

Perspectives on using Actor-Network Theory and Organizational Semiotics to Address Organizational Evolution

Alysson Bolognesi Prado and Maria Cecilia Calani Baranauskas
Institute of Computing, State University of Campinas, Campinas, São Paulo, Brazil

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Abstract: Systems design for a changing organization has long been in the research agenda of several academic and industrial communities, and still is an open problem. This paper draws on Organizational Semiotics and Actor Network Theory to delineate a method for clarifying and representing the social forces involved in organizational changes. A case study illustrates the approach in which all actors – people, technical devices and other objects – are modelled in the social level, tracing back the norms flow, their sources, enabling to negotiate the change with the appropriate stakeholders.

1 INTRODUCTION

Enterprises and organizations are always subject to internal and external pressure for change. Market and politics from one side, and managerial decisions and personal preferences from the other make the propagation of novelties and collective evolution a non-linear process, with forces acting in several directions. The pervasive adoption of an always-evolving Information Technology brings more complexity to the scenario.

Organizational Semiotics – OS for short – describes an organization as a “structure of social norms, which allows a group of people to act together in a coordinated way for certain purposes” (Liu 2000, p. 109). The OS seeks for the cognitive and behavioral universals of the participants of the organization to a better understanding of the environment in which an information system will be deployed and run.

However, when studying the readiness of an enterprise for the adoption of new technology, this theory may not cover factors such as support to managers and business process (Jacobs and Nakata, 2012). Some organizational researchers (Jacobides and Winter, 2012; Holt et al., 2007) argue that collective phenomena are not defined by previous structure but instead are the result of reciprocal actuation between individuals.

Actor-Network Theory – or ANT – claims that *social* is not a specific domain of reality or some

particular attribute of people, but rather is the name of “a movement, a displacement, a transformation, a translation, an enrollment” (Latour, 2005, p. 64) that occurs involving the stakeholders, their interests and the means used to achieve them. This dynamic point of view contributes to understand situations in which the state of affairs is not well stabilized and social structure is being reconfigured.

The potential of using ANT and OS together have been already pointed out by Soares and Sousa (2004) aiming at balancing social and engineering approaches to introduce technology in organizations, and explored by Underwood (2001) to understand the diffusion of shared meanings, a prerequisite to the success of Information Systems. These trials provide good examples of positive aspects of merging both theories and encourage the expansion to address social, pragmatic and normative issues.

This paper proposes a method to trace back the social forces involved in organizational changes. By unveiling the network of interferences and mediations present in a social scenario and locating the sources of conflicting interests, it is possible to drive the actions needed to improve the organizational structure.

In the following sections we present Organizational Semiotics and Actor-Network Theory and discuss how they can complete each other to be used as support for understanding changes in organizations. A case study is briefly presented for illustrative purpose, followed by the discussion and the conclusions.

2 THEORETICAL BACKGROUND

Changes in organizations can be seen as social activities, since they require discussion and negotiation among the involved people. To understand social phenomena in general, the Sociology traditionally takes one of two opposite approaches: structuralism or agency (Vandenberghe, 2008). The first defends the primacy of a social “field of forces” that shapes human behavior, while the latter sees the individual actions and choices as the sources of the perceived social reality (Hewege, 2010).

The structuralist approach begins with the definition of *social fact*: a human manifestation that is not part of the physical, biological or psychological domains. For example, the advent of money and economics cannot be attributed to the psychology of a single individual, neither to her body functions or the laws of matter.

A social fact is recognized by the “power of external coercion which it exercises or is able to exercise over individuals” (Durkheim, 2007, p. 10) giving rise to a *structure* that is beyond people but directs their behavior. This vision leads to distinct treatment for people and objects by placing them in separate plans. Modeling software with a social component turns out to be mainly based on structures that represent people and their relations (Hendler et al., 2008), limiting their possibilities of behavior according to a subset of existing social rules. The dynamics of communities is less addressed by such software development.

The agency-based approach sees the capacity of individuals to act independently and to make their own free choices as the source of social phenomena. The social structure is just a consequence of the use of physical and cognitive abilities of individuals according to their interests and intentions. Following the same example above, according to this theory, money was created by people interested to ease some trade relations and evolved over time, driven by decisions, needs and innovations, to a more complex concept.

In the following sections we present the two theoretical sources that support this work: Organizational Semiotics and Actor-Network Theory.

2.1 Organizational Semiotics

The Organizational Semiotics proposes to see an organization as an information system that uses

signs and norms to coordinate people working together. Norms capture patterns of behavior and signs carry meaning and promote communication.

At first, organized groups of people can be seen as driven by informal norms, whose performance relies on oral culture, constant negotiation of meaning, and individual abilities, beliefs and patterns of action. Some situations ruled by literate culture, bureaucratic procedures, and normalized behavior constitute an inner structure, that is captured in formal norms. Within this structure, some tasks can be automated and humans replaced by computers or other technical information systems. These three layers are nicknamed “organizational onion” (Figure 1). Each layer emerges, relies and depends on the outer ones.

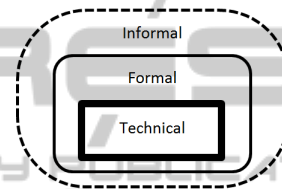


Figure 1: The organizational layers of norms (adapted from Liu, 2000).

Wright (1958) identified and conceptualized six distinct types of norms: rules, prescriptions, directions, customs, moral principles and ideals. Particularly, prescriptions and customs define the conducts of people. The former are characterized by having an explicit issuer or authority and attached sanctions in case of disrespect. The later have no such features, being acquired and forwarded by members of a community by means of imitation and social pressure and becoming regularities in individuals' behavior.

Norms can also be classified as perceptual, evaluative, cognitive or behavioral, according to the nature of the phenomenon they govern: to identify things, to attach a value to things, to grasp causality in flows of events, and to coordinate activities, respectively (Stamper et al., 2000). Liu (2000) shows a general syntax to represent behavioral norms in organizations:

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whenever <condition>
if <state>
then <agent>
is <obliged | permitted | prohibited>
to do <action>.
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Semiotic is the science that studies signs as units of signification and communication. According to Morris (1938), Semiotics is organized in three levels: syntactic, semantic and pragmatic. The first

deals with the structures and relations between signs, the second with their meanings and the third with the intentions and contexts of use. Stamper (1996) added a physical and an empirical level on the lower end and a social level to the upper level. This is called the semiotic framework or “ladder” (Figure 2).

The three lower levels (shaded) are often related to the computational structure of organizations, encompassing hardware, networks, protocols, data encoding, logic and software. The three upper levels correspond to exclusively human attributions: in the semantic layer data is comprehended and meaning is assigned; in the pragmatic layer the system is used with a certain purpose; and if this purpose presupposes or implies other people participating on the system, it reaches the social level. This last level is responsible from negotiation of the meanings of signs and the definition of norms of behavior.

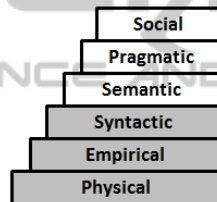


Figure 2: Semiotic framework, depicting levels in which signs’ presence and activity can be studied (adapted from Liu, 2000).

2.2 Actor-Network Theory

The Actor-Network Theory is a recently proposed theoretical-methodological framework that aims to provide an interested observer with a “sensitivity” to better capture how social phenomena evolve. It proposes to see the human interactions as chains of associations distributed in time and space that depend upon the continuous agency of its participants on each other and whose structure is dynamic, as a result of this joint action.

ANT is theoretically rooted in the principle that the basic human social skills are able to generate only weak, near reaching, and fast decaying ties (Latour 2005, p. 65). It is also asserted that all the forces responsible for sustaining the social aggregations come from the participants of the phenomenon. Therefore, to explain social structures such as organizations, that are expected to last longer and mobilize many different people to work together, it claims that *non-human* elements must be equally addressed.

The participants of the social realm create

associations among each other, intending to obtain support to propagate forces, share intentions, and mobilize other allies. These aggregates must be between humans, between non-humans, frequently are heterogeneous, but these distinctions are not considered relevant. Instead, it is fundamental to identify the role they fulfill in the associations, when transporting meaning or intentions: as intermediaries or as mediators.

An actor is an *intermediary* in a chain of associations when he or she or it forwards the actions received without transformation. The behavior of an intermediary is predictable and the outputs are determined by the inputs. On the other hand, a *mediator* inserts some new behavior to the system. Mediators modify, distort, enhance or translate the inputs received. They are creative and show some variability and unpredictability when acting upon the others. While faithful intermediaries often fade out in the studied scenarios, mediators appear resolving asymmetries and conflicts between the other actors.

According to ANT, social groups are performative, their existence relies on the constant action of the participants upon each other. Therefore, all the elements involved in a social phenomenon are *actors*, in a broader sense that encompass both human and non-human. No intentionality is assigned a priori to an actor; the focus is on their potential of mediation, interaction by physical or cognitive means, and contribution to the outcome of a situation.

The process of building the associations among actors is named *translation* and depends on the success of steps in which an actor, in the desire to change a certain state of affairs, looks for other actors whose acting skills are beneficial, stimulate their interests to join, defines roles and ensures compliance with the responsibilities assumed. A successful translation must follow these four well-defined steps (Callon, 1986):

- Problematisation: the problem that may be collaboratively solved must be defined;
- Interestment: potential allies have to be convinced to act conjointly;
- Enrollment: the role of each actor in the group is defined;
- Mobilization: the allies must be put to act associatively and control structures must be specified to keep them acting as agreed before.

The strength with which these movements unfold and mechanisms to ensure its stability and preservation define the success of the formed

network as a whole. When actors become connected, the consequences of success or failure spread through, creating a mutual interest that the group succeeds. When the translation is effective and the various actors are driven to act as one through the mechanisms of mutual control, their complexity is abstracted in a black box. So the network becomes itself an actor.

From the methodological viewpoint, ANT proposes to “follow the actors in their weaving through things they have added to social skills so as to render more durable the constantly shifting interactions” (Latour 2005, p. 68). This quest is oriented to the *sources of uncertainties* a researcher may face when exploring social groups, in an allusion to the principle of uncertainty from the quantum physics. The observer is always accounted as part of the representation and explanation of the studied phenomena. Each actor studied has his own frame of reference and shifting from one frame to another always adds some uncertainty.

ANT recommends that we follow the actors closely, investigating the circulating entities that make people act, understanding how each actor is recruiting the others, looking myopically to the phenomena in order to grasp details and covering the whole scenario (Fioravanti and Velho, 2010). When inquired about what make them act, actors are granted the ability of reflection and theorization, their explanations must be fully respected, including the used language and the figurations given to the causes of actions.

It is also advised to abandon some distinctions prior to the analysis: local and global are not hierarchically separated, but flattened and differentiated only by the extension and durability of their connections; truth and error are values applied by actors with different strengths in each frame of reference and not a researcher’s filter; and both human and non-human actors must be monitored symmetrically, being equally left to express themselves and be attributed some power or agency.

There is a list of occasions where objects become visible as actors and their role as mediators is enhanced enough to be studied: breakdowns, accidents and the proposal of innovations and novelties. When it is not possible to observe objects *in situ*, it is allowed to recover objects’ histories and the state of doubt or crisis in which they were born.

3 RATIONALE FOR COMBINING ANT AND OS

The Organizational Semiotics acknowledges the informal layer as the place for discussion, negotiation and uncertainties. Only when a state of affairs is stable, norms can be formalized and shifted successively to the formal and technical layers. This movement may lead to give up individual meanings and intentions, and rendering impersonal forces that apply the norms.

Since Organizational Semiotics is widely used to provide conditions to develop and deploy software into enterprises and for social groups (Bonacin et al., 2012; Liu and Benfell, 2011; Gazendam et al., 2003), it searches for the structural features of these sets of people, being less relevant how and who in particular defined the structures. Given this intense appeal to pervasive and impersonal norms, OS’s character is predominantly structural.

The ANT comes as a conciliatory proposal between agency and structure, in a position that can be named *structurationist* (Vandenberghe, 2008). For being focused on actors and the means by which they can interfere in the course of actions, ANT proposes that one of the goals of actors’ movements is to build a stable structure that, once established, governs future actions in a certain degree.

Patterns strengthened by the passage of time and the creativity required by uncertainties in the future are the essentials for society. Latour (2000) metaphorically represented this by the figure of roman deity Janus (Figure 3), who simultaneously looks to the past and to the future, mediating stabilized affairs and the need for innovation.



Figure 3: Two-faced Janus, from roman mythology, is used by ANT as a metaphor for the ambivalent character of the social aggregates: existing structures mold behavior (ancient face at left, looking to the past) and new behavior redefines structures (younger face at right, looking to the future). Extracted from Yonge (1880).

ANT highlights that the “fields of forces” generated by norms according to OS’ perspective (Al-Rajhi et al., 2010) are instead the sum of social forces generated, stored and replied by actors and conducted through the associations between them,

regardless of being human or not. Customs are not seen as anonymous anymore: they reach people through the associations each actor has. Although they do not have an authoritative issuer and neither an explicit penalty for being broken, ANT affirms that there is a process of translation that make people behave accordingly and that can be observed and studied. This process is better perceived in moments of group creation or of instability.

Norms are embodied in documents and devices. Sharing patterns of behavior is not always a face-to-face phenomenon. In this sense, both OS and ANT share a semiotic-materialism viewpoint (Law, 2009). Knowing the sources of these patterns is fundamental when someone is interested in changing them. Besides, knowing the nature of these reservoirs of rules, examples, laws and models – as human or non-human – allows us to choose an approach to tackle the change.

4 ADDRESSING ORGANIZATIONAL EVOLUTION: A PROPOSAL

This paper presupposes the scenario described by Sani *et al.* (2012) in which innovation and changes come from the outermost layer of the semiotic onion. Since at this point norms may be conflicting and provisional, there are behaviors and concepts that are not universal, but localized in individuals or subgroups with shared opinions. To grasp these subtleties for further analysis, the following steps are proposed:

1. Follow the actors through their daily activities related to the business processes to be understood, changed or improved. Let us call each of them as *focal actors* (Carrol *et al.*, 2012);
2. Identify actors' patterns of behavior and represent them as the existing norms. Provide an identifier for each norm (Sun *et al.*, 2001) for the sake of faster referencing;
3. Identify the actors that are promoting such norms through successful translations that keep agents working according to their interests. Let us call them *associates*;
4. Question about the unfulfilled intentions of existing norms, i.e., undeveloped or unsuccessful translations;
5. Follow the chains of intermediaries and mediators that converge into the associates, in a recursive process.

The outcomes of these steps can be used to find points of conflict or inconsistency, and can be scored using the proposed syntax for each norm:

```

Norm <norm-id>:
  whenever <condition>
  if <state>
  then <focal-actor>
  is <obliged | permitted | prohibited>
  by <associates>
  to do <action>.
    
```

The final product of the steps can be summarized using a graphical notation to represent all the involved actors and the norms they are subjected to. Human actors are represented as circles, non-human as squares and composite entities (human and non-human together, as for instance, external organizations) are depicted as triangles. Edges show associations between actors. Arrows represent the flows of influences that feed norms; solid ones are actual perceived norms and dashed ones are intended only. This is shown in Figure 4.

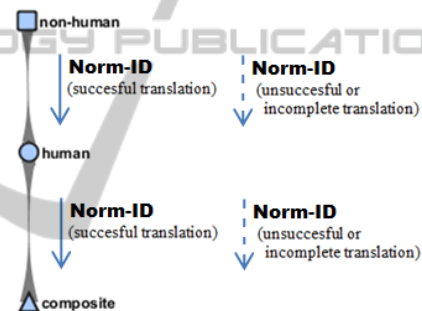


Figure 4: proposed representation for the different types of actors and the norms of behavior they exhibit and enforce.

5 AN ILLUSTRATIVE EXAMPLE FROM A CASE STUDY

A case study was conducted following an action-research approach (French and Bell, 1973), since the focus of the participants were in producing changes in a real-world situation and improving the practices of an organization. ANT and OS were used as tools when applicable, and the successive trials and cases of success informed the method described in this paper.

The IT team of a public University was requested by the Human Resources Department (HR) of the same institution to build a web version of a legacy system, already used in client-server mode, which was custom built by a third-part software factory fifteen years ago. This moment was seen by the managers as an opportunity to document, review and

improve business processes.

The dialogues below were simplified and translated from a series of conversations with the involved actors, following their own daily activities. We started from the main user of the system, member of the Human Resources Department staff, who we will refer to as *HR-STAFF-1*:

HR-STAFF-1: When I use this screen, I must first type the teacher's name and ID, set the status to '1' and click 'save'. Then change the status to '2' and click 'save'. Again, change the status to '3' and 'save', and only now I can input the other data: workplace, date of admittance and so on. Then click 'save' again and it's done.

When asked about the reason for that behavior, she just replied:

HR-STAFF-1: When I started to work here, my colleagues told me to do so. And also, see: when I insert a new teacher, the only value the system left for me to choose for 'status' is '1'. And only when 'status' reaches '3', the system enables the other fields for me.

In fact, analyzing the available source code, the IT team confirmed that such behavior was deliberated, but produced no intermediary effect or outcome other than enabling and disabling fields on the form. This brings us to the first recorded norm:

Norm N1:

```

whenever teacher data is inserted into
    HR database
if it is a new teacher
then HR-STAFF
is obliged
by SYSTEM, HR-STAFF (coworkers)
to set the status to 1, 2 and 3 in
    sequence.
    
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The HR staff member was sometimes advised by a senior consultant, who worked there since the time the legacy system was being developed. Although she does not use the system anymore, she provided some additional information about the motivations for the development of that software:

HR-SENIOR-CONSULTANT: there is a Deliberative Act that says the hiring process of a new teacher must begin at a Faculty, and then wait for approval by the Legal Department. Only if approved, HR proceeds with registration. The former HR Director believed that the system must reflect such rule, and all the involved workers must use the system.

The Deliberative Act is an official document, available at the local intranet for the researcher's inspection. Analyzing the text and the senior consultant's story, new norms were detected:

Norm N2:

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whenever hiring a new teacher
if the process is beginning
then FACULTY
is obliged
by DELIBERATIVE-ACT
    
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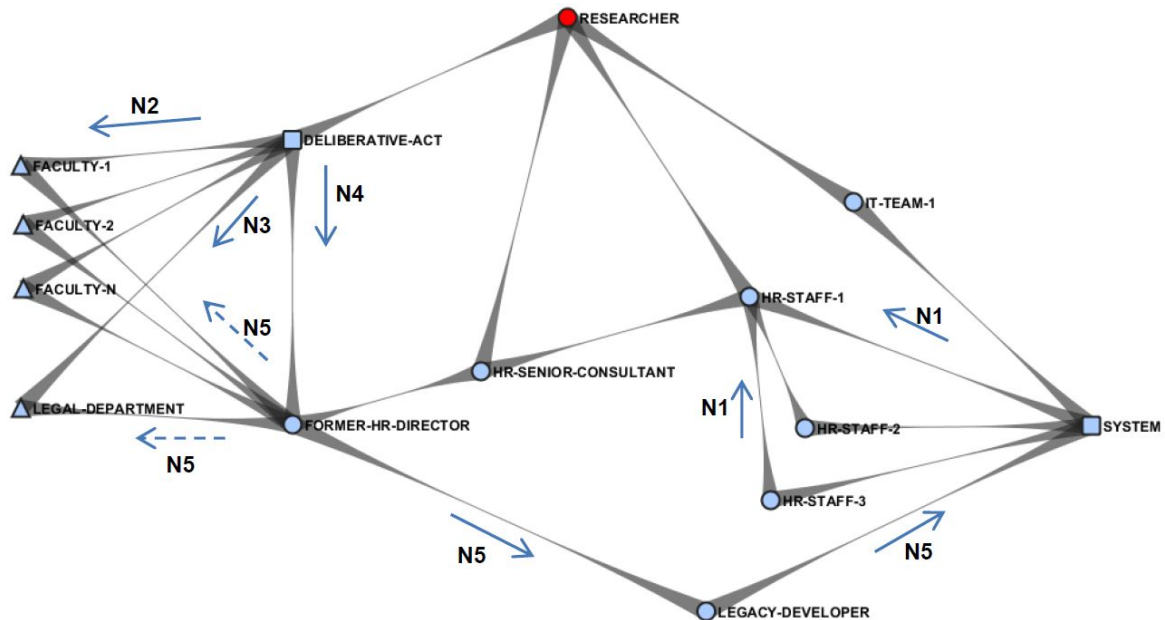


Figure 5: Actor-network and the flow of norms gathered during case study. Some arrows, although existing in the real data, were omitted for the sake of readability.

to send the filled forms to Legal Department.

Norm N3:

whenever hiring a new teacher
if the forms are filled by Faculties
then LEGAL-DEPARTMENT
is obliged
by DELIBERATIVE-ACT
to verify their content. If approved, send them to Human Resources; if rejected, send them back to Faculty.

Norm N4:

whenever hiring a new teacher
if the forms are approved by Legal Department
then Human Resources Department
is obliged
by DELIBERATIVE-ACT
to insert teacher's data on the database.

Norm N5:

whenever hiring a new teacher
if the forms moved in workflow
then FACULTY, LEGAL-DEPARTMENT, Human Resources Department
are obliged
by FORMER-HR-DIRECTOR
to inform process status, meaning:
 1-Forms filled by Faculty;
 2-Legal Dept. approval;
 3-Registering in the HR database.

The senior consultant also informed that norm N5 was not accepted by Faculties and Legal Department, since they were not interested in using the Human Resources software only to inform the hiring process' situation. Therefore the FACULTY and LEGAL-DEPARTMENT actors chose not to follow N5, being subject only to N2 and N3. Figure 5 represents all actors studied and the scenario of norms they are enforcing and to which they are subject.

The detection of these points of conflict in the norm flow leads to the situation where an organizational structured can be improved: either N5 is discarded, by negotiation with the current Human Resources Director, or its translation is completed by convincing Faculties and Legal Department to use the system. This decision is to be taken by the current Human Resources Director, in negotiation with Legal Department and Faculties.

5.1 Discussion

By knowing the role of the actors as intermediaries or mediators, and being aware of the process of translation, we are able to find the trials of introducing innovations. For instance, the former HR Director translated norms N4 to N5 according to his own interests, being a mediator. The legacy software developer, on the other hand, acted as a

faithful intermediary, implementing such behavior on the system (see Figure 5).

Non-human actors share the responsibility of keeping the others acting as expected by their designers. The SYSTEM kept HR-STAFF performing according to the FORMER-HR-DIRECTOR's intentions, although the other stakeholders, who were not connected to the system, ignored the norm N5.

During the representation of the actor-network, associations between actors do not always carry norms. They represent the flows of information and interests among all the involved entities. For instance in the case study, HR-SENIOR-CONSULTANT does not enforce or is subject to any norm. She provided the path through which the norms N2 to N5 became known. The ANT representation makes explicit the presence of this informant as a source of uncertainty. The role of the researcher is also highlighted as an active actor.

Although incomplete translations do not exist as a global shared behavior, they play an important role in the dynamics of organizations, because from the ANT point of view, they are precursor of norms or, as seen in the case study, generate local patterns of action that may be obsolete and subject to improvement. Using ANT, local sub-cultures can be disassembled, analyzed and explained; for example, the existence of norm N1 was maintained by the SYSTEM and the HR-STAFF by means of a custom, although the justification for such behavior, FORMER-HR-DIRECTOR, was not directly acting anymore.

It is also noteworthy that the passage of norms from the formal to the technical layer is not a passive process of diffusion, but instead subject to the active interference of actors' interests, capabilities and comprehension, for instance, the sequence of translations $N4 \rightarrow N5 \rightarrow N1$. Norms always reach people through a network of associations that may be heterogeneous in actors' nature and intentions.

6 CONCLUSIONS

Systems design for a changing organization is far from being a solved problem. The Actor-Network Theory argues that individuals' intentions are the source of social structure and provides a good methodological and theoretical support to find those interactions and understand how such structure emerges and is maintained. Organizational Semiotics, on the other hand, has a long tradition in

providing a deep understanding of the enterprises and, once patterns are established, guiding the software development.

By seeing the whole organization as a single information system and considering that all actors involved – people, technical devices and other objects – may have the same importance in the social level, through the proposed method and representation, we were able to trace back the norms flow through the network of actors and reach their sources, enabling to negotiate the change with the appropriate stakeholders of a case study.

This work will be continued by experiencing the presented approach in the design of social network systems (Pereira et al., 2011). Given the nature of these environments, with few enforced rules and norms emerging organically, the system design requires the capability to deal with structural instabilities, uncertainties and continual evolution.

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