# Use of information technology in mandatory settings: a proposal for an objective view of appropriation

*Research-in-Progress*

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**ABSTRACT**

Organizations invest in information technology (IT) looking for positive results that can only be produced if the technology is effectively used by individuals. The Technology Acceptance Model (TAM) applies a simple and quantitative model to predict *intention of use*, but it has difficulties to keep its explanatory power when analyzing implementation in mandatory settings (which are usual in business organizations). The more interpretive and constructivist approaches of Social Construction of Technology (SCOT) and Adaptive Structuration Theory (AST) propose interesting concepts - technological frame and appropriation – to qualitatively analyze the complex process of IT use as socially constructed. This research proposes the application of the main concepts of SCOT and AST in an objective causal model to analyze the appropriation of IT and its effects on the outcomes in organizational mandatory settings. We expect to contribute to appropriation theory and to the practice of IT implementation in the field.

**Keywords**
Adaptive Structuration Theory; Social Construction of Technology; IT usage; Appropriation; Acceptance.

## INTRODUCTION

Prediction models were built and rebuilt over the years, aiming to address the IT acceptance problem and, to some extent, also trying to predict future use. One of the theories that is often applied to explain the acceptance phenomenon is the Technology Acceptance Model (TAM), developed by Fred Davis during his doctoral research (Davis, 1985). The first published paper presenting TAM (Davis, 1989) has already received more than 14700 citations accounted by Google Scholar's search engine. The simplicity, the parsimony and the prediction power are the main qualities usually assigned to that model that is identified by Straub (2012) , just to give an idea of its importance, as the only native theory of the information system (IS) field.

Although many researches presented replications of TAM and provided a lot of suggestions to expand the model, the outcomes generated by the usage of adopted (or "accepted") systems are still not clearly understood. Even the definition of what is a useful system is still unclear after all the research involving the TAM model and its variations. Benbasat and Barki warn that there is "very little research effort going into investigating what actually makes a system useful" (2007, p. 212).

In spite of all organizational efforts to force users to adopt intended systems *as is*, users do find ways of bending things around and using a technological artifact according to their own interpretations and discretion. Thus, considering the prevalent mandatory conditions in most organizational settings, users have flexibility to determine their relationship to a technological artifact, at least to some extent, in a way that better suits them and still gives the organization the impression that the employees "bought into" the *as is* intended use.

Having all of that been said, we corroborate the general view that acceptance models work better in voluntary settings than in mandatory ones. The relationship among acceptance, use and achievement of intended outcomes seems too complex to be addressed by the simple TAM model. In fact that model is suitable to predict the intention of use. A user might not have the intention to use a system, but still be obliged to.

The Adaptive Structuration Theory (AST) and the Social Construction of Technology (SCOT) frameworks provide us with concepts that seem suitable to analyze and explain what happens to an IS artifact being used in an organizational context.

The objective of this research is, therefore, to develop and test a research model, inspired on the AST and SCOT frameworks, but applying more quantitative techniques to analyze and describe the effect of different interpretations and appropriations of a technological artifact by its users and the resulting outcomes.

## THEORY

### Measuring IT success in mandatory settings

When analyzing the set of technological artifacts adopted by organizations, we realize that the great majority of these artifacts are presented to their users under mandatory conditions. The artifacts are previously selected and implemented by organizational decision makers with the expectation of achieving positive outcomes, based on their perspective.

When TAM assesses the *intention to use* by comparing it with the user's beliefs, the assessment is biased by the mandatory condition of an organizational technological setting. It is impossible for the employees to ignore systems that are imposed on them to control and measure their work. If they did so, they would suffer the consequences inflicted by those mandating the system. In some cases, the use of information artifacts even becomes part of job descriptions.

Research applying TAM model deals with the relationships among beliefs, intentions and usage. This happens mostly for volitional contexts. For mandatory settings "the current conceptualization of perceived usefulness may not be appropriate" (Brown, Massey, Montoya-weiss, & Burkman, 2002, p. 292). The subjective norm has an effect over use in mandatory settings where individuals are affected by the social environment to comply with an expected behavior (Hartwick & Barki, 1994). This effect is reported to be stronger than the perceived usefulness and perceived ease of use for this particular setting (Venkatesh & Davis, 2000). Because of this effect on mandatory settings, the Unified Theory of Acceptance and Use of Technology (UTAUT) posits voluntariness as a moderating variable to explain the acceptance and use of a technology (Venkatesh, Morris, Davis, & Davis, 2003).

TAM was based on the Theory of Reasoned Action (TRA), which assumes that the behavior is under volitional control (Karahanna, Straub, & Chervany, 1999; Dishaw, Strong, & Bandy, 2002). Other studies identified that "attitudes matter more than intentions when technology use is mandated" (Brown et. Al., 2002, p. 294).

As Delone and McLean (2002) suggest, "researchers must also consider the extent, nature, quality, and appropriateness of the system use" (p. 5). The authors defend the idea that no system use is totally mandatory and that users have flexible limits to relate to them, as do the decision makers that decided on the adoption of the system by the organization in a different level.

Voluntariness by itself is a complex variable that can assume more than a dichotomic value (Karahanna et al., 1999; Petter, DeLone, & Mclean, 2008). Brown *et al.* (2002) propose the use of multiple dimensions to assess the 'mandatoriness' of a system. The dimensions include the necessity to complete one's job and the interdependence of system use. The mandatory or volitional configuration varies depending on such dimensions, as shown in Figure 1. The greater the level of interdependence and necessity, the more a setting is configured as mandatory. On the other hand, the lesser the interdependence and necessity, the more flexible the use and the more volitional the setting is.

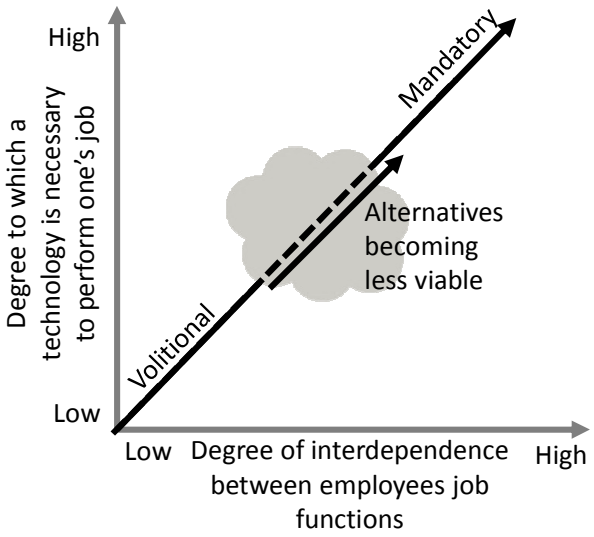


**Figure 1. Dimensions to assess 'mandatoriness' of a system (BROWN *et al.*, 2002)**

We understand that in mandatory settings, where the users have to use the technology, *IS success* will depend much more on 'how the users use it' than if they use it. In mandatory settings, individuals have the opportunity to use the system in a minimal level to comply with organizational demand, or to apply different strategies to avoid the system's use at all

(Hartwick & Barki, 1994). Our choice to consider user's perceptions about the outcomes is based on the fact that while "for voluntary systems, use is an appropriate measure [when the] system use is mandatory, usefulness is a better measure of IS success than use" (Petter et al., 2008, p. 238).

### Social Construction of Technology (SCOT)

The Social Construction of Technology (SCOT) is an approach derived from the studies of sociologists Wiebe Bijker (1997) and Trevor Pinch (Pinch & Bijker, 1984), and the historian Thomas Hughes (1994). This model considers that technological systems often involve many distinct agents who attribute different meanings to technological artifacts while an interpretive flexibility is negotiated and the meaning is still not closed. From a social constructivist perspective, technology is explained as socially constructed by actors that make use of social practices such as interpretation, negotiation and closure to perform technological change (Tatnall, 1999).

SCOT's perspective strongly refutes the idea of technology determinism. In fact, SCOT advocates that "social groups direct nearly every aspect of technology" (Pinch & Bijker, 1984, p. 17). Those negotiations and decisions are not limited to technology's designers, innovators, industrialists, developers, programmers and engineers, because even after the adoption process of a technological artifact by an organization has taken place, users can attribute new meanings to the artifact, discovering new uses and generating outcomes that were not planned before the beginning of the adoption and acceptance processes (Pinch & Bijker, 1984).

The same artifact can be considered successful by a group of stakeholders and completely unsuccessful by others due to interpretive flexibility. "The effective functioning of technological devices is socially constructed. That is, effective function, or 'working', is taken not as a physical given but as a social arrangement by the constructionist approach" (Dusek, 2006, p. 206).

The SCOT methodology has some requirements to analyze the sociotechnical change promoted by the interaction between social groups and technological artifacts. This theory, without making *a priori* distinction between the technical and the social, should explain the successful cases, but also the unsuccessful ones, the change and the stability of the socio-technical environment, the working of a technological artifact as an *explanandum* (which means 'a phenomenon that needs to be explained') and the duality of action and structure involved in the process (Bijker, 1997).

SCOT's framework is formed by four interrelated components. The *first component* is *interpretive flexibility*, which suggests that "technological artifacts are culturally constructed and interpreted" (Pinch & Bijker, 1984, p. 421). The *second component* of SCOT's framework is the concept of *relevant social groups*. In the process of technology development, multiple groups, each one possessing a particular interpretation of an artifact, negotiate its design (technical features) and the meanings that they attach to it. *Stabilization* is the *third component of SCOT*. It happens when a final decision, or at least a cessation of further decision, occurs. The *fourth component* is the *wider context*, or the wider sociocultural and political environment in which the development of the artifact takes place. It involves the background conditions for group interactions that shape the norms and values, which in turn will influence the meaning attached to an artifact (Pinch & Bijker, 1984).

Another interesting concept presented by Bijker (1997) is 'technological frame' that shapes meanings and behaviours in relation to particular artifacts. Each relevant social group has its own technological frame that is built when relevant social groups interact around a technological artifact. It provides the goals, ideas and tools needed for action.

This approach has been applied by sociologists to study innovation processes, but not to the same extent to analyze information systems management by organizations. An interesting effort using the concept of 'technological frames', although presented as an extension of Giddens'(1984) structuration theory, was applied by Orlikowski and Gash (1994) to analyze the use of Lotus Notes in an organization. They suggest that "where the technological frames of key groups in organizations - such as managers, technologists, and users - are significantly different, difficulties and conflict around the development, use, and change of technology may result" (p. 174). In our study we are particularly interested in how these difficulties can generate inefficiencies or lower quality of outcomes when using the technology.

As SCOT was initially developed to analyze innovation processes (Hommels, Peters, & Bijker, 2007; Pinch & Bijker, 1984), some adaptations are necessary to adjust its concepts to the particular interests of the present research work. Some constructs can be operationalized if we take into consideration the body of knowledge represented by the Adaptive Structuration Theory, as discussed next.

### Adaptive Structuration Theory

Considering that IT provides structures for organizational change and at the same time the interaction of users with technologies makes other structures emerge, Desanctis and Poole (1994) proposed the Adaptive Structuration Theory (AST). This is a particularization of Giddens' Structuration Theory. The intention was to adjust Giddens' original model to better discuss the institutional effects of technology, so that it could be applied in IT studies. The AST theory emphasizes the role of human actions and interactions in shaping a technology and choosing the ways in which it is used and argues that "people generate social constructions of technology" (p. 124), while interacting with the technology and with other individuals.

To analyze the effects of advanced information technology (AIT) on its outcomes, Desanctis and Poole (1994) propose the comparison among groups that are using and groups that are not using the artifacts or at least among individuals and groups experiencing different levels of artifact usage, or appropriation. In that sense, it is very similar to SCOT.

The social structures of an AIT, or its *structural potential*, can be described in terms of its *structural features* - "the specific types of rules and resources, or capabilities, offered by the system" (Desanctis & Poole, 1994, p. 126) and the *spirit* of this feature set – "the general intent with regard to values and goals underlying a given set of structural features" (p. 126). This conceptualization of *spirit* and the subsequent clarifications provided by Desanctis and Poole (1994) make it hard to truly assess and measure it. The *spirit* is neither defined just by the designer's intentions nor by the users' perceptions or interpretations of the technology. The authors compare it with the text of a law. The intentions of the creator are meant to be expressed in the text, but the text is not able to express all the creator's intentions.

Individuals and groups, when exposed to a technology, will start making judgments about it and "whether to use or not use certain structures" (Desanctis & Poole, 1994, p. 129). That happens until a stabilization level is achieved in a group. This is, again, very similar to the concepts of interpretive flexibility, stabilization and closure applied in SCOT's approach (Bijker, 1997).

A *faithful appropriation* is "consistent with the spirit and structural feature design, whereas unfaithful appropriations are not. Unfaithful appropriations are not 'bad' or 'improper' but simply out of line with the spirit of the technology" (Desanctis & Poole, 1994, p. 130). A measure of the *faithfulness of appropriation* was developed by Chin, Gopal and Salisbury (1997) and will be used in our model. If there are no different interpretations between the group of developers and the group of users, they reached a consensus and a stabilization process is in place. This "paves the way" to faithful appropriation, because users see the technology the same way as developers. But if these groups disagree in their interpretation about the *spirit* of the structure (and how technology is interpreted), violating it and generating an ironic appropriation, it means that a closure was not achieved and the groups are still negotiating the technology's meaning and role in their activities. AST defines the *level of consensus* as it refers to the extent to which individuals agree or disagree on how the AIT should be appropriated. Once more, this is very similar to the *closure* concept proposed by SCOT.

Chin et al. (1997) operationalized the measurement of *faithfulness of appropriation* through the comparison of the internal *spirit* interpreted by the user and the user's perceptions about his/her own behavior. They identified this measurement as a *subjective* appropriation. They also identified the *objective* appropriation, which could be assessed by comparing the *spirit*, as presented to the users by designers and the organization, with an objective assessment of users' behavior in relation to the use of the technology. They did not try to operationalize this second concept. Their model is shown in Figure 2.

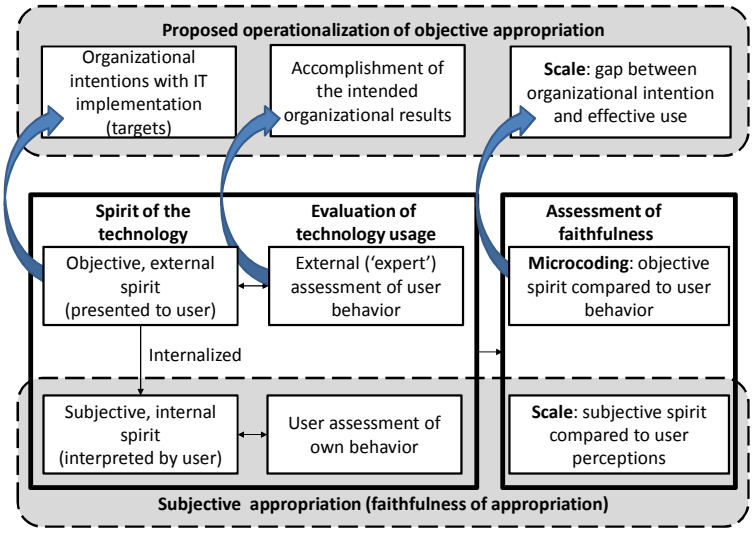


**Figure 2. Operationalizing the relationship among *spirit*, *usage* and *faithfulness of appropriation*. Adapted from Chin, Gopal and Salibury (1997)**

We will measure the *objective appropriation* through a comparison between the *spirit* communicated to the users by the designers and the *effective use* while performing the intended tasks. Comi, Eppler and Herrmann (2012) had the same intent, although using a different strategy, focusing on the task, in order to evaluate the *objective appropriation* of an IT artifact by means of an experimental research design.

Frequently, in the specification of the concept of *spirit*, AST researchers refer to *the designers* as those responsible for the technology's first definition and construction. However, we would like to clearly include, as part of the set of designers, the organizational decision makers, who decided to implement a particular technology at first place. The 'right' appropriation of the IT artifact will be compared to the intended outcomes and results. A desired use will be one that contributes to the achievement of intended goals. If users accept to use only minimal or limited features of the proposed IT, or if they use it in ways that had not been planned, that can result in planned results not being achieved or diverting from the original intentions.

Another issue is that it is many times assumed that the developer's (or the organization's) intentions – the *spirit* – are the "right" ones. Why could not the users have better solutions for the appropriation of the artifact? The appropriation by users (structuration process) may lead to a different artifact than what was initially planned by developers or the organization's decision makers. Our understanding is close to Griffith's (1999), who sees the possibility of some features being created by users without the interference of designers. The didactical model of how technology features evolve, presented in Figure 3, speaks for itself. An interesting illustration of this mode of *repurposive appropriation* is described in the work of Salovaara, Helfenstein and Oulasvirta (2011) about how users developed new creative ways to use digital cameras, which differed from what had been planned by the developers of the technology.

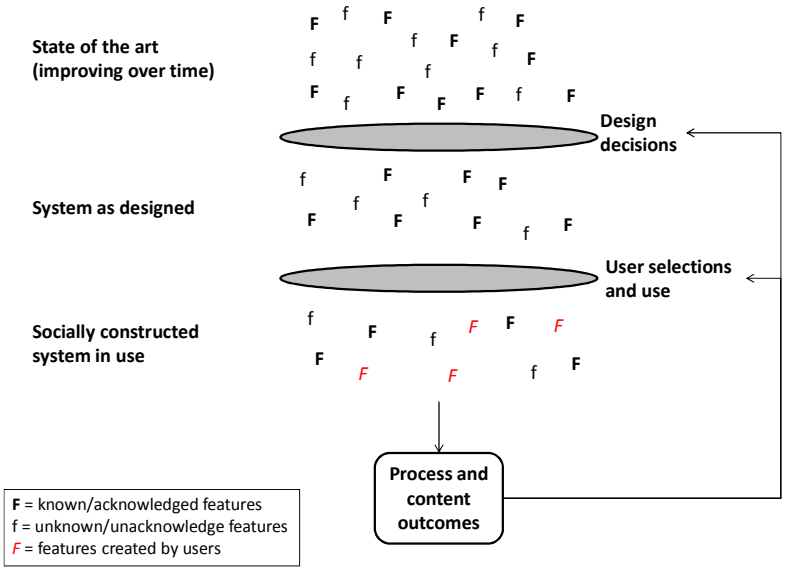


**Figure 3. Conceptual model of the creation of technology features (Griffith, 1999).**

As the technology structures are appropriated, individuals and groups display attitudes that indicate: (a) comfort – "the extent to which groups are confident and relaxed in their use of the technology"; (b) respect – "the extent to which groups perceive the technology to be of value to them in their work"; and (c) challenge – "their willingness to work hard and excel at using the system" (Desanctis & Poole, 1994, p. 130).

Our model and research design adopts a position that is close to Desanctis and Poole (1994) and Chin et al. (1997) propositions, however trying to use more objective measures for the constructs derived from the theory. Even though our methods are different from those specified and applied by Orlikowski (2008) and Bijker (1997), we also tried to keep as close as possible to their concepts and definitions. Our intention is to propose an extension to their efforts, which will allow their concepts to be tested by means of a more objective methodology, following the positivistic tradition, which is usually disregarded or given little consideration by interpretative/constructivist researchers, whose good theory ends up not calling the deserved attention from the main stream, particularly in the IS field, which is conservative in its methods, most of the times.

## PROPOSED MODEL AND METHODOLOGY

Considering our aim to analyze the appropriation phenomenon through the use of more objective lens, we are proposing a causal model (see Figure 4) that considers the effects of the *technological frame*, presented in SCOT and AST, on the IT *appropriation process.* We intend to analyze the effects of cognitive, social, and technical aspects over appropriation attitudes. As we included the main independent variable of TAM model (*behaviors*) as part of the *cognitive aspects,* we intend to compare concurrent predictions of use and appropriation moves. At same time, we will verify the effect of appropriation support strategies conducted by the organization to influence the development of intended attitudes towards appropriation.

Further, the model also includes the analysis of *appropriation moderation effects* in the relationship between *system usage* and *outcomes*. We expect that positive and higher attitudes related to the appropriation processes will moderate obtained results from system usage. Negative and lower levels of appropriation are expected to reduce outcomes even in the presence of *organizational desired usage level* in a mandatory setting. While direct use, good judgment about technology and positive evaluations will increase the expected effects of usage over outcomes, constrain, bad judgment and negative evaluations will decrease both usage and the outcomes. Higher levels of comfort, respect and challenge are also expected to increase the effects of usage over outcomes.

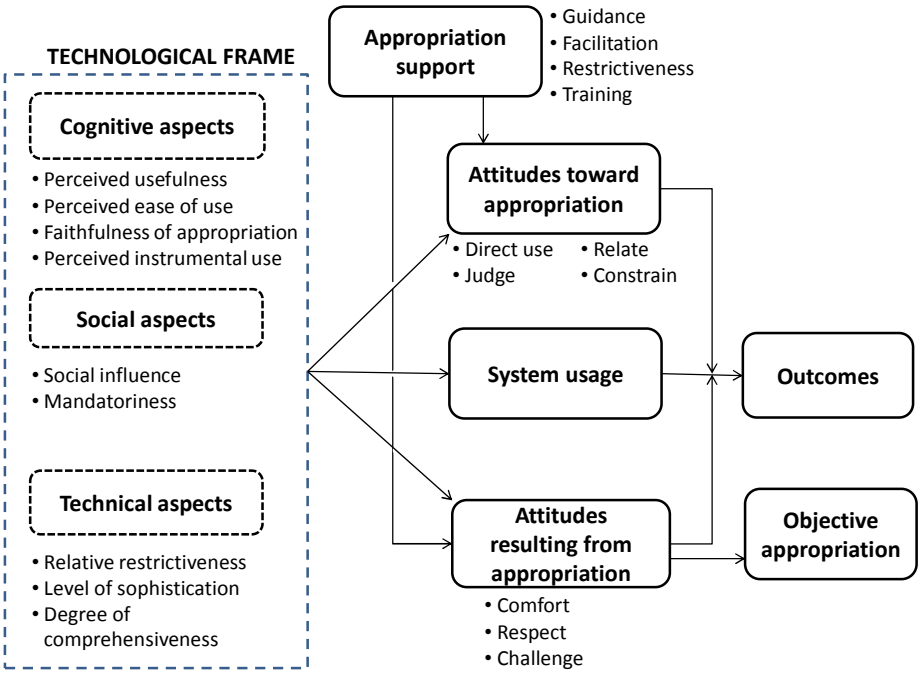


**Figure 4. Proposed model to evaluate the appropriation process and its effect over individual outcomes.**

Considering the complexity of the relationships that we plan to measure, we see the test and validation of the proposed model as a huge task. Because of that, we are planning to do it in steps.

First, we intend to apply measurement construction and validation techniques as proposed by Straub (1989) and the process described by Chin et al. (1997) to define and validate the new measurements. We will use existent concepts and categories applied in qualitative studies by AST researchers as a starting point to define our new measurements.

Second, we plan to analyze the relationships between the technological frame and appropriation attitudes and IT use. The explanation power of the analyzed constructs will be compared to the classical TAM independent variables: *perceived usefulness* and *ease of use*.

Finally, we plan to check the effects of *appropriation* over the relationship between *system usage* and its *outcomes*, defining the *objective appropriation* effect. We expect to compare designers expectations with final results obtained from effective IT use.

We have just started the first round of construct variables' definition process and we plant to have the results of a pre-tested survey available by the time of the AMCIS conference, so that we can discuss with delegates some empirical results of this work-in-progress.

## CONCLUSION

The proposal of a positivistic method to investigate theories and frameworks that are based on interpretive paradigms can attract criticism from both sides. However, we agree with Poole (2009, p. 584) that AST "can be illuminated by multiple methods" and that we should try to avoid a dichotomous view about research methods. In this direction, our proposed model is also open to be complemented by using mixed method techniques. When approaching the organizations during the field work we will try to negotiate possible ethnographic interventions to try to capture as much information as possible about the context where the appropriation process is taking place. This additional information will help us to adjust our survey items and also in further interpreting the results.

We believe that our effort will add knowledge to previous contributions that also provide a more objective view of the appropriation process (Chin et al., 1997; Comi et al., 2012; Gopal, Bostrom, & Chin, 1992; LeRouge & Webb, 2004; Sun &

Zhang, 2006). At the same time, our research design differs from previous efforts by being the first bridge between the SCOT and AST concepts, in order to investigate the technological frame structuration dimensions and the effects over the appropriation process in a causal model. Practical relevance will be obtained by analyzing the effects of appropriation support strategies (such as guidance, training and restrictiveness) as well as by considering the contextual conditions that enable (or inhibit) the appropriation processes. Our research can bring complementary and objective views about the concepts defined by SCOT and AST approaches.

This objective view about the appropriation process can also be applied to analyze other phenomena in the IS field. Switching costs and the resulting lock-in effects can be seen as caused during appropriation moves. Social network analyses can be used to verify the effects of social configurations over appropriation attitudes.

The model will be tested in educational organizations (public and private universities) that are using *academic portals* (the IT artifacts to be examined) to mediate the communication between lecturers and students (the system users). We understand that this choice is completely comparable to other organizational settings where an information artifact is applied to improve process quality and efficiency.

These portals are mainly implemented as mandatory systems due to their standardizing and controlling features, but we also find universities that offer them in a voluntary basis. In both cases the use is very flexible and goes from the application of a basic set of communication features (such as e-mail group lists and file transfer capabilities) to more advanced sets of distance learning possibilities (such as virtual classes, video casts, on-line tests, wikis etc.). These flexible characteristics make the appearance of several distinctive interpretations among the system users possible.

We are presenting this *research in progress paper* as part of our strategy to receive feedback and suggestions that will certainly improve our model and research design.

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