THE EMERGENCE OF UN-INTEGRATED INFORMATION ARTIFACTS DURING IS INNOVATION PROCESSES: RESOURCE WASTING DETOURS OR NECESSARY PART OF AN EFFECTIVE EVOLUTION PATH?

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ABSTRACT

This paper, along the lines of a common exploratory path pursued within our research group at the Urbino University, tries to give a contribution to the general issue of the successful adoption of innovation inside Small and Medium Enterprises. Particularly considering adoption of information systems and information technology based innovation. It seems that, while a general recipe for success doesn’t seem to exist, each and every company tries to find, and often finds, its special way towards it. In previous works the concept of “informational maturity” has been proposed as an “ex-ante” measure of the probability of success, based on the preparedness of the organization. In this paper, based on a case study developed during a working stage at a local company, we propose a practical way to create this “well prepared environment” through the diffuse co-development of small size, local and tactical, information artifacts. Then we analyze this organizational learning path in the framework and through the models of the Activity Theory. Finally we try a first generalization towards the proposal of some methodological suggestions.

Keywords

Systems Implementation, small and medium enterprises, organizational learning, organizational preconditions, organizational readiness, informational maturity, cognitive artifacts, mediating devices, activity theory, genres theory.

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INTRODUCTION

It seems that a quite successful path of innovation is not a straight one, given by an a priori compass aiming to a better state, but a tortuous route made of trials, errors, detours, even temporary get backs to a prior state, just to find a path sustainable and someway “digestible” by the organization itself.

Maybe long term innovation success is hidden inside the mix of creativity, concreteness and vision with which this process is led in the particular situation.

During one of our latest contacts with a company in our region, in the context of our research, we learnt the concept of a “ceddy” (originally, in Italian, “ceddino”). CED in Italian is the acronym for “Centro Elaborazione Dati”, that is the Data Processing Center, so ceddies brings with themselves the broad meaning of “Data Processing gadgets”.

This concept intrigued us more and more during our contacts, bringing us to look at the context around this concept, and making interesting findings around how this company cleverly manages its innovation initiatives.

What a ceddy really is, now, in the context we are discussing? Ceddies are small data processing artifacts, aimed at solving a very specific, local over time and space, information management issue.

Our aim here is to show how ceddies, well understood and cleverly nurtured, can be instrumental to a strong alliance between users and IT people, and how they can also be the base, inside this alliance, for creating a smooth path of innovation towards an integrated information system.

LITERATURE ANALYSIS

To understand the relationship between technologies and organization, we must analyze what makes Information and Communication Technologies so special in their intertwining with organization. First of all, ICT are multidisciplinary (Pontiggia, 1997; 2001), meaning ICT management involves strategic, organizational and social aspects (Caruso, Curzi, Marchiori, 2003). Other authors underline the ICT “duality”, as technology can be seen as a device to impose rules, but at the same time it is strongly influenced by users’ interpretations (Ravagnani, 2000; Masino, Zamarian, 2003). Finally, we can interpret ICT as a social object, able to influence users’ behavior (Giustiniano, 2005). As a
consequence, we can affirm that it is impossible to foresee ICT investments outcomes in advance (Giustiniano, 2005; Pontiggia, 1997; 2001; Masino, Zamarian, 2003), while ICT projects failure to reach at least broadly defined improvement objectives are more and more frequent.

Our conceptual approach to the relationship between ICT and organizational change is founded on three concepts. First, technology is an organizational choice, overcoming the organizational or technological imperative, being technology an adjustment choice inside organizational decisions (Masino, 2005). Second, we argue that organizational change depends on the interaction between users and technological devices (emerging perspective) (Giustiniano, 2005), that means that there isn’t a unique interpretation of IT artifacts. Finally, our research fully adopts the approach of bounded rationality, in the sense that any IT investment decision is a business decision, so it is subject to its decision maker rationality bounds (Simon, 1957; Thompson, 1967; Maggi, 2003).

Organizational literature, in the last years, has explored the issue of adoption success measures (Ravagnani, 2000a; Pontiggia 1997; 2001). So, new models have been formulated, such as Task-Technology Fit and Technology Acceptance. The central idea of these models is the relevance of user satisfaction, under two main points of view: perceived utility and perceived usability. These models, in fact, clearly state the growing relevance of the users and underline the limits of structured methodologies. So more importance is given to personal, qualitative and organizational factors.

It’s a quite common finding that the main causes of projects failure are tied to management more than to technology, problems seem to depend on the organizational conditions and on the underestimation of individual and social behaviors (Ravagnani, 2000a; 2000b; Davenport, 1998). It has also been argued that pre-conditions can be pointed out, which are able to influence the project results. We refer, here to a model, considering the “informational maturity” factor, trying to foresee whether the organization is able to build business advantages following technology adoption² (Caruso, Marchiori, 2003).

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² “Informational maturity is here considered as the organizational capability to consciously and consistently use information, to analyze, structure and manage its information flows, to develop in its members a portfolio of knowledge, competences and behaviors oriented to the effective use of information.” (Caruso, Curzi, Marchiori, 2003:7)
A suitable level of this kind of maturity could be seen as a pre-condition for the project: in the case it is not enough, a project postponement could be advised, in order to put in place specific actions to develop it (Caruso, Curzi, Marchiori, 2003). This variable is even more critical in the case it indicates a difficulty for the organization in sustaining a learning process. Given technologies tend to stiffen with implementation decisions, and to crystallize faster then the time people need to learn, making further adaptations more and more difficult (Ravagnani, 2000a; 2000b), we understand that the organization and people attitude towards learning is a critical issue in developing informational maturity.

Going further in this direction, cognitive scientists point out that abstraction and conceptualization are base capabilities for learning (Clancey, 2000) and also that artifacts can be a partial proxy to abstraction and conceptualization abilities. In fact, if we agree that “artifacts are conceived as negotiated, embedded, and sedimenter sets of rules” (Norman, 1991) we can consider the Information System itself as an artifact. This interpretation is important, mainly from an organizational point of view, given artifacts are both “set of rules imposed to users” as input but also “interpretations by the users” as output (Masino, Zamarian, 2003). Three kinds of decisions, in the proposition of Masino and Zamarian determine the “artifact-in-use”: design decisions, that are decisions about technical, operational and physical features; adoption decisions, about why the artifact is being integrated in the task environment; and, finally, use decisions, that involve the way in which users interpret, and then really use, the artifact. Usually, in fact, the artifact-in-use doesn’t coincide with what was determined during design and adoption, given objectives and values of the various actors are different.

The artifact-in-use can be seen, then, as the result of a mediated negotiation between autonomous and heteronomous rules (Masino, Zamarian, 2003).

Another important reference for our study is Activity Theory: “an activity is defined as the engagement of a subject toward a certain goal or objective”, strongly based on the concept of artifact, arriving to state that activity and artifact are so strictly tied that you cannot understand one of the two without the context given by the other one.

The analysis of AT revolves around a conscious hierarchy of acts: the subject (actor or group of actors) has a desired goal. To pursue this goal the subject engages himself in an activity; the activity is composed of tasks, each task of
actions, each action of operations. In other words an activity is a coordinated, integrated set of tasks. Activity Theory posits that conscious learning, and with it social progress, can only emerges from activity, and it’s a social, artifact based, activity that precedes individual conceptualization (Vygotsky, 1987).

CASE STUDY AND EMPIRICAL FINDINGS

Biesse was founded in 1970 to produce woodworking machinery mainly for the furniture industry. During the following years it grew and strongly diversified in the glass working and marble working industrial machinery and production lines, also investing in control electronics and systems integration know-how. This significant growth has been built both internally, founding new synergetic companies and externally, through selective acquisitions.

Following this expansion, the company takes the form of an industrial group, with production companies and commercial branches in 18 countries worldwide.

The group is organizationally loosely coupled, being divisions and branches fundamentally independent and self-contained, each with its philosophy and work methods. This has caused healthy competition between the units, fostering further development of improved and different work methods between them.

During 2003, the company decided, to better face a market slowdown, to rationalize and reorganize units, functions, and processes, diffusing and making uniform throughout the group the best practices found around the company. Boosting and integrating information systems have been an integral part of this initiative.

Ceddies, at Biesse, are often born as data processing tools to obtain information that isn’t easily available from the central information system. So their aim, and motivation, is to circumvent the many IS limitations and inflexibilities at supporting ever changing work activities.

These new, spontaneous, supporting tools have been developed directly by the user, and then more and more by information systems internal people, in cooperation and upon request of users.

The ceddies phenomenon has shown over time to be particularly popular inside Biesse and has been the cause of interestingly clashing feeling to the people involved. Users, obviously, are positive towards ceddies: not only they perfectly
satisfy their specific needs, also users are pleased ceddies don’t require adopting different work practices or learning new procedures to become rapidly useful. This fact alone is enough to make a user love a technology tool. He is able, then, through ceddies, to impose some of his organizational power, giving central stage to his concrete needs and daily activities. On the contrary, he often perceives the introduction of integrated, top down, solutions as a dangerous threat to his autonomy.

Users are aware that ceddies often are more of quick and dirty fixes than effective solutions to work processes and informational needs, so contributions from information system specialists, to make them more integrated and generalized are usually well accepted. The key here is that operational and integration benefits are immediately visible and concrete, establishing what can be seen as a path towards innovation through small, tangible, rewards that help people to be more willing to accept “intrusions” in their own task environments.

On the other side, at least at the beginning, Information System people at Biesse saw ceddies as an enemy, to be spotted and destroyed, because of the issues they cause, as lack of coordination, informational disaggregation and incongruity, in synthesis lack of integration. To them ceddies was further obstacles in the way towards integrated solution, being users so happy with them.

Along the path, though, even info specialists have softened their view, while they were learning to use ceddies as a mean to introduce change and to gain thrust and positive dialog with users. In fact ceddies, enabling “small rewards through small efforts”, showed to be powerful negotiation and dialog enhancement tools.

So, while the objectives of the two communities, users and technology implementers remain rather different, Biesse people empirically found the ceddy being not only a quick solution tool, but also an interesting dialog and common understanding building tool in the longer view.

Interestingly enough we saw Biesse consciously using ceddies as forerunners and preparation instruments to more complex solutions, a way to make the road to innovation smoother and easier, and to make different work communities better cooperate. So, through the ceddy, each community has its reward: users get a better work environment and conditions, while I.S. specialists gain positive recognition and attention from the users community. Then, upon these premises,
and with proper management, the ceddy can evolve, be used as a joint learning tool, and eventually be superseded by a better, more integrated solution.

One of the authors has been able, during a stage at Biesse, to study the life cycle of several real ceddies, we think it’s important to go briefly through a couple of them here, in order to give a context to our further reflections (Giannotti, 2006).

The first one is the “salespeople calendar”, a small database made available through an internet web interface, in which sales people record their customer visits. Interestingly enough this application is a home made software, partially resembling the sales planning module of an integrated CRM system that was proposed for adoption some time ago. The project was postponed, mainly because of organizational resistance from the sales function. This ceddy, then internally designed and realized, didn’t impose any particular work habit change to users, was easily accepted, and is gradually educating user towards a different way of working.

It’s adoption hasn’t had problems, as sales people know it very well, don’t feel under control and perceive from it a practical usefulness, because the tool eliminates a significant part of their clerical, and boring tasks, effectively automating them. In fact Information System people inside Biesse are convinced that internal customer satisfaction of the home made salespeople calendar and its easy adoption path, will allow them in the near future to propose again, successfully, the evolution to the formerly rejected integrated CRM system.

We studied another, more problematic ceddy case, “fastplanner”. This tool was initially developed as a spreadsheet by a user, to better organize sales forecasts, interacting with production, and suggesting possible goods delivery dates to customers. A function not performed by the main information system.

Apparently this ceddy grew to an exceedingly ambitious scope, due to its own success, and lots of new functions requests began to arrive. Information Systems people, under users and management pressure, decided to evolve the technology base of the tool, without evaluating its architecture, nor analyzing the planning process it aimed to support, trying to second the users’ desire for a gradual evolution.

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3 Customer Relationship Management: a specific information system aimed to support customer facing activities.
While ported from the original spreadsheet to database technology, *fastplanner* grew to hypertrophy and, while still appreciated by users, it lacks, and it will ever lack, structural features, such as multi plant integrated planning, a reasonable integration with plant scheduling and automation systems and reliable planning algorithms. In other words this cedy has exhausted its potential, but over time work habits have grown so tied to it, that the overdue restructuring of it became unpractical.

**ANALYZING THE CEDDY CONCEPT**

Based on what we have said discussing our case reality, we are now able to recognize a cedy in the case we meet one: it’s some sort of typically small piece of software, usually based on some user level tool (i.e. a spreadsheet, a database development tool, a query system, some sort of macro language…) whose aim is to solve a specific (local in space and usually time) end user issue without possibly modify processes or the task environment. Most of the time what differentiate a cedy from other IT tools, is the perception of the user. He feels the full ownership of the cedy, as a tool of his craft, something that he has personally influenced during its development, and will influence through all of its lifecycle.

**Ceddies as cognitive artifacts**

A cedy is an artifact, given that “an artifact may be defined as an object that has been intentionally made or produced for a certain purpose.” (Hilpinen, 2004) that has one or more authors, “Artifacts are contrasted to natural objects; they are products of human actions.” (ibidem). In the case we observed, and other from our experience, the author of the cedy is sometimes the user himself, well versed in the use of the tool, but most of the time the cedy is the result of a strict and fruitful cooperation between the author and a colleague from the Information Systems organizational structure. Beyond the single or collective authorship it clearly shows to be an artifact because intentionally:

- it’s aimed to advantage and better well being;
- it’s aimed to improve the performance of the system;
- it improves knowledge around a goal and ways to reach it;
- it’s aimed to support a class (a generality) of problems.
Several authors worked on the concept of artifact, proposing different taxonomies regarding the possible nature, and use, of an artifact: in fact we can distinguish between:

- physical artifacts;
- symbolic artifacts;
- computational artifacts;
- cognitive artifacts;

while we won’t argue about the physical nature of ceddies, being them mostly software, it seems quite easy to recognize the other three attributes as pertaining to our ceddies.

The most promising point of view seems to study the ceddy as a cognitive artifact, being it a tool “designed or adapted inside a specific human activity, that didn’t exist before this activity and can’t be fully understood outside the human activity in which is used and for which has been, at least partially, invented” (Rizzo, 2000).

Other authors propose that “Cognitive artifacts may be defined as those artificial devices that maintain, display, or operate upon information in order to serve a representational function and that affect human cognitive performance.” (Norman, 1991), and “Cognitive artifacts are in other words man-made things that seem to aid or enhance our cognitive abilities, and some examples are calendars, to-do lists, computers, or simply tying a string around your finger as a reminder.” (Soegaard, 2003) suggesting that cognitive artifacts, as tools to improve our cognitive abilities, are a crucial part of our task environment, the environment in which we act (Kirsh, 2000).

**Ceddies in use**

This can be true either if the artifact is used respecting the original intentionality of the author, the “design and adoption decisions” (Masino; Zamarian, 2003) or through innovative or even bizarre “use decisions”, respecting the bounded rationality approach. In fact it’s astounding how many artifacts are commonly used in ways completely different from those in the mind of the original designer!

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4 In the italian original text: “progettato o foggiato da una specifica attività umana, che non esisteva prima di quella attività e che non può essere compreso indipendentemente dall’attività umana nella quale viene utilizzato e per la quale è stato, almeno parzialmente, concepito”
Then, building upon the informational meaning of artifacts: “A cognitive artifact is an artificial device designed to maintain, display, or operate upon information in order to serve a representational function.” (Norman, 1993) and remembering that: “Solving a problem simply means representing it so as to make the solution transparent.” (Simon, 1996) we could argue that a cognitive artifact is a way to structure personal, or even collective, thought. In fact studying artifacts themselves we can understand a lot about the culture that generated them: it’s common work for archeologists understanding goals, technological advancement and even the social structure of a population, studying just their typical artifacts. This concept brought us to consider cognitive artifacts, and ceddies indeed, as powerful communication and mediating devices between cultures; between us and some ancient population cultures understanding something about their social and work environment, but also mediating different cultures inside our organizations. Several studies around the complex issues of integrating technology inside organization shows one of the main causes being evolving culture and the substantial unpredictability tied to the cultural change processes involved, between them Ravagnani and Pontiggia (Ravagnani 2000a, 2000b; Pontiggia, 2001).

**Culture mediating devices**

In the context of this paper the cultures to be mediated are those of the Information Technology sub-organization and the users in the other sub-organizations of the company. This need for mediation isn’t caused by conflict or necessary in nature, but possibly by the work requirements faced by the two populations. In fact the realm of System Development and of I.T. guys is all about abstraction, generalization and universal rules, while the user realm is about concreteness, timing, problem to be solved and strong orientation to solving specific issues.

Donald Norman points out another cultural gap reason through the concept of “different views of an artifact” (Norman, 1991). Considering a cognitive artifact in a social situation, there are two different ways of interpreting its impact: the system view, in which from an external point of view we can say that the user plus the artifact has a better performance than the user alone; and the personal view in which the user perceives a change in his activity system. In other words his tasks
are different from those he was used to, and he doesn’t necessarily perceive the “augmented power” of the whole system.
In the case of the Information System development, we argue that decision makers and developer are culturally more inclined to a system view, considering how the project would improve the whole system performance seen from outside, while users fear a profound and unknown change to their activities and work system: even the disruption of it.

**The Activity Theory view**
A very interesting theoretical framework for our study is Activity Theory: the cultural-historical theory of activity was initiated by a group of Russian psychologists in the 1920s and 1930s. The approach was proposed by Lev Vygotsky and his colleagues A. N. Leont'ev and A. R. Luria. They formulated a completely new theoretical concept to transcend the prevailing understanding of psychology, which was then dominated by psychoanalysis and behaviorism. This new orientation was a model of artifact-mediated and object-oriented action (Vygotsky, 1978). One of the first postulates Soviet psychologists agreed upon was the so-called "principle of unity and inseparability of consciousness (i.e., human mind) and activity". The meaning of this principle was that human mind comes to exist, develops, and can only be understood within the context of meaningful, goal-oriented, and socially determined interaction between human beings and their material environment. In this view artifacts are central, being the main part of any work environment, and learning emerges from activity and is a social activity, personal conceptualization being a subsequent consequence of social and environmental interaction (Vygotsky, 1987).

Building upon initial Activity Theory, Yrjö Engeström proposed the model shown in figure 1. In the model, the *subject* refers to the individual chosen as the point of view in the analysis. The *object* refers to the 'raw materials' or 'problem space' at which the activity is directed and which is transformed into outcomes with the help of physical and symbolic, external and internal mediating instruments, including both *tools* and signs.

The *community* comprises multiple individuals and/or sub-groups who share the same general objective and who construct themselves as distinct from other communities. The *division of labor* refers to both the horizontal division of tasks
between the members of the community and to the vertical division of power and status.

**Figure 1: The structure of human activity (Engestrom, 1987)**

Finally the *rules* refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system. Arrows describe the relation of interactions or mediations between the nodes.

**Figure 2: Two interacting activity systems**

The situation we are studying can be represented, then, extending the model, considering we are really dealing with two different work system, the developers’ and the users’, trying to work on the same object with different communities, rules, tools, division of labor and whatever. Complex indeed, specially in the case
the new object to build happens to be a new information system, big and unknown to both communities. See figure 2.

Using the paradigm made available by the activity theory, we can point out that, in the case of an Enterprise Resource Planning package based Information System communication through, and even cooperation on the shared object can be rather difficult. This artifact, beyond its dimension and complexity, it’s not a common work tools neither for one work community, the users, nor to the other, the developers or implementers.

What we propose is that a ceddy, with it’s simple, tame aspect can have a different impact and be truly an artifact pertaining both to the craft of users and developers, possibly helping to reduce the cultural distance between the two work systems. This being both joined to the “potentially shared object” and a common part of the tools represented in the upper vertex of the model. See figure 3.

*Figure 3: The action of a ceddy on interacting activity systems*

From the user’s activity system point of view the ceddy has been built to solve a concrete and specific problem of his daily work, so it’s not only an artifact to the development of which he has been an important actor, but also a real and useful tool. In the implementers’ activity system, the ceddy is a powerful insight into the world of the user and, possibly, a prototype to test some new ideas in the real tasks environment, so can be seen also as a tool. Finally the “ideal” ceddy, being the sum of all the ceddies developed over time, is a sort of a commonly agreed prototype of the final system, can be a joint learning tool and a smooth way to proceed towards the final system itself. So we have a two dimensional mediation...
between cultures on one side, and between the “as is” and the “to be” situations on the other.

**Ceddies life cycle and the risks in mismanaging it**

As seen in our case study, ceddies are born because of a specific need, usually developed through cooperation between two different work systems and, we have argued, could be, when properly used, a powerful mediation device.

Let’s not forget, anyway, their ad-hoc, un-integrated and specific nature: left to themselves they can really be the enemy of planning, architecture, integration and process optimization.

In other words, the fundamental risk with ceddies is they can become the weak base of a suboptimal information system, built over time just as an aggregation of ceddies. And we know integration is the possible outcome of proper design, and doesn’t usually emerge as an afterthought.

Avoiding this risk means, and we are not saying it’s easy, having a solid contract between users, implementers and management in which is clear that time and resources invested in ceddies are justified on one side by the efficiency gained through their use over the time of their validity, on the other side by the value they give to common understanding and conceptualization, being prototypes or way to represent “as is” or “on the way to improve” work procedures. But, and it’s a big “but”, they have to be killed at the right time, to be superseded by something integrated by design. Reusing source or execution code of a ceddy is a rare event.

And it’s also quite common that the new, integrated, solution won’t be so comfortable to the users, at least at the beginning: often progress requires occasional steps back; it’s a fact of life all the stakeholders have to accept.

We have got the evidence in our case study, that ignoring this, and letting a ceddy to grow oversize can be a significant source of problems. We have to learn to squeeze all the possible usefulness from ceddies and to be brave enough to understand when we cannot really expect more.

Possibly deciding at the right time, or in advance, that we have to prepare all of us to substitute a part of our ceddies with a well thought, integrated sub-system, being known from the beginning to the stakeholders that this is due.
HYPOTHESES AROUND A CEDDIES BASED SYSTEM DEVELOPMENT METHODOLOGY

In proposing his “Genre Theory”, Clay Spinuzzi posits that it is quite natural for the user to find a way to live comfortably building and using artifacts inside his task environment (Spinuzzi, 2003). This quest to well being can bring him to use artifacts exactly for the purpose and in the way for which they were designed or even in very unofficial, unpredictable and creative ways. In fact, Spinuzzi sustains that any living creature tries to get the best for its survival and well being from any given environment, just as a consequence of evolutionary behavior. At first exploiting what is available; then changing the environment in small, sustainable, steps and then changing himself through learning and adaptation. In this endeavor, human beings are lucky enough to be able to build and use artifacts. In Spinuzzi view genres are not discrete artifacts, but traditions of producing, using, and interpreting artifacts, traditions that make their way into the artifact as a ‘form shaping ideology’. That is, they emerge from cultural-historical activity and represent, reflect, stabilize, and help constitute that activity. In this view our ceddies are artifacts and they are also genres, being the way for users to solve issues with official information management systems, such as bridging between incompatibilities or adapting too general representations to specific needs. Methods, procedures, or even pieces of software, strictly tied to the “as is” situation and representing the specific, imperfect, reality of a real task environment.

In this scenario, ceddies and other forms of genres are a powerful repository of knowledge about the organization. Unfortunately a common behavior for Information Systems people is to regard them as a catalog of errors from the past, to be thrown away as soon as possible. This is usually just the best way to deepen the language gap and prepare harsh problems for the near future.

Not by chance, the dream of software architects is that of software systems made by parts, objects, that will work together in an integrated fashion, possibly chosen by a catalog of “standard software parts”. Unfortunately we are not there, yet, but we have, nevertheless, the absolute need to divide complex systems in manageable parts. And we mean manageable, understandable, and possibly modifiable both by implementers and users. Will those parts resemble ceddies in some way? Could smart, easily integrated ceddies be envisioned?
We have to find a way to be able to make the two said work systems closer and aim to co-development, building bridges over cultural gaps. We don’t pretend ceddies are the solution to all of this, but it’s a way, and we have seen them working quite well as this sort of bridge.

CONCLUSIONS

In this work we began to develop the idea of a “ceddies based organizational learning plan” that, properly managed, could bring us towards an increased level of informational maturity of the organization, thus making us closer to the successful implementation of an integrated information system. We believe this softer way could be sometimes better, at least from the organizational point of view, than classical structured methodologies. In our view, the power of ceddies mainly resides in their mediating capability, possibly making the activity system of developer much closer to that of users. This creates the potential process of gradually building together a system, not necessarily optimal in every sense, but at least the result of a joint harmonic work, reducing gaps and misunderstandings, towards success. We are, obviously, at the beginning of our understanding of this phenomenon, describing what we saw and trying to find a general model of it. In further research we have to study in deep the various phases of a ceddy life cycle, including the critical phase of its final substitution, and the characteristics we could possibly build inside a ceddy in order to better manage its life cycle. Another interesting issues will be studying ceddies’ pathologies due to mismanagement, the worst ideally being a full information system made by ceddies, and the ever open risk of blurring ceddies and information systems concepts. Then organizational issues open up, such as the view of ceddies by different level managers and their possible mediating influence on IT decisions, decision maker awareness of the meaning of ceddies, and possible alternatives to them in these roles.
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