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Organization structure theories and open innovation paradigm

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Abstract

Purpose – The impact of the e-globalization combined with staggering costs for R&D across industries has resulted in the call for new approach to innovation where openness and interconnectivity is the role. This new approach is designated as "open innovation". The new paradigm calls for the sharing of knowledge and resources in conducting innovation activities within and among organizations. As such, one needs to re-orient the structure of the organization to meet these new requirements. On the conceptual level, it becomes a significant undertake to try to grasp how our traditional understanding of the organization can be fitted within the requirements of the open innovation when the environment of the e-globalization is taken in consideration. The purpose of this paper is to discuss the question of how organization structure theories can be coupled to the open innovation paradigm. Out of that analysis the authors propose a new theoretical framework of organizational analysis that takes both the classical knowledge and the new economic context of e-globalization.

Design/methodology/approach – The contemporary period is recognized by the term "new economy", as a replacement for the "old economy". Another term of importance is "globalization", which is coupled to the issue of economy categorization. Humanity launched the modern age of globalization some decades ago, but we are going through a new type of globalization, *e-globalization*. In the *e-globalization*, processes are induced basically by the impact of the new tools of communication and information technologies. These dynamic processes have forced a re-thinking of the traditional innovation practices. In the paper, the authors reflect on the changes in relation to the traditional knowledge about organization structure, using a deductive approach and textual analysis and relate that to the requirements of an open innovation paradigm. In the process, the authors introduce the basics of the "theory of internetisation dynamics" as a new potential organizational theoretical framework.

Findings – From the analysis, it was found that some traditional concepts about organization structure and organizing mechanism theories are responsive to the needs of the open paradigm settings while other theories are not. However, each of these is able to contribute to one of the five components of the theory of internetisation dynamics.

Originality/value – The authors argue that by using the correct framework for the analysis of the organizational structure, one can propose a set of strategic steps which would help the companies to re-structure. That would save time and effort for policy-makers and managers of firms, as well as researchers active in this field of organization and organizing processes, who are focused on the open innovation transformation requirements of the firms. Running this analysis would add some input into organizational re-orientation in troubled sectors such as in pharmaceutical industries.

Keywords Pharmaceuticals industry, Organizational structures, Organizational theory, E-globalization, New economy, Open innovation, Actor-network theory, Theory of internetization dynamics

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Introduction

Background

Internet has dramatically reduced the transaction costs in respect to "point to multipoint" communication, making it easier for brokers and other information providers to supply information to their customers (Globerman *et al.*, 2001).

Abouzeedan and Leijon (2004) argued that we are going through a new type of globalization that is the e-globalization. In the e-globalization, firm internationalization processes are induced basically by the impact of the new tools of communication and information technologies (IT). Abouzeedan and Townsend (2005) reflected on these changes in relations to the traditional knowledge we have about organizations structure. The two writers found that traditional organizational theories cannot be taken to be valid in the e-globalization age without some reflection. Organizations need to adapt to the new realities of the e-globalized economy and allocate their resources differently. Economies develop different levels of entrepreneurial activities depending on the degree of availability of tangible as well as intangible resources (Abouzeedan *et al.*, 2009). These are designated as capitals (Abouzeedan *et al.*, 2009). In a previous work by Abouzeedan and Busler (2006), a new type of capital, i.e. innovation capital, has been suggested to serve as an indicator for the degree of richness of the entrepreneurial environment in an economy. The innovation capital concept proposed by Abouzeedan and Busler (2006) encompasses traditional components such as human capital and financial capital, but has also new forms of capital embedded in it such as the system capital. Innovation activities in the modern economies are leaning to be more interconnected and open in their nature (Abouzeedan *et al.*, 2009). Abouzeedan *et al.* (2009) defined and incorporated a new component within the innovation capital, namely open capital to deal the issue of accessibility and openness in the innovation process. Corely *et al.* (2002) related the physical, research and development (R&D) and human capital and used them to define innovative capacity of society. However, expenditures in R&D may be a waste of resources if the firm does not have the skills to transform them into commercial success (cs. Ballot and Taymaz, 1997). Information and Communication Technologies (ICTs) facilitate and enhance the innovation process (Awazu *et al.*, 2009). ICTs catalyzes fundamental changes in the structure, operations and management of organizations by facilitating and enhancing a variety of functioned and capacities (Turban *et al.*, 1999). These include: performing high-speed high-volume calculations; generating fast, accurate and inexpensive communication between organizations; and storage of easy accessible amount of information and increasing efficiency of the working force (Turban *et al.*, 1999). Such enhanced capacities are of great significance when creating an open innovation management routines (Abouzeedan *et al.*, 2009). Organizational thinking has also impacted our way of dealing with life cycles (Klofsten, 1992) and induced open nature of firm performance modeling as in the business platform model (Klofsten, 2010).

Open innovation has merged as a system model where enterprises commercialize their internal and external ideas and technologies and use, for that purpose both their external and internal sources (Fredberg *et al.*, 2008). The writers laid down number of significant roles of the ICTs. The first is to help organizations to understand the sources of ideas. The second is to help firm capturing ideas from the sources and the third is to enable the distribution of ideas (Fredberg *et al.*, 2008). One development out of the e-globalization and IT revolution era is the creation of the internet. Dana *et al.* (2002) introduced the term "internetization" to describe and capture "the process of adoption and diffusion of e-business systems and Internet technologies by innovative entrepreneurs." These scholars argued that the six stages of "internetization" include non-adoption, trial internet use, reactive internet trading, active exploration of internet, integration of operations with the internet and finally internet portal development. Related to the paradigm "internetization" is the issue of openness in the innovation activities. Utilizing full capacities of ICTs firms and organizations can easily

coordinate their innovation efforts via an open innovation management system using the techniques and tools of internetization management. The term "internetization management" was first introduced in Abouzeedan *et al.* (2003).

Polenske (2001, 2002) has theorized and studied the dispersion processes of firms as opposed to the clustering processes, due to the IT impact. Organizations can be studied from different angles (Robbins, 1998). One such approach is "task characteristics" (Robbins, 1998). The task characteristics approach began with the pioneering work of Turner and Lawrence in the mid-1960s (Robbins, 1998). Turner and Lawrence (1965) developed a theory to assess the effect of different kinds of jobs employee satisfaction and absenteeism. Turner and Lawrence's requisite task attributes theory laid the foundation for the "job characteristics model (JCM)" (cs. Hackman and Oldham, 1976).

Another important model in relation to the task characteristics is the social information processing (SIP). The central thesis in the SIP model is the fact that people respond to their jobs as they perceive them rather than to the reality of jobs themselves (Robbins, 1998). Total quality management programs seek to achieve continuous process improvements so that variability in management practices is constantly reduced (Robbins, 1998). Re-engineering demands re-thinking and re-designing those processes by which the organization creates value (Robbins, 1998). The new conditions of the e-globalization economy necessitate a re-examination of the existing organizational theories (Abouzeedan and Townsend, 2005). In their paper, Abouzeedan and Townsend (2005) have discussed the validity of the most prominent organizational theories, taking in consideration the nature of the new IT-based economy. Their analysis showed that some of the organizational theories decreased in their validity and significance in the new e-globalized economy, while others were not altered in their importance. Some theories, according to the two writers, on the contrary, have increased in their significance. Within the closed system category of theories; the two theories which have increase in their significance according to the two writers are the human relations theory and the conflict model. Both of the two theories are within the natural close system perspective of organizational analysis (Abouzeedan and Townsend, 2005).

Also, and as Abouzeedan and Townsend (2005) argued, within the open system category of theories, there were five theories which had increased significance. The first three theories (bounded rationality, transaction costs and knowledge based) are within the group of theories which are taking the rational perspective of organizational analysis. The other two theories, the organizational ecology and resource dependence are representative of the natural perspective (Abouzeedan and Townsend, 2005).

It is clear from the analysis conducted in Abouzeedan and Townsend (2005) that, in more recent times, the theories treating the organization as an open system has increased in significance in relation to the theories treating them as a closed system. The single theory which is most affected positively by the e-globalization realities is the transaction costs theory (Abouzeedan and Townsend, 2005). This is logically sound because the IT tools are breaking the boundaries of organizations, exposing them increasingly to the impact of the external environment (Abouzeedan and Townsend, 2005). Abouzeedan and Townsend (2005) stressed that it is vital for any scholar studying the process of organization formation to try to understand the processes and events that are taking place before looking at the actors behind the events. This view reflects the more recent approach of actor-network theory (ANT) in analysis of organizational structures (see Czarniawska, 2005; Callon, 1986, 1997; Callon and Latour, 1981). It seems that the conflict theorists, including Carl Marx, have traditionally

emphasized the actors rather than the actions (Abouzeedan and Townsend, 2005). Marx had pre-positioned his view against the capitalistic human players in the economic arena and out of that he tried to explain the conflict processes and their mechanisms. In reality the conflict was rather between two methods of production thinking and not conflict between managers and workers (Abouzeedan and Townsend, 2005).

The first section of the paper is a general introduction to the topic. The second section discusses innovation capital while the third section looks at the existing organizational theories. In fourth section, we look at the IT and relating that to the issue of organizational structures. In the next section, we discuss the open innovation paradigm. In section that follows, look at the relevance of the existing organizational theories to open innovation and in penultimate section, we present the theory of internetization dynamics. In the last section, we draw our conclusions.

Innovation capital

Two types of classical capitals are often mentioned in relation to the innovation capacity of society namely human capital and financial capital (Abouzeedan and Busler, 2006). The other two components, system capital and open capital are recent additions to the concept of "innovation capital." The concept of innovation capital was first introduced in a working paper by Abouzeedan and Busler (2005).

Human capital and financial capital

Human capital reflects on what individuals can contribute to in relation to different contexts such as: economic development, organizational output, organizational efficiency and innovation processes. Such contribution has both a micro level and an aggregate macro level. The human capital quality can be expressed in different ways, among them is as labor productivity. A better quality of labor should result in more productive organization. Abouzeedan and Busler (2006) argued that innovation expressed as R&D can be incorporated, to certain extent, with human capital. R&D leads to the creation of knowledge which may have a direct affect on technological change because investment in R&D can create spillovers (Romer, 1986). Empirical evidence shows that countries with higher R&D per employee have higher levels of total factor productivity growth (cs. Coe and Helpman, 1995). Technical change increases the relative productivity of human capital if education and other skills assist in the more rapid application of new technologies (Adams, 1980). According to Ballot and Taymaz (1997), typically R&D and human capital are merged under the categories of "receiver competence" (Eliasson, 1990), "knowledge base" or "absorptive capacity" (Cohen and Levinthal, 1990). Understanding the value of investments in education as a way to enrich human capital in societies resulted in studies aiming to estimate private returns from knowledge (Becker, 1975).

Financial capital, in relation to innovation, is reflective of the financial resources invested in the innovation activities. This type of capital can be related to both the micro and macro environments of the firm. Some early studies assumed that short-term growth was largely driven by capital investment, while growth in the long run was assumed to be due to exogenous technological change (Corely *et al.*, 2002). Innovation activities have the nature of being time consuming, not the least in medical and biomedical sciences. That is worrying if one knows that pharmaceutical companies tend to use closed innovation approach to their R&D activities (Abouzeedan *et al.*, 2009). Financial capital availability is of great importance to firm survival and growth (Abouzeedan and Busler, 2006). This is a critical issue for start-ups and small- and medium-sized enterprises in general.

System capital

The system capital is an indicator of the level of support that individual firms receive from various governmental and non-governmental sources (cs. Abouzeedan and Busler, 2006). The non-governmental institutions include public establishments, private firms, unions, associations, etc. The form of such support is varying in accordance with the structure and aims of such institutions (Abouzeedan and Busler, 2006). System capital is more related to the aggregate nature of the economy. Abouzeedan and Busler (2005, 2006) emphasized that their definitions of the system capital is excluding any financial support coming to the individual firm as this is covered within the financial capital concept. This type of capital looks at the macro environment and its ability to secure the non-financial needs of the firms (Abouzeedan and Busler, 2005, 2006). System capital should not be confused with structural capital. The structural capital, in its classical context (cs. Allee, 1999; Zangoueinezhad and Moshabaki, 2009; Ordonez de Pablos, 2004; Sveiby 1997) is an embedded component in the intellectual capital concept. Intellectual capital relates to intangible assets of the enterprise (Sveiby, 1997; Sveiby and Risling, 1986; Edvisson and Malone, 1997; Roos and Roos, 1997; Roos *et al.*, 1997).

Open capital, the fourth component of innovation capital

Innovation richness of an economy requires more open and interactive attitude among the economic actors of society (Abouzeedan *et al.*, 2009). In the traditional definition of innovation capital as proposed by Abouzeedan and Busler (2006), this component is absent. In a later work, Abouzeedan *et al.* (2009) tried to incorporate the openness aspect and defined open capital as:

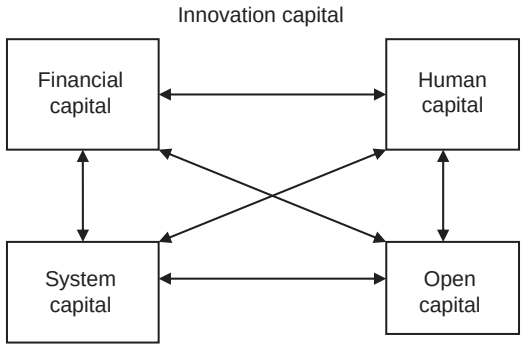
> The Open Capital includes, and not restricted to, all the networking resources which facilitates for the various actors to share and fully benefit from each others' tangible and intangible assets in a trust-worthy and open manner. This type of capital thus represents the texture that binds the other components within the Innovation Capital and gives them the ability to impact the innovation processes.

Open capital operates both at the micro as well as the macro levels of economy (Abouzeedan *et al.*, 2009). This is to the difference from the human capital and financial capital forms which are active at the micro level and from the system capital which has its impact apparent at the macro level of economy (Abouzeedan *et al.*, 2009). Open capital as a term should not confused with the open capital concept known in the financial management literature (Abouzeedan *et al.*, 2009). The new innovation capital with its four components is represented in Figure 1. The four components of innovation capital are in reality well connected and they feed to each other, enriching the innovation activities (Abouzeedan *et al.*, 2009).

Organizational theories

Background

There are different ways to look at organizations, analyzing their organizational behavior and grasping the processes driving their functionality and build-up. These include, basically, four lines of thinking as propagated for by organizational theorists. Researchers looked at organizations as: rational closed system, natural closed system, rational open system and finally as natural open system (see Scott, 2003, p. 108).



Source: Abouzeedan *et al*. (2009)

Figure 1.
Components of the innovation capital including the open capital

The rational closed system approach

The rational approach to understand organizational structure emphasizes the legal, task-oriented perception of organizational analysis (Scott, 2003). The rational system approach see organizations as instruments designed to attain specific goals (Scott, 2003). Some of the organizational theories within this category are discussed below.

The scientific management is one of the early representative theories of the close rational system perspective of organization analysis. This theory is coupled strongly with Fredrick W. Taylor. The theory discusses the way the production processes can be performed to obtain an optimal output, using the concept of "division of labor" (cs. Taylor, 1911). In such approach each worker is specialized in performing one single moment or subtask in the manufacturing process. Taylor, in his analysis looked only at the internal processes and neglected any interaction between the organization and the external environment (Abouzeedan and Townsend, 2005). Later on, Taylorism became synonymous with the deskilling and dehumanization of work (Magretta, 2003). Taylorism can be seen as the logical result of developments between years 1880 and 1920, in which engineers took the lead in the efforts to rationalize the industrial organization (cs. Shenhav, 1995, 1999). As pointed by Magretta (2003), the real limitation in Taylor's approach was its single-minded focus on the manufacturing efficiency of firms. Taylor assumed that the product output value meant making whatever you were making more efficiently. It did not occur to him to question whether you were making the right things to begin with, or whether one can create more value by involving the customer needs in production decisions.

Within the same decade a second approach which emphasized the management functions was introduced. Known as, the administrative theory, this parallel attempted to generate administrative principles to be used as guidelines for the rationalization of organizations and their activities (Scott, 2003). An earliest pioneer from this school is the French industrialist, Henry Fayol (1919/1949). Among American scholars who developed further this concept were Mooney and Reiley (1939) and Gulick and Urwick (1937). Two principles are considered the core of the administrative management theory, coordination and specialization (Massie, 1965). The principles of administrative management drew criticism because the theory neglected the question as to how decision is made in organizations (cs. Simon, 1945/1997; March and Simon, 1958).

The theory of bureaucracy is only one component of much more encompassing analysis work by the German writer, Max Weber, one of the most influential sociologist/political economists of the modern era. Weber believed that the most important feature distinguishing western civilization from rest of the world is the growth of the importance of rationality in the west (cs. Simon, 1945/1997; March and Simon, 1958). Weber utilized this focal point to analyze the legal, religious, political and economic administrative systems (Scott, 2003). Weber (2002) distinguished the bureaucratic systems from traditional administrative forms. According to him, the basic differences between the two have to do with the role played by each system. The bureaucratic system assumes the central role of the traditional power structure while the administrative one stresses the legal system power authority in its three forms, traditional, rational-legal and charismatic (Scott, 2003). Despite being been influential, the Weberian bureaucratic theory has drawn criticism based on various arguments (see Thompson, 1961; Dalton, 1950, 1959).

The rational closed system model of organizational structures was influential during the years 1900-1930 (Abouzeedan and Townsend, 2005).

The natural closed system approach

The rational closed system analysis emphasizes the existence of other type of individual goals of participants of social nature. The natural analysts are more concerned with the informal organizational structures and the values of participants rather than of the formal organizational build-up. There are a group of theories which are included of this category as the following.

The theory of cooperative system emphasizes the cooperative nature of organizing process. This organizational thinking is attributed to Chester I. Barnard (Scott, 2003). Barnard has looked at organization as a framework to coordinate the contributions of the individual participants (Barnard, 1938). Barnard's conception of an organization as a purposefully coordinated system of communications linking all participants became the foundation for Simon's theory of decision making (Scott, 2003). Barnard's views thus contain many ideas that are consistent with a rational system conception of organizations. What separates the two theories apart is Barnard's focus on the non-material, informal, interpersonal, and, indeed, moral basis of cooperation (Scott, 2003).

The human relations theory of organizational thinking emphasizes and recognizes the complexity of human motivation and the importance of the informal structures in organizations. This view was first heightened by the Harvard Business School researcher, Elton Mayo (1945). While Mayo used a structural level of analysis of human relations, the discovery of informal groups in organization was pursuit by a second group of researchers. They carried the analysis using social/psychological approach. The theory was tested by social psychologists such as Likert (1961) and Katz *et al.* (1951). Among the most famous sociologists of the human relations closed system approach was Whyte (1951, 1959).

The conflict model of organizational of analysis emphasizes that formal organizations, like all other social groups, has a core overriding objective, i.e. to survive (Scott, 2003). When discussing "conflict processes" via the conflict model, writers have to examine the work division issue which has been deeply imbedded in classical economic literature (Robbins, 1998). Gouldner (1959) stressed that internal conflicts would appear when organizational goals differ from that of the participants of the organization. In reference to Scott (2003), there are two great figures of European social thinking, with great interest in the conflict aspect of organization: Max Weber

and Karl Marx. Weber is considered as one of the early conflict thinker because of his emphasize on the authority structure of the organization (Scott, 2003). Gouldner (1954) has tried to uncover some of the tensions in Weber's theory of bureaucracy. Karl Marx, on the other hand, did not seriously begin to make impact on organizational thinking until much later (Scott, 2003). Consistent with the origins of the natural system perspective, the Marxist approach began essentially as a critique of the dominant rationalist views and of the mainstream natural system models (Scott, 2003). Marxists argue that organizational structures are not rational systems for performing work in the most efficient manner; rather, they are power systems designed to maximize control and profits (Scott, 2003). Collins (1975) combined the Weberian and Marxian themes on social conflict to arrive at a general critical theory of organizations.

Abouzeedan and Townsend (2005) saw no reason to understand concepts of efficiency and affectivity within only the context of a conflict. They argued that higher return due to the application of these management concepts, given the existence of good wealth – distribution policies of organizations – would lead to better benefit for the workers. Dowd (2002) analyzed the development of the theory of capitalism seeking to understand how the theory has progressed through the last two centuries and in the process his analysis penetrated also into the conflict aspect of the capitalistic approach.

The natural closed system approach was influential during the years 1930-1960 (Abouzeedan and Townsend, 2005).

The rational open system approach

The rational open system view organization as a non-bounded entity which is in interaction with its surroundings. This approach emphasizes the rationality of the organizational processes as well as the interdependence and exchange between the organization and the environment. Theories in this category include the following.

Herbert Simon (1945/1997) first propagated for a rational close system approach in his administrative behavior theory. Later on he changed his views as a result of collaboration with another organizational theorist, James G. March. When the two men came in contact, Simon started to see the organization as more open to its environment (cs. March and Simon, 1958). The two writers proposed the bounded rationality concept. Simon, in his later works, incorporated innovativeness as an ingredient in the decision-making and problem-solving management (Scott, 2003).

Lawrence and Lorsch (1967), were first to use the terminology "contingency theory." The contingency school of organizational analysis emphasizes the existence of multiple numbers of environments corresponding to different types of organizations (see Lawrence and Lorsch, 1967). Adaptability to environment is the core concept in this theory. The combination of rationality and openness of the organizational systems is clear in James D. Thompson's work (Scott, 2003). Thompson (1967) was among the first who recognized the importance of the environment for the structure and performance of organization. Galbraith (1973) stressed the two assumptions underlying contingency theory:

(1) there is no one best way to organize; and

(2) any way of organizing is not equally effective.

The first assumption challenged the administrative theorists who sought to develop general principles applicable to organizations in all times and places (Scott, 2003).

The second assumption undermined the view, held by early economists developing the theory of the firm, that organizational structure is irrelevant to organizational performance (Scott, 2003). Galbraith (1973) connected the extent of environmental challenge with organizational information systems. According to him environmental uncertainty enters the organization by affecting the work or tasks it performs (cs. Galbraith, 1977). According to Abouzeedan and Townsend (2005), Galbraith's approach to contingency of theory is more realistic to the situation today. Environments of today are more hocked to the information systems used in managing organizations (Abouzeedan and Townsend, 2005).

Almost at the same time that theorists proposed the bounded rational and contingency concepts another line of research looked at the variations of organizational structures; in an empirical way (Scott, 2003). That introduced the concept of the comparative structure (cf. Udy, 1959; Woodward, 1958; Pugh *et al.*, 1969; Pugh and Hickson, 1976; Blau, 1970). According to this theory, the formal structure of the organization is the dependent variable while a large number of independent variables were used (Scott, 2003). These are mostly the environmental factors (Scott, 2003). The comparative structure theory looks at organization as a production system which tries to maximize output using efficiency and affectivity mindset to the processes involved (Scott, 2003).

A recent approach which looked at why organizations are formed emphasized a cost reduction drive. This explanation, known as the transaction cost, stresses the reduction in transaction cost resulting from organizing and organization build-up (Scott, 2003). The reduction in transaction costs approach was first proposed by Coase (1937). Later on it was revived and extended by Williamson (1975, 1985, 1994).

Earlier works on competitive advantage of organization emphasized the tangible resources such as financial capital and location (Scott, 2003). Recent efforts stress the importance of the intangible resources, such as knowledge, as a competitive weapon, introducing the knowledge-based theory (Scott, 2003). Among the main researchers who emphasized that aspect are Nonaka and Takeuchi (1995). Most analysts of this school have drawn on earlier works of Polanyi (1967), who have stressed the importance of the distinction between the codified, recordable knowledge and the embedded, non-recordable "tacit" knowledge (cf. Nelson and Winter, 1982; Badaracco, 1991).

The rational open system approach has been influential during the years 1960-1970 (Abouzeedan and Townsend, 2005).

The natural open system approach

In the previous subsection, we have covered the theories analyzing organization, rationality, as an open system. Another open systems' perspective of organization analysis is emphasizing the natural approach. The natural open system approach focusses on the values and motivations of the participants. Theories presenting this approach are discussed below.

Weick (1979), argued that the productivity or viability is not necessary related to the successful interlocking of behaviors. An increase of the productivity is not necessarily dependent on specific behavior. So the core concept of Weick's work is that organizations evolve and grow through trail and error related to the efforts conducted to meet the challenges facing them (Scott, 2003). This argumentation resulted in the organizing models' approach to organizational build-up (Scott, 2003). Weick (1979) assigned a greater attention to the cognitive processes involving trail and error, chance,

superstitious learning and retrospective sense making. This is in difference to Simon's approach which emphasizes the administrative behavior of the closed rational systems (cs. Simon, 1945/1997).

The scientific management school treated the technical and social needs as two different spheres and cared only for the first sphere (Scott, 2003). The socio-technical system approach to organization argues that the needs for the individuals as well as the social units or organizations should be cared for in regard for the technical adjustment (Scott, 2003). The socio-technical school propagates for an optimal joint strategy which combines both the technical as well as the social needs of organizations (Scott, 2003). The scholars struggled to understand the connection between the human and inhuman sides of organizational activities (see e.g. Jaques, 1951; Emery, 1959; Trist, 1981). The socio-technical school of thinking was based to a great extent on the work of the scholars at the Tavistock Institute of Human Relations, England, which started as a voluntary outpatient center for psychotherapy (cs. Scott, 2003). The Tavistock Institute has developed a typology of organizational environments and used that to study larger firms (Miller and Rice, 1967).

The first two models of the open nature system perspectives, i.e. the organizing approach (Weick, 1969, 1979) and the socio-technical systems (Miller and Rice, 1967), used social/psychological and structure levels of analysis, respectively. The other schools of the open system natural analysis used ecological approach (Scott, 2003). The first of these is the organizational ecology theory. The ecological analytical view of the social system started as early as the beginning of the Darwinian area (cs. Hofstadter, 1945). Actually, the analysis itself utilizes the Darwinian Theory on the origin of species and his other related works to study the social systems. More serious efforts in that direction started to take shape after Second World War. Applying the Darwinian analysis of social system to organizations by scholars such as Hannan and Freeman (1977, 1989) and Aldrich (1979, 1999) has led to further developments and promotion of the organizational ecology approach.

In contradiction to the organizational ecology, which emphasizes selection process, the resource dependence school promotes adaptation as a way to undertake organizing activities and organizations (Scott, 2003). The approach of adaptation to environment has been labeled as "resource dependence" by Pfeffer and Salancik (1978). Other scholars labeled it differently, such as "political economy" (Zald, 1970; Wamsley and Zald, 1973) and "power dependency" (Thompson, 1967).

The institutional theory approach is a major open system theory which uses the natural analogy as to the way firms interact with their external environment (Scott, 2003). The difference between it and the contingency theory is that the institutional approach is more concerned with impact of the macro institutional actors of society on organizations while the contingency approach is more based on the micro environment of the firm.

The macro actors of today are dispersed on a wide geographical area and not localized (Scott, 2003). Early work by political scientists, such as Burgess (1902), by economist such as Commons (1924), and by sociologist such as Cooley (1902/1956) and Weber (2002), recognized the extent to which organizations were shaped by political and legal frameworks, the rules governing market behavior, and general belief systems. The most recent version of institutions – the view associated with "the new institutionalism in organizational analysis emphasizes the role of cultural-cognitive processes in social life" (Powell and DiMaggio, 1991). The natural open system approach is influential since 1970 (Abouzeedan and Townsend, 2005).

One of the benefits of the analysis of the validity of organizational theories, according to Abouzeedan and Townsend (2005), is the ability of researchers to evaluate the credibility of new coming theoretical concepts and its applicability within the context of the new IT-based economy. As an example of this perspective, one can investigate whether the ANT can be utilized without reservation in the environment of the e-globalization (Abouzeedan and Townsend, 2005). Referring to Olla *et al.* (2003), the idea of ANT was first proposed by Michel Callon and Bruno Latour (see Callon, 1986; Callon and Latour, 1981). The theory provides a unique socio-technical approach for understanding the creation of networks of aligned interests. In reference to Olla *et al.* (2003), ANT declares that the world is full of hybrid entities (see Latour, 1993) containing both human and non-human elements, corporeal and non-corporeal artifacts of all kinds. The theory was developed to analyze situations where separation of these elements is difficult (Callon, 1997). If one looks at the socio-technical systems view presented in the works of Miller and Rice (1967), and which stressed combined strategy in which the technical element is attached to the social value of the organization, then, one can find interesting results (Abouzeedan and Townsend, 2005). The validity of the socio-technical concept in the e-globalization age is not affected (Abouzeedan and Townsend, 2005). Applying that to the ANT, one can also reach to similar results. In this way, Abouzeedan and Townsend (2005) argued that, one saves the time and effort needed if we have to accommodate a trial and error approach in relation to acceptance or refusal of new streams of organizational analysis concepts.

IT and organizational structures

IT and open organizational structures

ICT is causing the organizations to adapt the open structure, in contrast to the classical close structure (cs. Scott, 2003). Potential benefits that an organization can obtain when it utilizes IT may be extensive and they may include efficiency gains, increased management effectiveness and improved business performance (Fink and Kazakroff, 1997). There are a lot of works which looked at how the IT revolution has affected organizations and their operations.

Allarakhia (2009) argued that the vertically integrated organizational structure facilitate innovation activities which are internally focussed while the new forms of organizational structures are more fluid and open, allowing for integration the internal and external sources of innovation. Abouzeedan *et al.* (2003) and Abouzeedan and Busler (2005, 2006), borrowed the terminology "internetization" (see Dana *et al.*, 2002) to propose and anticipate another type of firm management which is more suitable to open organizational structures. He called it "internetization management." In such management style, the marketplace is the whole globe and there are no geographical borders or physical barriers for exchanging ideas and resources except for the ability of the firm to absorb the "internetization" technologies. It is worth stressing that internetization management is more concerned with management techniques, frameworks and tools in the e-globalized era rather than the philosophical abstractism of management paradigms such as open innovation management. Such innovation paradigm stresses openness and cooperation in the innovation activities. It demands the usage of an open business model (cs. Chesbrough, 2003a). Lakhani and von Hippel (2003) listed types of incentives which are driving the firm to use open-source software.

Organizations and their definitions

Scholars have looked at organizations from different perspectives to define them. For example, Scott (2003, pp. 25-30) presents three basic definitions of organizations, organization as a rational closed system, organization as a natural closed system and organization as an open system.

In general, the rational closed system perspective to organizational analysis looks at the logical, task-oriented mission of the organization. That is why there is more than one way to describe the rational perspectives. Scott (2003, p. 26) presents four of the most influential definitions for the rational closed system perspective existing. These are exemplified by Barnard (1938, p. 4); March and Simon (1958, p. 4); Blau and Scott (1962, p. 5); and Etzioni (1964, p. 3). Scott (2003, p. 27) defined the organization, based on this approach, such that: "Organizations are collectivities oriented to the pursuit of relatively specific goals and exhibiting relatively high formalized social structures."

In the natural closed system view of organization, the observer is not merely concerned with the existing of tasks and objectives but rather how the individuals and participants perceive these tasks. The interaction between the participants and the formal structures within an organization is a focal point in the analysis which considers an organization as a natural system (Scott, 2003). Thompson (1967) argues that the rational system perspective is most applicable to at the technical level of the organization. The natural view emphasizes building upon tasks of organization, while also taking in consideration, the employees, their dreams, aspiration and involvement in that.

The previous two definitions of rational and natural systems tend to view the organization as a closed system, isolated from its environment and encompassing a set of stable and easily identified participants (Scott, 2003). However, organizations are not closed systems, sealed off from their environments, but are open to and dependent on flows of personnel, resources and information from outside (Scott, 2003).

Open innovation

Life science industry started recently and due to escalating costs of R&D to seek collaboration with academic institutions to stimulate and enhance their innovation activities through what is described at "open innovation system" (Melese *et al.*, 2009). The term "open innovation" was first proposed by Henry Chesbrough to describe how knowledge and technology is increasingly benefiting from the integration of knowledge and expertise from multiple sources to develop and create new products (Chesbrough, 2003b). Using the external knowledge relations more extensively as a compliment to in-house research influences the way firms are organizing and manage its innovation activities (Teirlinck and Spithoven, 2008). The nature of the innovation has changed, from suing linear model on innovation to using non-linear innovation models (Kline and Rosenberg, 1986). The non-linear innovation model focusses on the learning processes within and between firms (Teirlinck and Spithoven, 2008).

The nature of the open innovation model facilitates for the firms to adapt their business model in favor of R&D activities and technical change that take place outside the firm. As thus the innovation effort is distributed between various parties (von Hippel, 1988). Many notions and concepts were introduced to the innovation literature in relation to the new ways by which organizations run and conduct their innovation activities. Among such notions are: innovative environments (Aydalot, 1985), clusters (Porter, 1990), innovative milieux (Camagni, 1991), regional innovation systems

(Cooke, 1992) and learning regions (Florida, 1995). Laven (2008, p. 48) called the three theories of innovation systems, clusters and triple helix, theories of innovation-producing arrangements. This is because these theories emphasize the interaction between organizations in innovation production. Open-source R&D is another noble approach to conducting research allowing scientist and academicians to join forces across organizations offering their competence freely in order to help solving the various common problems (Munos, 2006).

The talk about the open innovation and promoting it as a new notion comes as a result of the increasing complexity of innovation and how innovation management should cope of this complexity (Teirlinck and Spithoven, 2008). In open innovation, external knowledge relations are vital elements and are complementary to the internal research (Cohen and Levinthal, 1990; Veugelers, 1997; Chesbrough *et al.*, 2006). Traditionally, business models tended to be closed systems. However, there are emerging examples of how open business models do support open innovation (Chesbrough, 2006).

Open innovation is expected to play a huge role in dealing with sectors where product development is very complex such as in pharma industry (Hedner *et al.*, 2011).

Innovation systems need energizers, who are players which are able to trigger the innovation process (Etzkowitz and Klofsten, 2005).

Relevance of existing oganizational theories to open innovation paradigm

Based on the discussion about the core concepts in the existing organizational theories (see "Organizational theories") and the nature of the open innovation paradigm in the previous section, one can draw a general discussion about the relevance of the different theories to the open innovation paradigm. This analysis is stated in Table I. There are four general observations that can be drawn from that analysis:

(1) Organizational theories related to the open system approach have higher degree of relevance to open innovation than the closed system approach. This sounds logical because the open innovation necessitates an open approach to the invention and innovation activities.

(2) Organizational theories related to the rational open system approach have the highest level of significance among the four approaches of organizational analysis. This indicates clearly that in modern thinking rationality is more dominant than the natural perspective.

(3) Organizational theories related to the natural close system approach have also a high level of significance in comparison to the rational closed approach. This indicates a clear need to emphasize the role of the participants in our analysis of organizational processes. Having that group with theories within the closed system indicates that the participants' impact on the organizing processes has been neglected when theorists moved from a closed system approach to an open one. Rationality was more emphasized than naturality.

(4) The least significant of the organizational theories, to the open innovation paradigm, are the ones who adapted the rational closed system approach.

Theory of internetization dynamics

Based on the previous discussion about the different organizational theories and relating that to a more recent understanding of how organizations would be

Theory	Relevance to open innovation	References
Rational-closed systems		
Scientific management	High	Taylor (1911)
Administrative theory	Low	Fayol (1919/1949), Simon (1945/1997)
Bureaucratic theory	Low	Weber (2002)
Natural-closed system		
Cooperative systems	High	Barnard (1938)
Human relations	High	Mayo (1945), Whyte (1959)
Conflict models	High-medium	Gouldner (1954)
Rational-open systems		
Bounded rationality	High	March and Simon (1958)
Contingency theory	High	Lawrence and Lorsch (1967) Udy (1959), Woodward (1958), Pugh *et al.* (1969),
Comparative structure	High	Pugh and Hickson (1976), Blau (1970)
Transaction cost	High	Williamson (1975)
Knowledge based	High	Nonaka and Takeuchi (1995)
Natural-open systems		
Organizing models	Medium	Weick (1969)
Socio-technical systems	High	Miller and Rice (1967)
Organizational ecology	Medium	Hannan and Freeman (1977, 1989), Aldrich (1979, 1999)
Resource dependence	High	Pfeffer and Salancik (1978)
Institutional theory	Medium	Selznick (1949), Meyer and Rowan (1977), DiMaggio and Powell (1983)

Table I.
Relevance of existing organizational theories to open innovation paradigm

understood in relation to the IT revolution and the e-globalized environment, we proposed a grand theoretical framework of organizational analysis that takes both the classical knowledge on organizational build-up and structuring and build-up on that.

The framework we propose would have five components, each of these components cover a part of the organizing processes of importance in organization build-up. These components are virtual socialization, cost reduction, effectiveness and efficiency, internetization management paradigm, innovation as a problem-solving tool and virtual contingency. We discuss each of the five components below.

Virtual socialization

The "virtual socialization" refers to the social aspects of the organizing process with the context of the new e-globalized economy. This component of the theory captures the participants' values. It encompasses them natural dimensions of the organization process.

Cost reduction, effectiveness and efficiency

The "cost reduction, effectiveness and efficiency" component deals with the issues of the costs involved in the organization's activities. This component captures the efficiency and effectiveness aspects of the organizing process and the cost reduction resulting out of that.

Internetization management paradigm
The "internetization management paradigm" is related to the managerial processes and routines coupled to the intensive usage of the new IT tools such as internet in the organizational build-up. This component captures the management values and the managerial performance of the organizing processes.

Innovation as a problem-solving tool
The "innovation as a problem-solving tool" component of the theory covers the contribution that innovation activities can deliver to the building up of an organization. This component captures the innovative thinking and the problem-solving approach to the organizing processes and the output coming as a result.

Virtual contingency
The "virtual contingency" component of the theory covers issues related to the virtual environment within which the organizational build-up in modern economy is taking place. This component captures the impact of the environments within which the organizing processes are performance.

The connection between each of these five components and the existing organizational theories are stated in Table II. From Table II one can see that the proposed theory captures the nature of the organization within its historical development. It covers both the closed and open system and the rational and the natural.

Conclusion

To analyze the process involved in an organization build-up, scholars have proposed through time various explanations, in form of organizational theories (Scott, 2003). Recently there was an interest to see how the theoretical heritage of organizational thinking can be understood in relation to the new facts created by the ICTs, and the

No.	Component	Similarity of component to	Basic concept
1	Virtual socialization	Cooperative systems	Cooperative nature
		Human relations	Human motivation
		Socio-technical systems	Combined strategy
		Actor-network theory	Socio-technical construct
		Conflict model	
2	Cost reduction/effectiveness	Scientific management	Efficiency
		Transaction cost	Production system
3	Internetisation management paradigm	Administrative theory	Management function standardization
		Comparative structure	Output maximization
		Organizing models	Trial error
4	Innovations as problem-solving tool	Administrative theory	Decision making
		Bureaucratic theory	Legal authority
		Bounded rationality	Innovative problem solving
		Knowledge based	Knowledge enhancement
		Institutional theory	Impact of institutions
5	Virtual contingency	Contingency theory	Adaptability to environment
		Organizational ecology	Environmental selection
		Resource dependence	Environmental adaptation

Table II.
The components of the "internetisation dynamics theory"

resulting e-globalized economy (Abouzeedan and Leijon, 2004). The analysis discussed the validity of the organizational theories in the context of this new economy (Abouzeedan and Townsend, 2005). In this recent work we took the discussion further and proposed new framework of organizational analysis. We called this framework "internetization dynamics theory." The new theory has five components, namely, virtual socialization, cost reduction, effectiveness and efficiency, internetization management paradigm, innovation as a problem-solving tool and virtual contingency. The components of the framework are able to cover the classical organizational thinking but also incorporate new inputs of modern management thinking such as "internetization management" into its texture.

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