways: as a plan, as a ploy, as a pattern, as a position and as a perspective. These five definitions show various perspectives that fit well with the former more “mainstream” definition.

But (20) (21) go on stating that part of the strategy is deliberate and another part is emergent. Therefore, the strategy-making and strategy-execution process begins by planning the intended strategy (strategy-making phase). Afterwards, comes the strategy-execution phase (creating a plan for how to put the strategy into action, and executing that plan). During the attempts to execute the intended strategy part of its contents are discarded (unrealized strategy) and the rest is executed (deliberate strategy). Other forces/variables foregone during the planning phase lead to the occurrence of an emergent strategy component (emergent strategy). The emergent and deliberate strategy compose the realized strategy. (20) (22), and (18) state that the process repeats itself in a circular manner, where one can go back to any step at any time. “Sensing” and being aware of the evolution of this process is critical and desired, for only this way may we detect and make informed decisions about innovations or threats within the organization (20)(19)(23) (24).

How does strategy cope with turbulent environments? Although many authors currently recognize this problem, they focus mostly on what capabilities and forms of organizing allow an organization to continuously innovate, anticipate and/or react to change (18)(25) (1). A few authors have focused on the decision process, arguing for defining and adjusting strategy in an incremental and rhythmic manner, as events unfold, while keeping their options open (26) (3) (27). Albeit dealing with dynamic environments, these proposals lack a framework, integrated with the whole strategy-making strategy-executing process and with the implementation of CBAs.

2.4 Organizational Design & organizational change

Let us understand what is an organization? Given this work’s focus on the relation between CBAs and social entities, the definition of organization must take this into account. In (28), three different perspectives are presented as a summary of previously used perspectives: Individuality (assumes humans/organizations and technology to be discrete, independent entities with inherent characteristics), Duality or structurationism (considers humans/organizations and technology to be interdependent systems that shape each other through interaction) and Relationality (assumes humans/organizations and technology exist only through their entangled intra-relating). The perspective that better serves my needs is the structurationist/dualist perspective. It allows observing and designing social and technological entities separately, and then understanding and predicting what interconnections are enacted between them. Through this perspective, I shall define an organization as a “recurrently enacted and patterned set of relations, reproduced over time and space” (28) between social and material entities.

As with the word organization, there are many definitions of Organizational Design (in part due to the different definitions that exist for the word organization), which belong to different schools of thought. Some focus on the internal aspects of the organization, others focus on contingencies, or how to align the organization with its environment (29) (30).
But recently, due to information technology and the changes it has generated within society, contingencies themselves are shifting (1), competitive advantages have become ever more transient, the organizational "environment" and the organization itself are evermore turbulent (25). Therefore, organizational design has shifted its focus from the design to a continuous process of designing, with an understanding of technology and strategy, and with a preservation of variety within the organization (post-contingency theory (1)). Due to this fact, Organizational Design should also reflect this dynamic nature. Therefore, I shall define an Organizational Design as the specification of the desired entities, relations and organizational characteristics (the aspects of the organization the organizational design analyzes and makes prescriptions about), as well as the identification of the conditions to enable them.

But how why do organizations change? There are various important organizational change classes of theories, examples are: planned change ("presume that managers are the primary source of organizational change and that these actors deliberately initiate and implement changes in response to perceived opportunities, to improve organizational performance or fit with the environment" (31)), the technological imperative (considers technology as a primary and autonomous driver of organizational change), gradualist (consider organizational change to be slow, incremental and cumulative), punctuated equilibrium (considers that change is rapid, episodic and radical) and hybrid (accepts both gradual and radical change) perspectives. Given the definition of organization that I have selected, I shall define organizational change as a "continuous phenomenon that results from the situated practices" or relations occurring between social and material entities, which create changes in the relations and/or the entities themselves, “by innovating, experimenting and improvising” (quotes from (31)). This definition models both emergent and deliberate change.

2.5 Current Organizational Engineering Perspectives

I shall now present the organizational change models that have been proposed to cope with the challenge of optimizing the use of information technology within organizations. Examples of these are the business and enterprise engineering perspective, the DEMO (Design and Engineering Methodology for Organizations) perspective, the CEO (Centro de Engenharia Organizacional) Perspective and the CODE (Center for ODE) Perspective.

The business and enterprise engineering perspectives focus on the identification and the deployment of new business models in organizations, through the use of information technology innovations (32) (33) (34). These perspectives present a series of methodologies and processes to manage the change, that follow a top-down process, without feedback loops and a clean sheet approach starting with IT innovations identification (34).

The DEMO perspective is based on the Language Action Perspective and seeks to redesign and reengineer enterprises to exploit modern information and communication technologies (35). To accomplish this it makes use of an Enterprise Ontology, which is defined as "the independent essence of an enterprise" “from a holistic systemic point of view” (35), and Enterprise Architecture, which is defined “as a coherent and consistent set of principles that guide how the enterprise must be
designed” (36), which serves to obtain coherence between the organization and its information technology. These concepts are then applied through an iterative process (35).

The CEO Perspective seeks to provide the organization with the best information technology that fits its strategy, and support the organization’s redesign to successfully implement the given technology within the organization (34). To accomplish its objectives the CEO perspective makes extensive use of the CEO Framework, an enterprise architecture framework, which supports modeling organizational change processes through role modeling, which has many other uses such as those presented in (37). The application process used by this perspective begins with the modeling of the organization’s current state. Then the organization’s desired state is modeled. Finally, the to-be model is implemented within the organization.

But this perspective mostly ignores the organization’s soft aspects, accomplishes a poor integration with the disciplines of organizational science and considers change to be an isolated one-time phenomenon. Therefore, the CODE perspective (reusing much of the work developed by the CEO perspective) was created and the discipline of ODE was proposed. This perspective reveals a strong preoccupation with both the social and technological aspects of the organization, continues to extensively use the CEO-Frame- work, and recognizes that reengineering the organization isn’t a onetime isolated event, shown by its circular application process: the ODE Loop (34).

3 Proposed solution

The solution to the proposed problems shall demand the interconnection of the previously presented disciplines, which may seem ontologically distant at first sight. I will begin by integrating Requirements Engineering and the Software Development Methodologies with Organizational Design. The CBA has already been defined. Its environment is the Organization (with all its entities) or a part of it. The shared phenomena represent the interconnection between CBAs (or other material entities) and the social entities within the organizational context. Therefore, we may state that the shared phenomena represent the intersection of the CBA’s requirements (or the material entities characteristics) and the social entities characteristics. Finally, moving onto Strategy, all of its definitions refer to intended or realized practices, states or characterizations of the latter. Therefore, to integrate Strategy to the organizational design concepts, I shall consider that Strategy is accomplished by the enacted practices (or interconnections) between the social and material entities.

With this I shall move on to the solution itself, which includes two main components: the Analysis Design and Management of IT and Organizations (ADMITO) Framework (38), which supports the whole organizational steering process; and the detailed organizational steering process. To support the Organizational Steering process one needs to be aware of the relevant organizational context, its state and its flux. To gain awareness about this context one needs to create a model of it (be it an explicit or a mental model), because as is stated in (39) (40) (41) (42), explicit models allow us to communicate, create and transform knowledge about the organizational context. Therefore, they
allow us to gain organizational awareness, and hence enhance organizational self-awareness. Therefore, Organizational Steering demands the modeling of the concepts previously defined within this work. This is the purpose of the ADMITO Framework (38), which supports (Fig. 2) modeling both the desired organizational context (the blue-print) and the actually observe organizational context after intervening within it (the observed organization). The blue-print and the observed organizational context are characterized by the same concepts.

The ADMITO Framework, which extends (43) (which is an extension to (15)), follows a structurationist logic. In other words, it represents social entities, material entities and the interconnections between them, which allow them to mutually influence each other. Social entities are people or groups of people and may have a given set of characteristics. Material entities comprise both organizational entities (non-technological artifacts intentionally used and built by humans within the organization, such as policies) and technological entities (artifacts constructed by engineers). The CBA is a type of technological entity. Material entities may also be characterized. The characteristics employed for organizational entities are organizational characteristics. On the other hand, CBAs and technological entities alike are characterized using requirements.

Interconnections may be symbolic expressions (communicative possibilities of material entities for a specific social entity, or how it’s perceived by a social entity), interpretations (actual communications of material entities for a specific social entity), affordances (possibilities of goal-oriented action that are afforded by material entities to a specific social entity) or actual practices (actual goal-oriented actions occurring between social and material entities). One interesting aspect of the previously defined interconnections/relations is the differentiation between actual and potential interpretations and practices. This differentiation is needed due to the freedom that characterizes human agency (having the potential to occur isn’t enough to guarantee its occurrence).

Now that I have presented the basic concepts of the ADMITO Framework, one may notice that an organization is a set of (social and material) entities and a set of enacted and patterned set of relations/interconnections over time and space. Therefore, Organizational change is any change to the characteristics of the organization’s social or material entities, to the set of social or material entities that constitute the organizational context, to the set of interconnections that constitute the organizational context from one instance to another.

To predict and present the rationale behind organizational change, we must consider what influences them. These are the characteristics of the material and social entities that are connected by an interconnection and the external influences. The latter are represented by influence links. Influence links are directed relations that link two structurationist interconnections (interconnections between separate social and material entities): the influencer and the influenced. Influence links may be positive (indicates that an increase of the influencer shall increase the relevance of the influenced and/or lead to its enactment) or negative (has the inverse effect of a positive influence link), potential or actual.

The concept of strategy, with its various definitions, is also included. A strategy is accomplished by the practices within the organization (its execution) or may be decomposed into sub-strategies. As
with the previous concepts, a strategy may be intended (that which management wishes to enable within the organization) or realized (that which actually happens).

Thanks to these concepts, we may now define emergent (changes that actually occur and aren’t represented in the blue-print) and planned (changes that actually occur and are represented in the blue-print) organizational change. To identify them, all one has to do is compare the blue-print and the observed organization. Finally, when employing this framework one must be conscious that all he can attempt to directly change are the organization’s various entities (the tangible components of the organization), because the enactment of the interconnections between the tangible (social and material) entities depends on the social entity’s will. In other words, one must enable change.

Now that I have presented the ADMITO Framework, research problems 1 and 2 have been solved. Now I shall explain how the Framework may support the Organizational Steering process. The solution to the various problems that I wish to solve with this work shall result from this integration. The process of application follows the following steps (also illustrated in Fig. 2):

1. **Design the organization’s blue-print**: How we wish the organization to become and how may we enable the desired change?
   1.1. **Define the organization’s intended strategy**: Favor the incremental development of strategy to keep the steering cycles fast and adjust them based on what happens
   1.2. **Decompose the organization’s intended strategy** into sub-strategies until you reach a level where additional decomposition will generate tactical issues (issues whose method of resolution is irrelevant to the designer). To keep the cycle short, one may need to prioritize which sub-strategies to further decompose (postponing the decomposition of the others).
   1.3. **Identify how the intended strategy may be operationalized**: for each leaf of the strategy decomposition tree, the designer must question himself as to what practice(s) may accomplish/operationalize that strategy (prioritize to keep the cycles short).
   1.4. **Identify how the desired practices may be enabled**: For each practice the designer must identify what are the social and material entities that shall enact it, and the characteristics that will tend to enable it. One must also identify the relevant structurationist interconnections that may (positively or negatively) influence the desired and undesired practices, and identify the entities and practices that influence them, etc. (prioritize to keep the cycles short).

2. **Intervention**: now that the desired organizational context has been designed, one must intervene within the organization accomplishing the required changes.
   2.1. **Managers must develop and/or enable the necessary changes in organizational and social entities** (prioritize aspects to on focus to keep the intervention phase on schedule).
   2.2. **Engineers must develop and change the necessary technological entities**: More specifically, **software engineers must implement and/or change the relevant CBAs**. In this phase, an agile methodology is preferable to keep the intervention phase on schedule (by prioritizing and selecting requirements to implement along with stakeholders).

3. **During and after the intervention emergence occurs** and the organization changes.
4. **Observe** the organization and model the relevant organizational context eliciting the various relevant entities, their actual characteristics and interconnections and the strategy that was actually accomplished by these interconnections. The observer then seeks to understand why change has occurred and represents this through the use of influence links, which will allow one to identify any relevant influence links ignored during phase 1 (improving his decision-making).

5. **The process repeats itself benefiting from the added knowledge, awareness and learning acquired** during step 4, thanks to the explicit modeling of the organization and the rationale behind the change that occurred. Even if things haven’t gone as desired, this isn’t problematic. A new chance to intervene shall come. This phase’s possible scenarios are presented in **Fig. 1**.

   I must highlight the relevance of both step 1.4 and step 4 on reducing the complexity and size of the relevant organizational context and solving research problem 4. One begins by modeling only what operationalizes the desired or emerged strategy and (only) the interconnections and entities perceived as relevant (direct or indirect) influencers of the strategy’s operationalization. Through this back trace along from influenced to direct and indirect influencers, the practitioner focuses on modeling solely the relevant domain of the organization. Otherwise, due to the dynamism of the organizational context, one might finish modeling the whole organization, and by the end of this task, find many differences from the model and the organization itself. Besides this, modeling the whole organization may be too complex and impractical (44).

   But the elicitation of these influence links and the characteristics needed to enable certain interconnections is highly complex. How may a practitioner/researcher do this? There are various options and all are based on inductive or deductive reasoning. A practitioner may deduce this from the current literature. Otherwise, one may induce this knowledge from a set samples using statistics or simply personal judgment. Samples may be obtained through various means: by analyzing case studies, by studying the history of an organization (how it has been changing and why), by using one’s past experience, or by steering an organization and using the data from past interventions and the organization’s reactions to them – a form of action research (45) – among others. Based on these inferences and deductions, we may create design patterns that represent frequent problems (general or specific to a given context) and how they may be solved, leading to even faster planning. But one must never forget. These patterns, inductions or even deductions must not be seen as deterministic!

   Finally, step 1 through 4, supported by the ADMITO Framework, also include the integration of the organizational steering process with the strategy-making, strategy executing and CBA development processes, and hence solve research problem 3.

### 4 The case studies

This chapter shall analyze two case studies in order to validate the proposed solution.
4.1 **Epsilon case study**

This section shall present my analysis of the Epsilon case study (presented in (7)) using the ADMITO Framework. This case study presents a merger between two organizations Epsilon and Omicron that was met with resistance by Epsilon’s employees because they viewed Omicron as a competitor. But this resistance was special: it was mostly mediated through an electronic forum created by the company’s management as a suggestion box to ease the effort of merging the two organizations. The initial blue-print reflecting the intended strategy and changes is visible in Fig. 3. Fig. 4 presents the actual organization, where employees began using the Forum because they perceived it as a democratic medium for resisting change. Then, management perceived the Forum as a threat to the desired change and began monitoring it, which led employees to begin using other more subtle means.

Afterwards management attempted to terminate what they perceived as the main influencer of the resistance, by firing Peterson (Fig. 5). They also attempted to mitigate the resistance by forcefully implementing it. Finally, with all the forceful implementation (many employees were being fired), employees used the forum as a form of expressing solidarity. Eventually, employees began understanding that change was inevitable, the realized strategy was aligned with the planned strategy, Peterson recovered his job through legal measures, and the forum’s activity ceased (Fig. 6).

4.2 **M-Tel case study**

This section shall present a summarized analysis of the M-Tel case study (presented in (7)) using the ADMITO Framework. This case study presents a large Telecommunications provider that created a cost cutting program called Multiple Channels to Market Program (MCMP). One of the changes included in this program, which hoped to cut costs, was the creation of a Desk Sales Unit that would both sell to corporate customers and support Field Sales People (see Fig. 7).

A while after launching Desk Sales, Management perceived it as a successful initiative that accomplished its work as planned, believing the realized strategy was aligned with the intended strategy. But things weren’t that simple. Desk Sales people instead of accomplishing their tasks, were creating a façade of compliance in order to reach their extremely difficult targets (Fig. 8). They did this because they found their targets (selling and being involved in sales) too difficult, which was due to the lack of training and due to the pressure that their direct managers put on them to put this façade in place (because they also viewed the targets for the employees’ capacities). This façade was highly successful in hiding desk sales people’s practices because high level managers only saw their results through a very aggregate view.

To achieve their targets, Desk Sales people accomplished menial of tasks for field sales people in exchange for sales and sales involvement. Besides this, they also began providing customer service to clients in order to obtain their confidence and sell more to them. This was a completely emergent behavior which generated an additional emergent strategy. To accomplish this they created their own tools to register their tasks and prioritize them (Fig. 9), and contacted customer support
employees through informal ties (befriending customer support service members), or through formal communication when customer support services accepted their requests anyway (an emergent behavior enacted by some customer support units) (Fig. 10). Interestingly, although the Desk Sales General Manager was replaced, the new Desk Sales General instead of attempting to negatively influence the current behavior influenced it even more by enforcing even harder targets and removing most of Desk Sales people’s time, which almost eliminated their training.

5 Discussion

Having applied the ADMITO Framework to the previous two cases using a blue-print/observations logic, I must state that all verifications were satisfied. All entities and concepts present in both case studies were easily modeled using the ADMITO Framework (satisfying the first verification). Even informal ties and emergent work systems were easily represented. For example, had M-Tel the awareness of what was going wrong within their Desk Sales units and why it was going wrong, they could have reconfigured their blue-print in order to solve their problems. Instead they made matters even worse.

Through the use of influence links, and the characterization of entities, one may model both the organization’s tendency to change as the rationale for change along time (satisfying the second verification). An example of this may be seen in Fig. 3, which represents how management believed Epsilon would change (through influence links and the entity characteristics). But things didn’t happen exactly as they expected. This change and its rationale are presented in Fig. 4.

The third verification was also satisfied. The ADMITO Framework supported the identification in both cases of the intended and realized strategy (including its emergent and deliberate components). Adding to this, in the Epsilon case study the organizational steering logic was being accomplished. Albeit unconscious, this shows that the steering logic may be accomplished.

Epsilon’s case involved the creation of a forum and the application of a process in line with “steering”. The ADMITO Framework was capable of both capturing the planned requirements of the forum, the interconnection management wished to enable through those characteristics and the actual practices that were enabled between the forum and the employees (satisfying the fourth verification). M-Tel’s case is also full of rich examples where information system requirements could be captured (e.g. the various emergent systems and informal ties used to provide customer support).

The fifth verification was also satisfied. In both cases, a practitioner/researcher, by back tracing along the influence links that start at the desired or emerged interconnections, may understand the relevance of all the modeled concepts. All concepts modeled in Fig. 3 are relevant except two: management and the fact that they interpret the merged design as more efficient. Influence links allow us to understand when to stop modeling (based on our perceptions). If one’s perception fails, the rapid steering cycles present many opportunities to improve our perception.
Besides all these verifications, all the concepts represented in the ADMITO Framework and the Organizational Steering process resulted from the integration of concepts, practices and processes from various disciplines in a deductive manner. Therefore, they are integrated by definition.

Does this fully validate these solutions? Two rich case studies are very relevant. But applying the proposals to more case studies would possibly elicit more concepts. It would also be relevant to study cases where organizations are managed through a process organizational steering. Finally, the conscious application of organizational steering through action research is critical to fully validate it.

Compared to the current proposals presented within this work, organizational steering presents various advantages: it integrates all these disciplines, from strategy to CBA development into one common language, supporting both agile/incremental methodologies and traditional methodologies; it offers an integrated awareness of the organization throughout the various aspects referenced by this framework; it is capable of modeling both organizational change and the reasons for organizational change; it models intended and realized phenomena, and among the latter which are emergent and which are deliberate; it gives equal importance to both social and material aspects alike, allowing the representation of mutual influences among them; it allows identifying emergent behaviors and artifacts which may then be selected as requirements for future CBAs.

After this analysis I may clearly state that Organizational Steering supported by the ADMITO Framework presents clear advantages to the previous methodologies. Not only because of its innovations, but also due to the fact that it makes use of the knowledge present in all these methodologies, builds upon it and in many cases integrates itself with them.

Albeit these advantages, many problems remain to be solved. How may we solve conflicts between influence links and entity characteristics when deciding what will emerge? Possibly patterns of organizational change based on past experience/samples or deduced from literature may aid this. How may we prioritized what is to be accomplished during the planning and intervention phase (this is highly relevant for the integration with software development and with strategy making)? How does management develop and/or enable the necessary changes in organizational and social entities? How long must each cycle take? How may we elicit these explicit representations? In other words, how may we observe the organization? This is a very interesting and extremely important problem that must be solved because the ADMITO Framework’s ability to enhance one’s organizational awareness is limited by one’s capacity to observe the organization. How should the governance of organizational steering be designed and accomplished within the organization? This problem has to do with who steers what within the organization (responsibilities), and how may we enable the enactment of those steering processes through organizational steering (governing).

Finally, I must state that although these problems are unsolved, seeing them as limitations is limiting in itself. Instead both researchers and practitioners alike should see them as opportunities to research and innovate.
6 References


2. Organizational Design and Engineering. Magalhães, Rodrigo e Silva, António Rito.


42. **Lankhorst, Marc e al., et.** *Enterprise Architecture at Work: Modelling, Communicating and Analysis*. s.l. : Springer, 2005.


68. Work systems as the core of the design space for organizational design and engineering. Alter, Steven. Lisbon, Portugal : s.n., 2009. IWODE09 - International Workshop on Organizational Design and Engineering.


### 7 Appendixes

#### 7.1 Appendix A: Contributions

It is relevant to explain that these proposals are a joint development between me and various Professors (38). Among the various concepts I spoke of above, I participated in: the definition and categorization of the various types of entities; the definition, **but not the categorization** of the interconnections between social and material entities; all influence link aspects; the definition of the notation used by the ADMITO Framework; all strategy related aspects (including their traceability with the interconnections that accomplish them); the detailed definition, **but not the (initially) general definition**, of the organizational steering process (including its integration with strategy making and the development of CBAs); the application and validation of all components (including those not developed by me) through two case studies; the integration of the various disciplines analyzed during this work; the justification of organizational steering based on **structurationism, instead of sociomateriality**.
7.2 Appendix B: Possible scenarios after a steering cycle

![Diagram]

**Fig. 1.** Possible scenarios verified when comparing the observed organization with the planned organization.
7.3 Appendix C: The ADMITO Framework & Organizational Steering

Fig. 2. The organizational steering process
Appendix D: Epsilon’s Diagrams

**Fig. 3.** Blue-print of the merger between Epsilon and Omicron.

**Fig. 4.** The actual changes that occurred after the merger.
Fig. 5. Blue-print of management’s reaction to the perceived employee resistance.

Fig. 6. Observed changes within the organization after the increase of coercion
Appendix E: M-Tel’s Diagrams

Fig. 7. Desk Sales blue-print.
Fig. 8. Actual behavior and entities within Desk Sales.
Fig. 9. Observed practices and material entities that emerged to support unprescribed work.
Fig. 10. Observed practices enacted by Desk Sales employees to provide customer support.