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Abstract

Purpose – The purpose of this paper is to discuss the structural design of customer teams (CuTes) working with external teams to implement customized information systems (IS). Design consists of theoretically based measures and a first set of real-world, empirical values.

Design/methodology/approach – A search in the organizational literature suggested that the adhocracy is the preferred structure for CuTes. Adhocracy-like measures were then developed and applied to a high-performance CuTe to reveal a first benchmark for a team's adhocratic design.

Findings – High-performance CuTes do not necessarily implement the adhocratic principles to the highest degree.

Research limitations/implications – It is still open whether all the structural measures described here are necessary and sufficient to describe the adhocracy-like structural design of CuTes.

Practical implications – The CuTe is highlighted as the key incumbent of cooperation with the technology supplier and consultants in terms of project authority and responsibility. A psychometric instrument and real-world values are proposed as a reference for the structural design of high-performance CuTes.

Social implications – The performance of IS projects is a social concern, since IS products should be aimed at serving people better both inside and outside the organization. Professionals who work in CuTes to develop better IS should receive institutional recognition and management attention.

Originality/value – This study seems to be the first to discuss the structure of CuTes in customized IS projects from a theoretical and applied perspective.

Keywords Information systems development (ISD), IT project management, Socio-technical theory, Enterprise resource planning (ERP) (packaged systems), IS professionals, IS metrics, Teams, Organizational structure, High-performance work, Adhocracy

Paper type Research paper

1. Introduction

Structure is a classic concern in organization studies. In the information systems (IS) field, it has been also an important research topic since at least the 1980s (White, 1984; Leifer, 1988). But "structure" is a word commonly used in reference to different phenomena, or it is used inconsistently between studies. We conceive structure as the set of all formal and informal relationships between people in an organization, along with the relationships between either material or conceptual organizational resources that may influence organizational effectiveness. That is, structure is the set of all formal and informal relationships between the organizational assets that impact an

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organization's performance – like the formal hierarchy between organizational functions and the informal personal bonds between employees.

In projects of customized information systems software (CISS) like ERP implementation, we typically have the participation of at least two equally important, interdependent teams: the customer's and the technology provider's. According to Bellini *et al.* (2012), there is a need to better understand the role of customers in CISS development, so we focus on the customer's team (CuTe). Also, it is our contention based on industry experience that many customer organizations are not effective in evoking the business needs of CISS products to be developed, in assessing the sequence of events in projects, in anticipating the future changes in business requirements, and, most critically, in understanding their very importance in the joint work with the external partners. So, CuTe members may not feel as they were key for the effective development of CISS products.

Following Ravichandran and Rai (2000), the organizational infrastructure should be set prior to process management and it should involve different stakeholders. Structure being part of that infrastructure, the customer being a complex stakeholder in IS implementation, and structure in team processes being largely neglected (Crawford and Lepine, 2013), we worked on the following research question:

RQ. How should CuTes be structured in CISS projects?

The question was answered in four stages: first, we searched the organizational literature in order to find structure-related frameworks that apply to IS teamwork; second, we searched the IS literature to find structure-related factors for IS teams, with a particular interest in CuTes; third, we proposed a measurement framework from that literature review; and fourth, we applied the framework by means of in-depth interviews to a high-performance CuTe that was in charge of a landmark CISS implementation in Brazil. Since that CuTe was a high-performance unit, we argue that the empirical data represent a first set of reference values for high-performance CuTes in terms of their structural design in CISS projects.

The paper is organized as follows: first, we review the organizational literature to find a structural configuration that accommodates high-performance CuTe work in CISS projects; second, we review the IS literature to find factors that fit that configuration; third, we assemble the factors into measures and metrics, and apply them to a high-performance CuTe to understand their behavior in practice; and fourth, we argue that our theoretical measures and empirical values constitute a benchmark for the structural design and management of CuTe work in CISS projects.

2. Organizational structure

Organizational structure may be seen as "an arrangement of roles used in organizations to focus power, responsibility and accountability" (Brophy *et al.*, 2005, p. 29), the relationship between individuals, tasks and corresponding authority and responsibility levels, as well as work principles and norms (Donaldson, 1996), the levels of access to the organizational resources (Lin *et al.*, 2006) or the set formed by the following organizational dimensions: formalization/written documentation, specialization/division of labor, hierarchy of authority/span of control, centralization/decision making, professionalism/education and training, and personnel ratios – all of which are presumably reflected in the organizational chart by means of expected work activities, reporting relationships/chain of command, and departmental groupings (Daft, 2008). Also, the informal structures play an important role in some circumstances (Chan, 2002).

We work on these views to conceive structure as the set of all formal and informal relationships between people in an organization, along with all relationships between

either material or conceptual organizational resources that may influence organizational effectiveness. That is, structure is the formal and informal relationships between the organizational assets that impact an organization's performance – like the formal hierarchy between organizational functions and the informal personal bonds between employees. This definition is broad enough to accommodate all aspects of how people and other resources are organized and interact in the organizational environment and that impact the organization's interests.

We also propose that structure reflects an emergent property of organizational elements put together (Georgiou, 2003) in a sense that is similar to the effects of aggregation in complex systems (Johnson, 2001). In fact, as people and organizations build their own repertoires of actions (Nelson and Winter, 1982), structures emerge to accommodate them. Also, if the environmental demands and the organizational capabilities should match in light of the law of requisite variety (Ashby, 1957), structure is the tying matter. Therefore, we should expect that structure impacts work and organizational performance (Ravichandran and Rai, 2000). In particular, the organizational structure is core for high-performance work (Posthuma *et al.*, 2013).

Researching on structures is a tradition in organization studies (Sinha and Van de Ven, 2005). Although the paradigmatic views on structure are as diverse as to include structuring, deep structure, class structure, organizational structure, and structuration (Gioia and Pitre, 1990), the research tradition resulted in schemas of sound theoretical and pragmatic implications. This is the case of the landmark studies on bureaucracy (Weber, 1946), the relation between the environmental dynamics and the mechanistic or organic nature of organizations (Burns and Stalker, 1961), the relation between technologies and production systems (Woodward, 1965), the differentiation and integration in organizations (Lawrence and Lorsch, 1967), the socio-technical dimensions of work (Trist and Murray, 1993), the organizational configurations (Mintzberg, 1980, 1983), the organizational metaphors (Morgan, 1980, 1986), and the virtualization of organizations (Mowshowitz, 1994).

A common interest when we classify organizations according to structure is to position them between the extremes of bureaucracy and organicity. Most debates on the structural design of work systems consist of seizing implications from the mechanistic bureaucracy and the organic adhocracy as the background of human action and business processes. After reviewing the literature on organizational structure, we focus on Mintzberg's (1980, 1983) organizational configurations to classify such structures, given the number and conceptual diversity of factors in his classification, as well as the fact that the factors address important structural issues for IS teams – as we shall see next. Also, Mintzberg's configurations are used to inform IS research since at least the work of Leifer (1988), and more recently Morton and Hu (2008).

Organizations exist for people to transcend their individual limits of information processing due to the complexity and uncertainty of the work environment (Simon, 1979). Organizations then develop and can be described according to relatively stable configurations of their attributes. Mintzberg (1980, 1983) identified five main organizational configurations that describe an organization as a simple structure, a machine bureaucracy, a professional bureaucracy, a divisionalized form, or an adhocracy. Also, he identified the attributes that differentiate the alternative configurations. In adhocracies (our particular interest here), the organization's coordination mechanism is of mutual adjustment, the organization's key organizational component is the support staff, decision making depends on selective decentralization, decision flow occurs both top-down and bottom-up, the degree of informal

communications and the degree of training and indoctrination are high, the organization of work is organic (instead of bureaucratic), the organizational clustering is functional and market oriented, the size of the organization is small, staff and liaison mechanisms are abundant, the organization's external environment is complex and dynamic, power is given to experts, the strategic apex is responsible for the external contacts, conflict resolution, work balance and project monitoring, and the operational division is truncated or mixed with management for the informal work.

In a seminal study developed in the rise of socio-technical work design, Leavitt (1965) conceived structure as one of the four key dimensions of organizational effectiveness – along with the organizational technologies, tasks, and people. Structure and people account for the organization's social subsystem, whereas technologies and tasks account for the technical subsystem. Leavitt's framework of four interdependent, equally important dimensions was originally intended to frame organizational change in industry, but it also proved effective to describe and design organizations that seek work effectiveness in general. In the IS field, that framework does not seem to have guided much research, but we find spots of applications like Palvia *et al.*'s (2001) four dimensions of quality in IS assessment, Sarker's (2000) social constructivist perspective on IS implementation, and Grant and Mergen's (1996) extension of Leavitt's framework to include technical communications (that occur between technologies[1]) for solving organizational problems related to information technology (IT). Bostrom and Heinen (1977) also adopt exactly the same four dimensions to frame an IS intervention in work systems, but they do not mention Leavitt as the theoretical source.

Our study recalls Leavitt's (1965) four-dimension framework to conceive structure as a critical factor in the design of an IS-based work system. In the IS field, structure has been researched since at least the 1980s (White, 1984; Leifer, 1988), but we posit that the IS literature does not define structure in any widely accepted way. Doherty *et al.* (2010) propose four dimensions for the organizational structure (hierarchical configuration, centralization of decision making, standardization of processes and practices, and horizontal integration), but it is not clear if the factors are exhaustive. Even the view that seems to dominate the field – according to a review by Fuller and Dennis (2009), structure is the set of rules and resources that individuals use to create, define, and maintain systems of social interaction – does not differentiate sufficiently from the concept of task standardization (the rules) and the technologies that are deployed (the resources).

2.1 Adhocratic teamwork

Teamwork is increasingly present in organizations (Ancona and Caldwell, 1992; Jetu and Riedl, 2012; Perry *et al.*, 2013), with teams being responsible for most software development work (O'Connor and Basri, 2012). Therefore, team performance should be an organizational concern. Broadly speaking, team performance relates to innovation efficiency, schedule and budget effectiveness, and the perception of members (Ancona and Caldwell, 1992). If the performance of teams formed by people with different backgrounds and skills is critical for the success of IS projects (Lu *et al.*, 2011; Kirsch *et al.*, 2010) and if people issues may determine a project's success or failure (Levasseur, 2010), there is a need for some mechanism that makes teamwork happen. This mechanism is the structural configuration; in fact, "sometimes it will be necessary to modify the team's structure by either recruiting talent or removing weak links that hinder performance and productivity so as to ensure that the appropriate competencies are present" (Agrawal, 2012, p. 396). But the structural aspects of team processes are largely neglected in current literature (Crawford and Lepine, 2013).

We are interested in a particular instance of teamwork – that of CuTes. According to Bellini *et al.* (2012), a CuTe is the team of professionals from the organization that contracts the implementation of CISS who are in charge of business and IT roles in a mutual authority-responsibility partnership with external developers and consultants (XTeam[2]). In fact, IS development requires IT and business expertise (Pee *et al.*, 2010). Some CuTe professionals are also lead users of the customer company, so they can act as prototypers as well.

Usually, CuTes and XTeams are special cases of project teams, since they are mostly temporary, goal oriented, strictly supervised, multi-functional, knowledge-intensive, and innovative (Unger-Aviram *et al.*, 2013). The CISS products they develop – possibly an ERP system – have a source code that is built according to specific demands of the customer organization when implementing its core business processes on an IS infrastructure[3]. Therefore, special attention is paid to issues like the organization's business principles, culture, industry knowledge, resource availability, and strategy. CuTe members are the primary incumbents for working on such demands. CISS development is most likely needed in dynamic, complex business environments, implying that IT-business professionals in CuTes should innovate, be multi-functional, and work with other experts in outsourcing agreements. But CuTe professionals have a complex mix of cognitive and behavioral traits (Bellini *et al.*, 2012) that explains much of the challenge involved in managing the knowledge workers (Scarbrough, 1999; Faraj and Sproull, 2000). Also, rigid measurements and standards between subunits in which CuTe professionals possibly work do not necessarily promote alignment with the overall IT function (Dhaliwal *et al.*, 2011), or, in the words of Chan (2002, p. 109):

> IS excellence requires flexibility and fluidity, as seen in the informal structure, and not merely strict adherence to predetermined responsibilities and procedures, however commendable. […] The informal organization can react quickly to internal and external shocks, and permit the organization to continue to excel while more formal strategies and structures catch up.

Anyway, the customer organization in CISS projects is expected to decide for a team structure that facilitates CuTe work. At least for small businesses, the structure of ERP implementation teams is reported as a critical decision (Malhotra and Temponi, 2010). After all, structure is a means to an end (Chan, 2002) and as such it is a needed engineering step. In fact, team design is an increasingly popular issue (Park *et al.*, 2013) and leaders should particularly focus on structures that emphasize the route to the team's goals (Unger-Aviram *et al.*, 2013). However, the deep and dynamic nature of IS team structure is underresearched (Yang and Tang, 2004), particularly the impact of team dynamics on software development (O'Connor and Basri, 2012). Also, if a rigid structure characterized by higher levels of specialization, formalization and hierarchy is the preferred one for teams working on stable tasks (Bunderson and Boumgarden, 2010), what is the preferred structure when task requirements may change over time?

Trying to address these gaps, and given the attributes of adhocracy mentioned before, the context of CISS projects and the general profile of CuTe professionals, we believe that Mintzberg's (1980, 1983) adhocratic configuration is the preferred structure to accommodate CuTes in their joint work with XTeams. In fact, adhocracy is the only structural configuration that promotes sophisticated innovation. Innovation is facilitated by a more flexible and informal information and decision flow that takes precedence over the established formal authority when necessary. Innovation is typical in dynamic and complex environments, like those of CISS projects – most CISS projects are part of

organizational change initiatives that respond to critical changes in the organization's mindset or in its business setting. Whenever innovation in processes, products and services is needed, tasks exhibit increased uncertainty, and, if more uncertain, less subject to systematization and more to ad hoc structures (Donaldson, 1996).

Multidisciplinary expertise in project teams is also promoted in the adhocracy, since experts hold proper power, liaison mechanisms are widely available, and training is institutionalized. Multidisciplinarity addresses the systemic principle of requisite variety, according to which CuTes should incorporate enough skills to promptly adapt to the presumably large range of possible IT-business projects in the future. Multidisciplinarity promotes the redundancy of functions – the holographic principle that enables a system to behave consistently and flexibly.

In adhocratic teamwork, professionals are preferably assigned to specific projects and organized according to a matrix structure (in which functional and project skills are put together), in such a way that each team can satisfy the greatest possible number of demands. Matrices – frequently regarded as intrinsic to the adhocracy – combine the bureaucratic structure of functions and departments with the organic structure of market-oriented project teams (Kuprenas, 2003; Morgan, 1986). Additionally, managers, staff and line personnel should act in concert, sharing project authority and responsibility. This has a direct and positive effect on a team's ability to solve conflicts (Scarbrough, 1999), but it also requires top management to work skilfully in managing human relations; after all, professional expertise challenges the control systems like those found in hierarchies (Donaldson, 1996), IT-business people do not easily welcome managerial interference (Scarbrough, 1999), and tightly coupled structures are less natural for people (Park *et al.*, 2013).

As for the coordination within and between project teams, adhocracy is favored by expert autonomy, liaison mechanisms with the internal and external environments, and mutual adjustment. Management does not include the traditional control mechanisms – but this should not mean that adhocracy is chaotic, since project performance is always monitored.

Mintzberg's adhocratic configuration can be divided in two categories. The operating adhocracy focusses on searching for customers' solutions, operating under contracts, and reacting to contingencies like adapting to whatever project comes about. Operational and administrative personnel do not differentiate within projects in the operating adhocracy, and it usually involves product customization. The administrative adhocracy, on the other hand, focusses the organization's internal problems, exhibits a technically sophisticated work system, and relies on a reduced operational workforce (operations are frequently outsourced). This last attribute is possibly explained by the fact that the administrative adhocracy – due to solving internal problems and maybe not exhibiting all the required technical expertise, or even due to having deliberately decided to exploit only the organization's core competencies – may decide to search externally the complementary skills and focus only on managing the projects.

The administrative adhocracy seems to better describe the nature of CuTe work, whereas the operating adhocracy describes the XTeam's. But this is disputable, since both adhocracies apply to complex, ill-defined problems, particularly those involving sophisticated innovation and customization (Mintzberg, 1983).

2.2 Adhocracy shortcomings

There are also some problems in designing CuTes according to the adhocracy. One of them is the little expected formalization of professional behavior (Motta, 2000) that may

hinder the institutionalization of performance measures. The innovative organization is barely based on coordination, thus deviating from classic bureaucratic principles such as the sharp definition of tasks, the standardization of processes and the strong commitment to planning and control. In fact, formatting one's actions weakens his/her flexibility to react to the environment (Mintzberg, 1983). Also, standardizing human behavior usually leads to undesirable side effects like inhibiting learning (Powell, 1998), and best practices for IT-business professionals are usually questionable (Scarbrough, 1999). But since work consists of tasks and coordination, it is mandatory that a certain degree of control be implemented; the solution is maybe to focus on the interfaces between tasks rather than on individual behaviors (Morgan, 1986).

Adhocracy relies on intense communication, temporariness, lack of formalization, and unpredictable workload, leading to a situation that is efficacious but inefficient (Mintzberg, 1983). Besides, the matrix structure that is typical of ad hoc practices collides against the functional divisions, thus giving rise to centralization effects (Motta, 2000); and paying loyalty to double seniority in matrices (by function and by project) lowers the team's morale (Morgan, 1986).

3. Structure in IS development

Starting with Mintzberg's adhocratic design in mind, we performed a literature review that covered all articles published between 2000 and 2006 in four journals: *MIS Quarterly*, *Information Systems Research*, *Information Systems Journal*, and *Management Science*. These journals were selected for their broad interests in IS research and for their high impact in the literature. Other competitive journals could have been included in the review, such as *Journal of Information Technology*, *Journal of the AIS*, and *Journal of Management Information Systems*; but we wanted to review journals that were broadly adopted in Brazilian business schools, since our empirical study would be developed in a Brazilian professional setting and those academic outlets could have been used by the professionals involved. Contributions published in other periods and in other sources were also included in the search whenever a seminal work was found in the references of articles included in the primary search. It was no problem to include sources from different periods in the review, since we were searching for measures available in relevant IS literature, with no interest in making statistical inferences from the sources.

The initial year of the literature review was 2000, that is, two years before the start of the IS project in which we eventually tested the literature in a specific context – described later in this paper. The project started with a mapping of organizational processes in 2002, and its system development phase started in the second half of 2003. The last year of the review was 2006, when the implemented system was fully operational and the project was also concluded. That is, the literature review included the whole period during which the project unfolded. Since the time period was relatively short and we considered only four journals in the primary search, it was possible to read all relevant articles that included seemingly structural measures for IS teams in general. Table I shows the articles that provided the final set of measures.

Another aspect to comment is that the review was completed five years before the preparation of this paper for publication, for two reasons: first, the review was submitted to academic conferences and to professionals in order to discuss the validity of the theoretical compilation; and second, we wanted to let the academic community mature the articles included in our literature review, since a published work motivates a series of other works to be published in response. We found no need to update our review so far, that is, recent publications do not change the measures in our compilation.

Primary study	Primary source	Measures (no.)
Primary search		
Gallivan and Keil (2003)	*Information Systems Journal*	5
Kirsch *et al.* (2002)	*Management Science*	4
Aladwani (2002)	*Information Systems Journal*	1
Austin (2001)	*Information Systems Research*	1
Faraj and Sproull (2000)	*Management Science*	1
Guinan *et al.* (1998)	*Information Systems Research*	1
Ravichandran and Rai (2000)	*MIS Quarterly*	1
Secondary search		
Andres and Zmud (2001/2002)	*Journal of Management Information Systems*	7
Grover *et al.* (2002)	*Journal of the AIS*	6
Jones (2005)	*Information Resources Management Journal*	6
Ravichandran and Rai (1999/2000)	*Journal of Management Information Systems*	6
Kim and Peterson (2003)	*Information Resources Management Journal*	4
Palvia *et al.* (2001)	*Industrial Management & Data Systems*	3
Garvin (1993)	*Harvard Business Review*	2
Athaide and Stump (1999)	*Journal of Product Innovation Management*	1
Corbin (1991)	*Journal of Systems Management*	1
Förster *et al.* (2003)	*Organizational Behavior & Human Decision Processes*	1
Ghezzi *et al.* (1991)	*Book "Fundamentals of Software Engineering"*	1
Jiang *et al.* (2006)	*Journal of the AIS*	1
Jiang *et al.* (2002)	*International Journal of Project Management*	1
Stump *et al.* (2002)	*Journal of Product Innovation Management*	1

Table I.
Sources of structural measures

The theoretical compilation resulted in 21 measures that are assumed to address the structural design of CuTes. Following a hierarchical measurement approach that differentiates between measures, metrics and indicators (Pressman, 2001), the measures were assembled into six metrics and one indicator as part of a semi-structured interview protocol to enable CuTe members and managers manifest their perceptions about the structural design of their teams in CISS projects. The questions in the protocol correspond to the measures, and they were phrased to incite the interviewees to reflect on the degree of adhocratic configuration of their teams. The instrument is primarily designed for team use as a self-assessment tool, but it can be also deployed by project leaders and external partners to assess a team's structural archetype. The following section presents the measures and metrics that constitute the adhocratic/organic design of CuTes in CISS projects.

3.1 Team structure – CuTe adhocratic/organic design

The On CuTe Structure instrument resultant from the literature review is composed of one indicator (CuTe adhocratic/organic design) that is the outcome of computing six metrics and 21 measures. The reason for having just one indicator is due to the previous argument about designing and managing CuTes with the adhocracy in mind. This is a different procedure from the one adopted in Bellini *et al.* (2012), where a literature review was needed to find the indicators of personal traits of team members (with no assumption derived from the general organizational literature). Our instrument is intended to measure the structural design of CuTes and compare the empirical results against the adhocracy standard. Tables II-VII show the structure-related measures and metrics, and the corresponding questions in the instrument are reported at the bottom of each table. Each table corresponds to exactly one metric, and the set of all six tables (metrics) corresponds to the

Measure code	Original measure in the literature	References
Fit1	Management support for social integration (training)	Aladwani (2002)
	Education	Palvia *et al.* (2001)
	Education and training	Garvin (1993)
	Team training	Kim and Peterson (2003)
	Commitment to skill development	Ravichandran and Rai (1999/2000)
Fit2	Personnel rotation	Garvin (1993)
Fit3	Structure of team interaction (team workplace)	Jones (2005)
	Managerial leadership and infrastructure	Ravichandran and Rai (2000)
	Commitment to skill development	Ravichandran and Rai (1999/2000)
	–	Corbin (1991)

Questions in the On CuTe Structure instrument

Fit1: is the level of (technical and social) training and indoctrination adequate for your role in the project?
Fit2: is it likely that you change between (meaningful) roles in the project?
Fit3: does the workplace enable you to perform and learn about your role?

Table II. Organizational fit

Measure code	Original measure in the literature	References
Interdep1/Interdep2	Outcome control	Kirsch *et al.* (2002)
	Task interdependence	Andres and Zmud (2001/2002)

Questions in the On CuTe Structure instrument

Interdep1: to what extent are you assigned tasks that serve as input for your partner's and your team's tasks?
Interdep2: to what extent are you assigned tasks that need input from your partner's and your team's tasks?

Table III. Task interdependence

Measure code	Original measure in the literature	References
Conflict1/Conflict2	Outcome control	Kirsch *et al.* (2002)
	Time pressure (concern for career and concern for quality)	Austin (2001)
	Speed and accuracy	Förster *et al.* (2003)
	Goal conflict	Andres and Zmud (2001/2002)
	IS management commitment to quality, and quality policy and goals	Ravichandran and Rai (1999/2000)

Questions in the On CuTe Structure instrument

Conflict1: are you requested to deliver tasks on the basis of celerity, or of user-friendliness, accuracy, and expediency?
Conflict2: do you request your team and partner to deliver tasks on the basis of celerity, or of user-friendliness, accuracy, and expediency?

Table IV. Goal conflict

single structural indicator (adhocratic/organic design). The questions as stated in the tables are just reminders for the interviewer, so the interviewer is stimulated to develop a much deeper conversation with the interviewee – with the support of techniques such as, but not restricted to, repertory grid and laddering (like in De Moura *et al.*, 2015).

Measure code	Original measure in the literature	References
Formal1	Relationalism (information exchange)	Grover *et al.* (2002)
	Team atmosphere	Jones (2005)
	Organic or mechanistic coordination	Andres and Zmud (2001/2002)
Formal2	Team atmosphere	Jones (2005)
	Safe space	Gallivan and Keil (2003)
	Programmer and analyst empowerment	Ravichandran and Rai (1999/2000)
Formal3	Relationalism (information exchange)	Grover *et al.* (2002)
	Expertise coordination (bring expertise to bear)	Faraj and Sproull (2000)
	Organic or mechanistic coordination	Andres and Zmud (2001/2002)
	Team atmosphere	Jones (2005)
	Informal information	Gallivan and Keil (2003)
Formal4	Team atmosphere	Jones (2005)
Formal5	Monitoring the supplier, and supplier opportunism	Grover *et al.* (2002)
	Relationalism (flexibility, and information exchange)	Grover *et al.* (2002)
	Team atmosphere	Jones (2005)
	Behavior, and outcome control	Kirsch *et al.* (2002)

Questions in the On CuTe Structure instrument
Formal1: are you free to exchange information with your partner and your team?
Formal2: are you encouraged to express your ideas, even if not fully developed yet?
Formal3: do informal gatherings and information have a place in the project?
Formal4: how do you learn about your role in the project?
Formal5: how frequently do you refer to contractual information when interacting with your partner?

Table V.
Formality and knowledge sharing

Measure code	Original measure in the literature	References
Coop1	Inclusion	Palvia *et al.* (2001)
	Top management support	Kim and Peterson (2003)
	Programmer and analyst empowerment	Ravichandran and Rai (1999/2000)
Coop2	Relationalism (information exchange)	Grover *et al.* (2002)
	Organic or mechanistic coordination	Andres and Zmud (2001/2002)
Coop3	Relationalism (power)	Grover *et al.* (2002)
	User influence or power	Gallivan and Keil (2003)
Coop4	Behavioral factors (team skills)	Guinan *et al.* (1998)
Coop5	Divergent thinking	Gallivan and Keil (2003)

Questions in the On CuTe Structure instrument
Coop1: how frequently are your participation and that of your team in the project elicited by senior management?
Coop2: are you free do meet with your partner and your team to discuss project information?
Coop3: is power used for the benefit of the project, or mostly for personal and team interests?
Coop4: what about the mix of expertise in the project?
Coop5: is conflict of ideas seen as an impediment for work?

Table VI.
Cooperativeness

Measure code	Original measure in the literature	References
PartControl1/	User-related risk (nonsupport)	Jiang *et al.* (2006)
PartControl2/	Relationalism (shared problem solving)	Grover *et al.* (2002)
PartControl3	Organic or mechanistic coordination	Andres and Zmud (2001/2002)
	Outcome control	Kirsch *et al.* (2002)
	Self-control	Kim and Peterson (2003)
	Decentralized control	Ghezzi *et al.* (1991)
	Programmer and analyst empowerment	Ravichandran and Rai (1999/2000)
PartControl4	User-related risk	Jiang *et al.* (2002)
	Genuine participation	Andres and Zmud (2001/2002)
	Stimulation	Palvia *et al.* (2001)
	Joint new product	Athaide and Stump (1999)
	development	Stump *et al.* (2002)
	Self-control	Kim and Peterson (2003)
	User influence or power	Gallivan and Keil (2003)

Questions in the On CuTe Structure instrument

PartControl1: to what extent is it likely that problems will be immediately reported to you if they pertain to your expertise domain?

PartControl2: to what extent is it likely that problem solving will be immediately requested from you if it pertains to your assigned task?

PartControl3: to what extent does other decision making issues on your task reflect your input?

PartControl4: to what extent does the final system reflect your input?

Table VII. Genuine participation and autonomy

Metric organizational fit (Table II) describes how fit the individual is for working in the project, that is, what part of the environmental variety (professional role) is due to each member and to the team as a whole. It consists of the level of ongoing training and indoctrination for the role (Fit1), the likelihood of people changing roles during the project (Fit2), and the design of the workplace where tasks are intended to be fulfilled (Fit3).

Metric task interdependence (Table III) describes how integrated and purposeful each role in the project is. It consists of the likelihood of assigned tasks serving as input for someone else's tasks (Interdep1), and the likelihood of assigned tasks being served by someone else's tasks (Interdep2).

Metric goal conflict (Table IV) describes how self-governed and effective each individual is expected to be in the project. It consists of criteria for delivering completed tasks (Conflict1), and criteria for asking someone else to deliver tasks (Conflict2).

Metric formality and knowledge sharing (Table V) describes how flexible and committed each role in the project is, that is, how able the team is to respond to complex demands from the environment. It consists of the frequency of free information exchanges (Formal1), the atmosphere of spreading the word about one's perceptions and insights (Formal2), the level of informality between the parties (Formal3), the alternatives available for professional self-improvement in the project (Formal4), and the degree of contract-attached individual behavior (Formal5).

Metric cooperativeness (Table VI) describes how power is managed and used for the benefit of cooperative work. It consists of top management's concern for each role (Coop1), the autonomy for doing joint work (Coop2), the outcomes of organizational power (Coop3), the integrity of cooperative work (Coop4), and conflict resolution (Coop5).

Metric genuine participation and autonomy (Table VII) describes how authoritative each individual is in his/her role, that is, how control and operational information is

expected to flow within the project. It consists of the likelihood of point-of-action decision (PartControl1), the likelihood of point-of-decision action (PartControl2), the share of decision making due to each professional (PartControl3), and the share of work due to each professional (PartControl4).

4. Method

The literature review enabled the development of the On CuTe Structure instrument for in-depth interviews. The instrument was applied to a CuTe working in a landmark ERP implementation in Brazil, in which one of the authors had an insider's perspective during the whole project. The project's manager and seven key CuTe members were interviewed in order to identify the actual structural design of the team in light of the adhocratic/organic measures and metrics. The assumption that guided the interviews and subsequent analysis was: if the project's CuTe was a high-performance unit, then applying the On CuTe Structure instrument to it would enable validation of the instrument and reveal a set of reference values for the structural design of CuTes in similar projects.

The ERP package was fully operational in 2006. We delayed some years to report the structural configuration of the project's CuTe because we wanted to take a reasonably long outsider perspective until user adoption and business results were widely available. Also, "social actions of developers, while clearly shaped in some part by the technologies being used, reflect social norms, behaviours and actions that are more stable over time" (Sawyer *et al.*, 2010, p. 99), so it was needed to let our perceptions mature about that CuTe. Extended timeframes between data collection and publication are also reported in Sawyer *et al.* (2010), who collected their data from 1991 to 1994, and in Alvarez (2008), who collected their data in 1998, 2002, and 2003.

4.1 Unit of analysis and research site

The unit of analysis for the empirical data was the set of formal and informal, declared and hidden, voluntary and mandatory, deliberate and unconscious work relationships in the partnership between one high-performance CuTe and one renowned XTeam in a landmark CISS project. The unit of analysis was identified in an organization here called The University. The University is a prominent Brazilian private university, and, as part of a comprehensive redesign of its institutional strategy, business processes and market orientation, it has implemented an ERP package from one of the technology leaders (PeopleSoft). The ERP implementation was a socio-technical effort hereafter referred to as The EntERPrise that put The University in a position of technological vanguardism – the first university in Brazil to implement a full system for student administration, and the first contract of PeopleSoft in Brazil for its educational solution.

The system implementation phase of The EntERPrise started in August 2003 and extended through April 2005[4], in a partnership that included business and IT professionals from the customer organization (The University's CuTe) and another team (the XTeam) formed by professionals from the technology supplier (PeopleSoft) and from a consultancy experienced with ERP implementations. The implementation followed a two-year mapping of The University's processes and the selection of the most appropriate ERP package and business solution from several Brazilian and international providers. The package to be chosen was expected to reduce inefficiencies in operational processes, speed up management and make it less complex, reduce management and IT costs by 15 percent, and promote transparency and improved effectiveness to organizational decisions. In fact, ERPs support the business processes with timely, accurate enterprise-wide information for decision making (Vemuri and

Palvia, 2006) in a cost-effective, best-in-the-industry manner that negotiates between software customization and organizational change (Pollock and Cornford, 2004).

PeopleSoft's experience with about 600 customers worldwide suggested that three years were needed to implement the full package, but The University decided to implement the 35-module system in 18 months. The system was planned to be used by 30,000 students and 2,000 faculty and administrative personnel of one of the most important universities in Brazil, which is also home to one of the country's oldest IT clusters – The University hosts dozens of companies of all sizes that are responsible for an important share of the Brazilian IT market.

Even though The University is a leading IT teaching, research and development center in Brazil, implementing a full ERP solution was not a simple task. Notwithstanding The University's important achievements in developing its own systems for decades, it is a Brazilian organization after all – what *per se* imposes enormous challenges for the international technology suppliers. The Brazilian management processes are usually very different from the known best practices. As an illustration, The EntERPrise involved the development of an entirely new set of functionalities (customization) for managing student enrollment, tuition payments, and research projects. Students in Brazil have a high degree of freedom to manage their enrollment in courses, classes and other academic activities, and their tuition fees are negotiated directly with the university; also, researchers assume a large range of responsibilities when they are in charge of projects, like managing the bureaucracy of student grants and the stock of ordinary office items. This need for extensive customization – some informants even affirm that almost everything was customized, with exceptions like the procurement system – was again in the agenda when implementing the human resources management system, once the labor legislation in Brazil is quite peculiar. However, ERP customization – as opposed to changing an organization's business processes to match the standard business processes embedded in an ERP – is costly and risky (Morton and Hu, 2008). But we also contend that customizing an ERP may boost the organization's core competencies that ultimately distinguish it in the marketplace (Prahalad and Hamel, 1990).

The international literature is in need of more research on ERP cases in the developing countries (Doherty *et al.*, 2010) and particularly on the challenges of IT research in Brazil (Bellini *et al.*, 2013). Although Brazil is in a very hard decade with an impoverished economy, large public debts, lack of basic infrastructure, intense social conflicts, and political instability, it is still part of the BRICS block that is an important economic power in the world. Therefore, we believe that Brazilian IT cases should be of interest for the global community.

Besides the idiosyncrasies of the Brazilian work environment, The University had a centralized IT department that seemed to be reluctant on sharing the power over technology and information, or at least it was skeptic about system development and the effectiveness of the new system. In fact, conflicting epistemological and analytical perspectives frequently arise about the dynamics of ERP implementation (Kaniadakis, 2012), and the success of the resulting ERP system is dependent on the customer organization's prevailing structural configuration (Morton and Hu, 2008). That is, there were good theoretical reasons both in terms of process and outcome for the IT department to hesitate. Also, the IT department was a heritage of the late data processing unit, so its culture on how IT should be governed along with the organizational status it possessed were important aspects to negotiate in face of The University's new IT infrastructure and IT-mediated processes. The IT department would remain an

important organizational unit to support seamless daily IT operations, but at the same time IT would be increasingly transparent and focussed on the unexperienced end-user.

The University was also concerned with how to maintain the system in the future, the impacts of changing the suppliers and updating the technologies, and how to reallocate – after The EntERPrise – the highly paid, highly trained professionals who were hired to work specifically in the project. In fact, the in-house team (The University's CuTe) that would work in The EntERPrise was formed by two groups of professionals: select IT-business professionals who were already employed by The University, and newcomers – IT-business professionals hired from the market. The CuTe formed by these two groups would be responsible for customizing the system along with the support of the XTeam's professionals (the professionals from PeopleSoft and the ERP consultancy). But the professionals who were contracted externally to work specifically in the project had a business mind that contrasted with the routine-preserving mind of most professionals at The University – so, how to make the two groups cooperate during and after The EntERPrise if the externally contracted individuals become permanent employees? Also, another concern was to assure for in-house business professionals allocated to work in the CuTe as lead users that they would not be displaced from their original units at The University at the end of the project – so, they worked part-time in those units, and part-time in The EntERPrise. In the words[5] of The EntERPrise's chief executive, project manager:

> For the morale to be high, we decided that lead users [from The University's business units] who were allocated to the project would not be displaced by their [business units'] managers.

With a peak of 145 employees distributed in 15 subteams, The EntERPrise was a challenge for design and management, what confirms the need for more knowledge about team development processes (Perry *et al.*, 2013). The EntERPrise could be framed as a death march project, in which typical project parameters (like budget, functionality, expected performance, and size of the team) "exceed the norm by at least 50 percent" (Yourdon, 1997, p. 2), thus leading to a situation where the likelihood of failure is greater than the likelihood of success. Indeed, professionals were allocated to the project upon compliance with one major requirement: to contribute to a team that was expected to learn fast and implement a fully functional system within a tight schedule – 35 modules in 18 months, that is, half the typical time needed. Common challenges included managing very different people, building a cohesive team, making planned and fortuitous replacements, maintaining high levels of motivation, struggling against fatigue, and negotiating politics (Yourdon, 1997). As a matter of fact, The EntERPrise's manager frequently expressed his concerns about the need to hit the target on a single shot, so professionals were hired from the market or reallocated from The University's work units according to the following rationale:

> For hiring the team members, I collected information on how they related to their groups. […] I was concerned with hiring individuals who were enthusiastic about change. […] Our group was an "outlier" if compared to the rest [of The University]. […] For the technical people, [we hired on the basis of] behavior and ability to learn fast. For the business people, [the requisite was] to master the unit's business processes. […] It is faster to learn the technology than the business. […] The IT people have learned to work at a higher level of decisions – that of the business processes. […] We took advantage of the competition between the teams for the benefit of learning.

But the high demands on people made emerge mixed feelings among the in-house professionals. Leaders were frequently challenged by the organizational climate and in need to find innovative solutions for teamwork. This is aligned with the competitive

advantage view that suggests that high-performance work systems may increase workers' dissatisfaction, conflicts and turnover intentions, which may be otherwise softened by empowering the individuals (Jensen *et al.*, 2013). The following statements illustrate the perceptions:

> [The practice of] mere [bureaucratic] authority doesn't convince me. […] The changes [at The University] are inhuman. […] The system under development is standard, but the solutions [we] devised are not. (Developer 1)
>
> A project is exactly this – you must work hard. (Developer 2)
>
> That shirt [labeled with the project's name] demanded us responsibility. […] Individual and team commitment was a critical success factor. (Analyst 4)
>
> I don't believe that we developed a new methodology, but [it is also true that] we "ignored" some PMBOK paragraphs. […] [Also] we always tried to minimize customization [to what was really in need of customization] […] [and] managers should put hands on [the operational activities], in order to see what was feasible. […] [Commitment was evident, so] the team performed as a whole: [when confronted with a technological impediment for the integration of systems] "If necessary, we would move the data 'by hand' from one side to the other!" [But] promoting the strategy is not trivial, [so] you [must gradually] translate it into project premises. […] Technical people are more "binary": if they don't believe that [the plan] is feasible, they don't buy it. [But we tried to motivate people, since] responsibilities were not [formally and inflexibly] defined, [so] we had to calibrate the expectations. (Manager)

As for the main deliverables, with the new system The University moved from a situation where every single professional had his/her own numbers about the institution – that is, the institutional information was not consolidated, available or enforced – to a situation where the information was integrated, consistent and shared according to permission rules. The University also promoted a budget-focussed culture for planning and expenditure, with the ERP system being the tangible artifact to assure the institutionalization of practices. Another outcome of The EntERPrise was to institutionalize a process-oriented work environment, that is, The University started to see itself as a collection of efficient work processes. Overall, The University developed great capabilities during The EntERPrise and consolidated its image as a professionalized organization.

The complexity of the highly customized system, the costs imposed by the technology supplier to update the system, and a new strategic orientation of the educational group which The University pertained to (all units of the educational group would be integrated by a new system that was incompatible with The EntERPrise's system) eventually forced The University to replace its very successful ERP by another solution available in the Brazilian market, in 2012. The reasons for the replacement reinforce that customization was so widespread in the system that it became highly sophisticated and imposed unrealistic financial obligations for The University in the long run.

4.2 The high-performance CuTe

IS success is difficult to define. According to Morton and Hu (2008) and Jetu and Riedl (2012), an ERP implementation may be considered successful if time, cost and quality are met (project management criteria) and if expectations are also met (product criteria). Those criteria were met in The EntERPrise, according to The University and the Brazilian IT news media that covered the implementation extensively. The individuals

involved in the implementation also considered that The EntERPrise's team was successful. Team members' self-evaluations about team performance and success in IS development are acceptable measurements (Sawyer *et al.*, 2010), or in the words of Jones and Harrison (1996, p. 59):

> Self-evaluation of performance has been widely adopted in the areas of organizational behavior and human resources management. […] Not only is the self-appraisal process appropriate for IS project teams, it may also improve the team members' performance during future IS projects. […] we propose that IS project team members' perceptions of their team success is a useful indicator of IS project success.

The EntERPrise's success is an evidence that the system implementation team – formed by the CuTe and the XTeam – was a high-performance unit, since it is reasonable to assume that complex systems and implementation processes that are considered successful should have been accomplished according to high work standards. Another evidence is that the implementation team was designed according to principles such as: professionals should have high learning skills; there should be expertise redundancy (and not redundancy of individuals), thus addressing requisite variety; teamwork should be promoted for the effective interaction of technology experts, business analysts, and lead users; high levels of autonomy should be assigned to the professionals for the identification and correction of detours; group cohesiveness should be leveraged for achieving group goals; and no one should have dual roles while working in the project, except the lead users. The synthesis is that this high-performance team organized itself to perform the tasks, it nurtured social relationships, and it had leadership who provided direction (O'Connor and Basri, 2012).

4.3 Data collection and analysis

The first author of this paper was a faculty member at The University during The EntERPrise, when he interacted on a weekly basis with the implementation team. All respondents in the in-depth interviews (Table VIII), except the project's manager, attended at least one of his courses at The University. At class, theoretical issues about ERP implementation were frequently discussed, and discussions invariably ended up addressing The EntERPrise, since each class had on average three students who also worked in the project. Thus, besides interviewing key informants and experiencing the "winds of change" at The University, the first author was also provided with fresh, up-to-date facts from the shop floor reported by student workers.

The set of eight respondents in our empirical data collection included the most typical professional roles in IS development: the project's manager, system analysts, code programmers, and users (Yang and Tang, 2004). One of the respondents was also a lead user of actual organizational processes that were highly customized in the project, so she served as a key prototyper. Having only eight respondents was not a problem, since some organizational roles are assumed by just a few members. Also, we elaborated two additional requisites in order to improve the likelihood of data validity: the respondents should have been professionals working in the project during most of its execution (our respondents participated from 53 to 100 percent of the project's duration measured in months) and the respondents should be close to the interviewer (the first author of this paper), since some questions addressed sensitive information. These demands were satisfied by only a few participants in the project.

The individual interviews were scheduled for June 2006 in common agreement between the interviewer and each respondent. One interview was done by e-mail and

CuTe member	*Role in the project*	*Prior IS experience*	*Experience in the company*	*Experience in the role*[a]	*Experience in the project*
Developer1	Webmaster	90 months	108 months	18 months	53%
Developer2	Webmaster	36 months	36 months	20 months	59%
Analyst1	Programmer and systems analyst	36 months	68 months	10 months	62%
Analyst2	Network administrator	–	45 months	34 months	100%
Analyst3	Webmaster and systems analyst	222 months	120 months	34 months	100%
Analyst4	Network administrator	30 months	30 months	25 months	74%
Analyst5	Lead user (business analyst)	–	84 months	18 months	53%
Manager	Chief executive	120 months	120 months	34 months	100%

CuTe member	*CuTe partners (no.)*	*XTeam partners (no.)*	*Main interaction with the XTeam*	*Duration of interview*
Developer1	15	2	Face to face	103 minutes
Developer2	8	3	Instant messenger	124 minutes
Analyst1	10	8	Face to face	58 minutes
Analyst2	10	8	Face to face	50 minutes
Analyst3	13	5	Face to face	125 minutes
Analyst4	10	8	Face to face	164 minutes
Analyst5	8	3	Instant messenger	(by e-mail)
Manager	90	35	Face to face	214 minutes

Note: [a]This includes all the member's experiences (not restricted to the project) with the corresponding professional role mentioned in column "role in the project"

Table VIII.
The respondents

instant messaging, and the other seven interviews were done in a room controlled for ergonomics and privacy. A bookstore coupon of R$20 (the equivalent of a popular book at that time) was distributed to each respondent prior to the interview, along with a legal statement of non-disclosure of personal information.

Our choice for the particular technique to extract relevant conceptual categories from the interviews was a variant of the revealed causal mapping (RCM) method (Nelson *et al.*, 2000), a method that includes cognitive maps and content analysis to reveal the causalities hidden in people's minds. The rationale for using RCM was that this method provides a more systematic view of someone's discourse, so we believed that it would be helpful for analyzing long statements. But we did not apply the full RCM method, since our interviewees were objective and sharply clear in their statements most of the time, and also because we were not able to schedule another round of interviews with them to discuss the cognitive maps that would likely emerge from the analyses.

The categories that emerged from content analysis were developed with the help of a spreadsheet that recorded the main analytical content: the respondents' objective answers to the questions and occasional clarification notes. At the end, 49 categories represented the perception-based values for the 21 measures of the data collection instrument. The categories provided a view of the actual instantiation of adhocratic structural attributes of The EntERPrise's CuTe. We validated the findings with the help of three external judges with academic and industry experience. The validation process addressed the apparent consistency of the discourses – that is, how real the discourses seemed to be in describing the structure-related attributes of a high-performance CuTe.

5. Results

CuTe performance is key for successful CISS implementation like in ERP projects, and the team's structure plays an important role in performance. Our literature review revealed that an adhocracy is the preferred structural design for CuTes. Also, we identified six structure-related vectors of performance (metrics) – Figure 1.

Empirical data from The EntERPrise revealed a set of actual values for each metric according to the perception of eight key informants who worked in a high-performance CuTe. Figure 2 shows the aggregate values of each structure-related metric. Each metric consists of several measures, and each measure corresponds to one question in the open-ended On CuTe Structure instrument (Tables II-VII).

Since the values of each measure (each question in the instrument) resulted from personal discourses, we normalized them in a five-point scale from low to high levels of presence of the structure-related attributes in focus. Therefore, the value of each metric represents the aggregation of normalized measures according to the authors' discretion with the help of the spreadsheet notes.

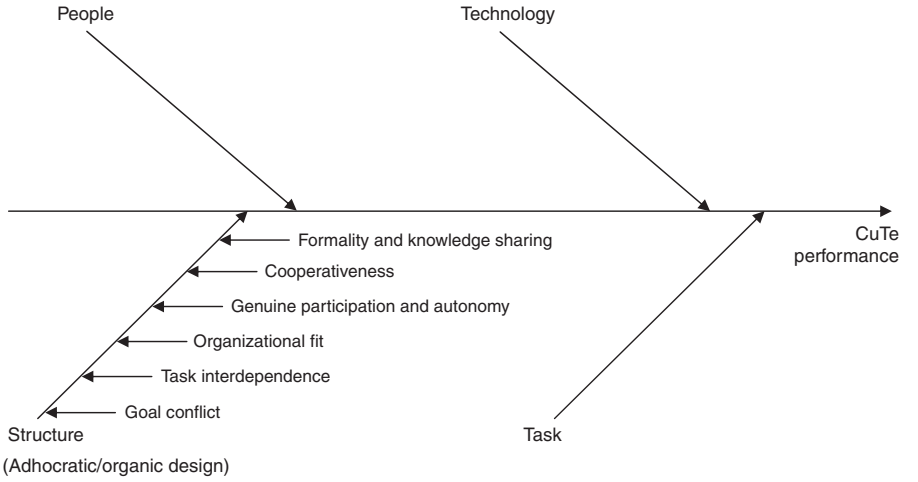

Figure 1.
Ishikawa diagram for CuTe socio-technical performance based on team structure

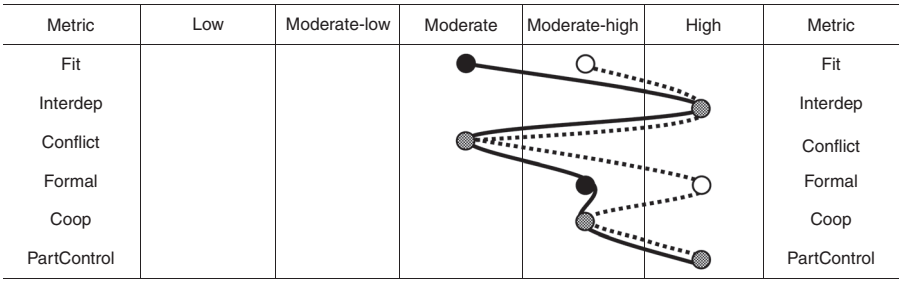

Figure 2.
Perception map on CuTe structure

Notes: Full circles represent the team members' perceptions; empty circles represent the manager's perceptions; mixed circles mean that both the members and the manager manifest similar perceptions

The values in Figure 2 are plotted according to the project manager's and team members' perceptions. Comparing manager- and employee-rated performance can serve multiple purposes. As shown in the literature review of Den Hartog *et al.* (2013), misalignment between manager- and employee-rated human resources practices can affect human resources outcomes. But in our study the project's manager shares with CuTe members a particular vision about the structure of the team, and the vision seems to be realistic. Realism is apparent from the fact that both the manager and his team did not overrate performance as if they wanted to legitimate their work. Also, the substantial agreement in perceptions from the manager and his team may reveal another important attribute of high-performance teams, that is, a collective frame of mind or groupthink in terms of a focussed analysis. High-performance individuals may disagree in many aspects of life and the profession, but not in what is important for technically successful teamwork. Overall, the manager's perceptions are slightly more positive than the perception of team members – as expected (Den Hartog *et al.*, 2013).

In terms of organizational fit (Fit), the perception was that the CuTe was structured according to moderate and moderate-high levels of training for the job and opportunities for an individual to continuously contribute in meaningful tasks. This may be explained by the "self-made individual" behavior that is typical of knowledge workers and the relatively stable job routine of software developers. The following statements illustrate additional lessons learned in this metric:

> I developed greatly when I changed my seat in the room – I sat near to a more experienced fellow. […] Being honest and competent – that's all. (Developer 2)

> Rotation [in tasks] may make me stay in the team. […] Changes in professional routines are desirable, but not all of the time; otherwise, nobody works effectively. (Analyst 3)

> If trained [but we were not], we could have been 100% more efficient and have reduced overtime to a third. (Analyst 4)

In terms of task interdependence (Interdep), the consistent perception was that the CuTe was structured according to high levels of interdependence. This may be explained by the very nature of ERP projects in demanding strict process standardization and deliverables, and the typical routine of knowledge workers that requires accurate specification of tasks and interdependence due to task complexity. The following statements illustrate additional lessons learned in this metric:

> I was uneasy with the lack of information [about the organizational change]. (Developer 1)

> One has to ask for clues whenever needed – but not "please, do it for me." [There shouldn't be this] large gap between the IT and the business people. (Developer 2)

> Some people contend about minor issues… [but] we should engage in better communication. (Analyst 3)

> Upon requests from colleagues, [it is sometimes important to] delay the answer, in order to make it clear that you're [also] busy. (Analyst 4)

In terms of goal conflict (Conflict), the consistent perception was that the CuTe was structured according to moderate levels of outcome and process goals. The discourses focussed mainly on celerity as a task priority, with product quality as the initial condition. It is obvious to our informants that product and process quality are equally important, but their focus on a process indicator (celerity) suggests that product quality is assured in high-performance teamwork. We assign a moderate level of performance

to this metric because the informants do not focus on product quality when acting and asking others to act, but take quality for granted. The following statements illustrate additional lessons learned in this metric:

> Some are driven by detail, but don't advance an inch. (Developer 1)

> I must [learn to] distinguish between quality and my expectations [about the performance of others]. (Analyst 3)

> We had to delegate much [authority] in order to accomplish the tasks. For the sake of speed, we trusted. (Manager)

In terms of formality and knowledge sharing (Formal), the perception was that the CuTe was structured according to moderate-high and high levels of flexibility to respond to project contingencies. This may be explained by the complexity of ERP projects – that impedes the planning stage to predict all occasional needs – and the fact that knowledge workers see creativity and improvisation as critical resources. The following statements illustrate additional lessons learned in this metric:

> For the developers' self-esteem, separation wasn't good at all [the business/user personnel worked in the building where the institutional focus was on, while the developers worked in another building]. […] The developers' amalgam was the sensation of isolation. […] Being at the same room is really important for knowledge sharing. […] [And] sports activities [in the campus] served to unite the team. (Developer 1)

> Just one thing is not allowed: staying quiet [when an idea comes to mind]. We believed that those people used to have good ideas. […] We were chiefly proactive [in solving problems]. […] [But developers'] proactivity poses the risk of users becoming dependent. (Manager)

In terms of cooperativeness (Coop), the consistent perception was that the CuTe was structured according to moderate-high levels of an open debate space. The only measure that provided mixed results was the use of power as an enabling mechanism for the debate. It seems that power is not always a neutral driver of actions, thus introducing some artificial inputs in the motivation-based process of cooperating. This may be once again explained by the complexity of the whole project, what may have pushed the power structures to act in the shop floor in order to meet higher-order demands. The following statement illustrates additional lessons learned in this metric:

> In order to build a cohesive team, we moved from the beginning to a large room with no walls nor symbols of hierarchy [as expressed in furniture and protocols]. […] [In my daily "pilgrimage" through the employees' desks] I wasn't capable of helping them technically in 99% of the cases – but this wasn't important for the workers [since they primarily wanted to be heard]. […] People were encouraged not to repress [their emotions]. […] Some executives asked me for private meetings, but I answered: "You and I will solve nothing. We need to talk with those who 'live' the process". (Manager)

And in terms of genuine participation and autonomy (PartControl), the consistent perception was that the CuTe was structured according to high levels of alignment between the individuals' roles and the project's needs. This may be explained by the socio-technical principle that problem detection, decision making and action should be enacted at the same location. Also, it refers to a job design that is both necessary at the individual level and sufficient at the group level. The following statements illustrate additional lessons learned in this metric:

> The "invisible" hierarchy inhibits behavior. (Developer 1)

> Ask me responsibility, give me authority. (Analyst 2)
>
> I was part of it [the implementation], thus we cross our fingers for it! (Analyst 3)
>
> Our [first] manager used to protect us [from some hard activities]. The second manager imposed the tasks [although unsympathetic, that was effective]. (Analyst 4)
>
> Participative leadership mediates the feeling of group authority. […] [The sense of] accountability for project faults is related to [the sense of] ownership [and this is mediated by participative-versus-hierarchical development]. […] There is room for faster, quality decisions that include all stakeholders. […] The bureaucratic authority wasn't necessarily the actual authority. (Manager)

6. Conclusions

We looked for the structural design of CuTes that work with XTeams in CISS projects. We achieved this intent by searching the general and the IS literatures on structure and by measuring the theoretically developed measures in a high-performance, real-case CuTe. Our proposition for the structural design of CuTes in CISS projects consists of the set of theoretically developed measures and the empirical values that we found when applying the measures as a whole. The theoretical measures account for the aspects to be considered when building a CuTe, and the empirical values account for the degree to which the measures may be enforced by management.

This study contributes in several ways to the literature. First, it reiterates the role of customers in organizational change projects that are mediated by the implementation of CISS products. In particular, there is a need to frame how a CuTe will cooperate with an XTeam in terms of project authority and responsibility. CuTes are particularly needed to reveal the organization's *raison d'être*, the unique competencies that account for the organization's differentiation in current markets, how technology is used in support, and the strategic stance.

Second, we recall the much ignored Leavitt's (1965) framework of four interdependent, equally important dimensions of the work systems, and we apply it as the background for CuTe work design. We studied one of those dimensions, which is maybe the less systematically defined and researched one – structure. Besides the novelty of studying CuTe structural design, structure was defined as the set of all formal and informal relationships between the organizational assets that impact an organization's performance, with Mintzberg's (1980, 1983) adhocracy being suggested as the reference for the structural design of CuTes.

Third, we developed a psychometric instrument (the set of questions in Tables II-VII) to measure CuTe structure in reference to the adhocracy, and we collected a first set of empirical values. The values were provided by key professionals from a high-performance CuTe that was in charge of implementing a landmark ERP project in Brazil, and this fact permitted us to assume the empirical data as a first benchmark for a CuTe's adhocracy-like structural design.

6.1 Limitations

There are three evident limitations in our study if one wants to find prescriptions in it. First, generalization from organizational change projects is always a risk (Paper and Simon, 2005). Second, our study involved a university case, but universities are a very special type of organization (Pollock and Cornford, 2004). And third, the complexity of high-performance work practices poses difficulties for other firms to imitate the successful ones (Posthuma *et al.*, 2013).

Another limitation is that our literature review targeted only a few sources, so the reported measures may be only necessary, but not sufficient, to describe what is already known about the structure of software teams. Although we argue in favor of our choice of sources and timeframe for the literature review, it is clearly limited. This limitation of scope and time also occurred in our choice of a project to collect the empirical data.

Our study is also limited by the fact that an individual's statements (like those reported in the in-depth interviews) are populated with incomplete perspectives, bounded rationality, latent intentions, simplifications of reality, and communication skills. Also, the non-disclosure agreement prevented us from revealing the XTeam's perspective about the CuTe's structural design, so our measures did not benefit from triangulation of sources.

Another limitation refers to the very meaning of our empirical values. They are not prescriptions, but reference values from a particular high-performance CuTe. That is, we do not know if it is possible for a CuTe to perform better than our values suggest, and we also do not know if lower values are present in high-performance CuTes.

Limitations also concern the normalization procedure for plotting the measures and metrics in a comparable measurement map. The process relied on the researchers' discretion with the help of a spreadsheet where categories were registered after content analysis.

And the last known limitation is that the very success of The EntERPrise may have produced an overconfident groupthink effect that prevented CuTe members from recalling and reporting less desirable structure-related attributes of the team.

6.2 Future research

Future research should start with a critique of our compilation of theoretical measures. Second, if the nature of CuTe work changes in unexpected ways in the future, it is mandatory to challenge the assumption that the adhocracy is the preferred structural design for CuTes in CISS projects. Third, complementary research should address the other three dimensions in Leavitt's (1965) framework for an ideal design of CuTe work, that is, structural design should be integrated with people traits, technological resources, and task standards. A first effort to frame CuTe cognition and behavior is available in Bellini *et al.* (2012). Fourth, it would be potentially fruitful to compare our results with results from high-performance CuTes that are organized according to other structural configurations in similar projects[6]. And fifth, the On CuTe Structure instrument can be adapted to collect more objective data, such as with Likert scales – but we recommend doing so only after the rationale discussed in this paper is thoroughly validated by our peers.

Overall, equifinality in high-performance work practices (Posthuma *et al.*, 2013) makes us warn that our theoretical measures and empirical values may not be the utmost benchmark for high-performance teamwork. We tried to sketch a roadmap. Future research should have in mind a Chinese proverb that says "to know the road ahead, ask those coming back."

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Notes

1. We do not agree with them, since we frame communications between technological devices as a technology itself or as a task/process.
2. Not to confound with Ancona and Bresman's (2007) concept of X-Team. Ancona and Bresman's concept of X-Team refers to the team's focus of attention (the team's external boundaries), whereas Bellini *et al.*'s (2012) concept of XTeam refers to where the team is located (it is external to the customer organization). The two concepts were developed independently.
3. CISS products are similar to COTS products (Brereton, 2004), but here we emphasize the large customization effort involved in developing CISS in contrast to COTS products.
4. A beta version was available until December 2005. During that period, other systems from PeopleSoft were also implemented, such as human resources management, customer relationship management, and business intelligence.
5. All statements were translated in literal form from the original Portuguese discourses. The words in brackets were inferred from the discourses.
6. We thank an anonymous reviewer for this insight.

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