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Internet technologies and interactivity of management control systems: some empirical evidence

Abstract

The article seeks to address the question whether or not the dynamic environment characterized by the organizational and competitive patterns of the information economy influences the interactivity of management control systems. Particularly, the research presented in the article aims at comparing and contrasting the degree of interactivity featuring the management control systems of "traditional" versus "internet-based" or "internet-related" companies.

The study is exploratory and descriptive, and it is based both on a questionnaire analysis and on some interviews. The questionnaire was sub-ministered to Italian companies listed in the FTSE MIB 40 (the industrial index, except for banks and insurance companies) and in the FTSE Star (once TechStar).

The article develops along three sections.

In the first part, the aims and motivations of the article are clarified. In the second part, the contingency theory is revisited in the context of information economy and propositions are drafted to frame the factors that may influence the degree of interactivity of management control systems. In the third part, the research design and the empirical evidence are described as a premise to our final discussion of the results.

Concluding remarks essentially suggest that companies leveraging on internet technologies will not necessarily leverage upon the same technologies to foster interactivity of their management control systems.

Keywords: web technologies, management control, contingency theory, interactivity of management control systems.
JEL Classification: M10, M13, M14.

Introduction

In recent years, under the pressure of environmental changes and together with the development of the information economy, interactivity – or better the interactive use of management control − has been indicated more and more as a desirable feature of management control systems. Such feature has represented the research focus of several authors (Simons, 1995; Chenhall, 2003; Bisbe and Oltley, 2004; Henri, 2006; Bisbe and Malagueňo, 2009; Simons, 2010).

Interactivity means alternative generation, *ad hoc* search triggered by exchange of information, organizational dialogue, pervasive involvement into the decision-making processes. Benefits drawn from the interactive use of management control system include better ability to navigate uncertain environment and enhanced power of exploration of strategic options (Simons, 2010).

The overall idea of "the use" of management control as key to interpreting the outcome of management control allowed Simons (1995: 6) to distinguish between diagnostic control systems and interactive control systems. The diagnostic control systems are the essential management tools for transforming intended strategies into realized strategies: they focus attention on goals achievement for the business and for each individual within the business. These systems allow managers to measure outcomes and compare results with preset profit plans and performance goals; without diagnostic control systems, managers will not be able to evaluate if intended strategies were being achieved. These systems relate to *strategy as a plan.* The interactive control systems are formal information systems managers use to involve themselves regularly and personally in decision activities of subordinates. Such systems focus the attention and force dialogue throughout the organization. These systems relate to strategy *as pattern of action*. Particularly, in that model, interactivity serves to hedge against the risks of strategic uncertainties.

Building upon Simons (1995 and 2000), Chenhall (2003) in his contingency-based review, puts forward two extremes in the full range of control taxonomies: mechanistic control and organic control. In the author's words: "Mechanistic controls rely on formal rules, standardized operating procedures and routine. Organic systems are more flexible, responsive, involve fewer rules and standardized procedures and tend to be richer in data" (Chenhall, 2003: 131). More specifically, Chenhall indicates that the prevalence of control systems used either diagnostically or interactively originates the taxonomy of mechanistic control or organic control.

A further contribution to the idea of "the different use" of management control systems is supported by Henry (2006). In his work, the author specified that the diversity of measurement of performance meas-

urement systems (a key element of management control) depends on the interaction between one of the four fundamental functions of performance measurement systems − such as monitoring, strategic decision-making, attention focusing and legitimization, and the organizational culture.

Further studies (Bisbe and Oltley, 2004; and Bisbe and Malagueňo, 2009) analyzed the relationship between interactive use of management control system and innovation. This is particularly relevant to us as internet based and internet related business are innovative organizations (Grandlund, Taipaleenmäki, 2004).

Several studies have highligthed how the use of management control systems supports creative innovation (Chapman, 1998; Ahrens and Chapman, 2004).

A very recent development (Simons, 2010) shows empirical evidence on how management control systems are used to generate an entrepreneurial gap to influence the individual creativity and exploration needed to foster innovation and growth.

Building upon this consideration and given that the control system used interactively in one firm may be used diagnostically in an other (Simons, 1995: 113; Bisbe and Malagueńo), we thus understand that a control system *per se* does not qualify as either diagnostic or interactive. Interactivity is what features a control system. This is the reason why we decided to focus on *interactivity of management control* and not on *interactive control systems*.

In this article, we refer to interactivity of management control systems mainly as diffusion of the underlying information and pervasiveness of the decision-making processes. Such choice is supported by Simons' remark that: "diffusion of information for an interactive system is greater than diffusion for a diagnostic control system. Interactive control systems (…) are designed to be important data sources to the entire management group of a business" (Simons, 1995: 193).

The aim of the present research is to describe the "interactivity" attitude[1] of traditional companies versus Internet companies. The attempt is to investigate the role of internet technologies in promoting interactivity of management control systems.

However, we are also aware that internet technologies are not the only factor which may lead to the interactivity of management control systems (Simons, 2010). We thus explored the way "interactivity" is either fostered or inhibited by other factors such as the environmental dynamism, the organizational complexity, the founder management, and the maturity stage of a firm.

1. Contingency factors, and features of the control systems

In the present section, a literature review is provided to support the contingent nature of management control systems and to propose that the degree of interactivity of management control systems varies in the presence of selected variables or contingency factors, which are typical of contemporary firms.

According to the contingency approach, the most appropriate control system for an organization depends upon certain contingent variables, that is "the system must be matched with circumstances" (Otley, 1987: 8-9). Many advocates of the contingentcy approach contributed to identify the contingent variables (Scapens and Arnold, 1986; Hopwood, 1989, 1988, 1972; Bromwich and Hopwood, 1994, 1986, 1981) whereas other academics debated on the general validity of the theory (Ashton, Hopper, and Scapens, 1991). Early accounting researchers have investigated the importance of environment, technology, structure and size for the design of management control systems[2]. More recent studies have aimed at explaining the effectiveness of management control systems in relation to the nature of contemporary settings. As a consequence, they have examined the relevance of some additional variables such as strategy, new structural arrangements, advanced manufacturing settings and national culture (Chenhall, 2003: 128).

Bernardi (1987: 18) states the quality of the contingency theory lies in: the methodology applied, the highly descriptive power of the theory, the normative usefulness of some theoretical results, the recognition of academics and practitioners. Nonetheless, when one considers real cases, one realizes that what is postulated by the contingency theory would imply at least that: a) the contingency factors are known by companies; b) the control needs can be derived from contingency factors without any cognitive constraint; and c) the implementation of the control system features consistent with the control needs is an organizational change process with no delays and no defaults.

[1] We derived this idea from Chenhall (2003: 127-168), who states that in a contigency based research it is of the utmost importance to understand "…how particular aspects of MCS are consistent with the control "culture" of organizations" (page 132). Most specifically the author defines two types of control culture: the mechanistic and the organic. In Chenhall's words: "Mechanistic controls rely on formal rules, standardized operating procedures and routine. Organic systems are more flexible, responsive, involve fewer rules and standardized procedures and tend to be richer in data" (page 131).

[2] On this point see: Waterhouse and Tiessen (1978) and Otley (1980).

We know that the terms aforementioned show the limitations of the theory. Such theory has not been validated with a robust empirical evidence. Particularly, some critics argue that, notwithstanding the particularistic approach, the contingency theory is based on universal rules, and presumably the descriptive/diagnostic dimension of the theory coincides with the normative one. In other words, the theory assumes that there is no difference between "what it is" and "what it should be". As an example, the process of organizational design is seen by the contingency theory as a rational and deterministic process of organizational optimization (Bernardi, 1987: 1).

Even though we recognize the limitations of the contingency theory, we observe that the contingency-based research has maintained its popularity over the years (Chenhall, 2003: 127; Chapman et al., 2007). Therefore, we decided to use the contingency approach, however, by being extremely careful in the formulation of the research question we avoided to express a normative view on the interactivity of management control systems.

The selection of contingency factors is, however, difficult. The traditional list of contingency factors includes a number of factors such as:

- the predictability of the environment, task uncertainty and predictability of the technologies utilized (Amigoni, 1977; Daft e Macintosh, 1981; Otley, 1987; Maciariello and Kirby, 1994; Anthony, Reece and Hertenstein, 1995; Merchant, 1998; Simons, 2000; Groot and Lukka, 2000);
- the organizational structure as the degree of decentralization, the team based structures, the existence of inter-organizational networks and the leadership (Amigoni, 1977; Otley, 1987; Anthony, Reece and Hertenstein, 1995; Merchant, 1998; Caglio and Ditillo, 2008);
- the company size (Child and Mansfield, 1972; Merchant, 1981; Raid and Smith, 2000);
- the business strategy (such as degree of conservatism of the strategy, the product differentiation, and the degree of entrepreneurship) (Amigoni, 1977; Otley, 1987; Maciariello and Kirby, 1994; Merchant, 1998; Bouwens and Abernethy, 2000);
- the market competitiveness and the availability or the access to scarce resources (Maciariello and Kirby, 1994; Merchant, 1998; Groot and Lukka, 2000);
- the technical feasibility of control (Simons, 2000);
- the expectations of key stakeholders (Maciariello and Kirby, 1994; Merchant 1998; Groot and Lukka, 2000);
- the different stage of the organization life cycle (Grandlund, Taipaleenmäki, 2004);
- the culture, both in terms of national culture (Hofstede, 1980-a, 1980-b, 1991; Bhimani, 1996) and in terms of company culture (Amigoni, 1977; Otley, 1987; Anthony, Reece and Hertenstein, 1995; Merchant, 1998; Simons, 2000; Groot and Lukka, 2000).

However, recent developments include two interrelated streams of research.

The first one elaborates on the idea that the different use or functions contribute to shape the management control systems and outcomes (Henri, 2006; Bisbe and Malagueño, 2009).

The second development advocated by Malmi and Brown (2008) welcomes more studies on the interactions among variables that contribute to create the management control system as a package. The fundamental idea is that studying individual systems (within management control) individually may influence any conclusion drawn from the study, hence the analysis of management control system has to investigate the broader management control system. This is, however, consistent with Abernethy and Brownell (1997), Simons (1995) and Merchant and Otley (2007).

Our study would like to contribute to the discussion started by Chenhall (2003: 161). The author advocates a revision of the contingency theory: "(…) to maintain the relevance of management control systems contingency-based research, scholars will need to focus their attention on contemporary dimensions of management control systems, context and organizational and social outcome".

In addition, we would like to shed further light on the interactive use of management control systems specifically observing the features of companies prone to an interactive use of management control systems (Bisbe and Malagueño, 2009).

After reviewing the most relevant literature on contingency based studies, we aimed at selecting those factors, which we considered relevant to the contemporary environment under investigation, e.g. the information economy. In addition to that we considered other contingency factors emerging from prior field work (Cifalinò, Zoni 2001; Caglio, 2003) and academic discussion (Mouritsen and Krenier, 2003; Bergendahl, 2001).

1.1. Description of the contingency factors. *1.1.1. The technological driver.* According to a well documented stream of research, web technologies should be interpreted as a driver of change, able to challenge hierarchical structures and traditional

managerial tools by virtue of their new potentialities of diffusion and elaboration of information (Shapiro, Varian, 1999; Porter, 2001; Sawhney, Parikh, 2001). Such research is based on the assumption that the evolution of Information Technologies (IT) can heavily influence organizational choices of firms. According to this view − the so-called IT-utopian paradigm or technological imperative view − the characteristics of IT determine the adoption of specific organizational models and deterministically affect the effectiveness and the efficiency of organizational structures (Applegate, 1996; Lipnack and Stamp, 1997; Schein, 1994).

IT is, therefore, considered to have an independent influence on organizations, exerting unidirectional and causal effects over individuals and structures. Often, the newly emerging technologies are said, by IT-utopians, to provide organizations with the possibility to "free" themselves (Peters, 1996) from the traditional limits of space and time, allowing firms to choose new organizational configurations characterized by lower co-ordination and control costs.

Among the most intriguing contribution on the subject, Evans and Wurster (1997, 2000) maintain that internet technologies are able to solve the traditional trade-off between richness and reach of information. Reach simply indicates the number of people exchanging information, while richness is defined by three aspects: bandwidth (i.e. the amount of information that can be moved from a sender to a receiver in a given time), customization and interactivity. In the past, this trade-off entailed proximity and dedicated channels whose costs limited the number of people that could be reached by information; conversely, it required compromises in richness of information to reach a large audience. Within firms, the traditional logic of span of control and hierarchical reporting were a consequence of the fact that information could not be rich and broad simultaneously (Evans and Wurster, 1997: 73-74).

This view seems to take its origin from Boisot's work (1986), where two important characteristics of information were highlighted: its coding, i.e. the possibility of structuring and classifying information, and its potentiality of diffusion, i.e. the sharing of information within the organization. These characteristics are said to greatly influence the use of information for management control purposes, in the sense that information technologies may improve management control processes as long as to enhance the codifyability and diffusion of information. Time and space constraints often limit the potentialities of management control systems: information technologies provide the means to overcome such limits, thus, enhancing the interactivity of management control systems (Simons, 1995).

Expanding on the concept of information technologies as a determinant of interactivity of management control systems, in the companies of the information economy, traditional management control tools, such as programs, budgets and economic reports, should be revisited to account for the opportunities enabled by internet technologies. The most extreme supporters of this logic state that traditional management control systems should be discarded because they represent a painful heritage of the industrial age. Consequently, they are completely inadequate for the control needs of internet companies. Agreeing with such view, Kevin Kelly, executive director of the journal *Wired*, has even affirmed that "firms are becoming as complex as biological systems. And they are defying our traditional control logic" (Gibson, 1997).

However, other authors are more moderate, rather pointing to the fact that not all firms really take into consideration the value of web technologies: they simply use them because they are available without trying to exploit in full their potentialities. One of the most unexplored areas is indeed represented by the use of information technologies to support the interactivity of management control processes. According to Simons (1995) such interactivity may be enhanced in three ways: by combining different forms of presentation of data and information (images, graphs, sounds, words), thus enhancing their richness; by improving the timeliness of information sharing processes, thus enhancing the reach of information; by providing a more dynamic and flexible analysis of relevant information to better support decision-making processes (Simons, 1995 (*Italian edition*): 224).

1.1.2. The maturity stage driver. The "technological explanation" has been the most credited one to justify the peculiarities of the new economy (Baines and Langfield-Smith, 2003; Demers, Shackell and Widener, 2002). A different perspective of analysis of internet-companies, which does not view technology as the key driver, is based on their life cycle.

Normann (1979) indicated that there are five different stages in the life cycle of any firm. These phases require different organizational structures and management tools to be adopted. More specifically, the stages are set to be five: the first stage in the life cycle is called the sensor stage, it represents the time when the business idea gets defined; the second phase is the phase of development. At this stage, products or services included into the business idea are developed; the third stage is the market penetration, which re-

quires the resources to build up an infrastructure able to access the target market; the fourth phase is represented by the exploitation and the stabilization of the firm position; the fifth phase is called the final stage, characterized by the need for the firm to revitalize its business by innovating or substituting it.

We can easily maintain that the life cycle model is a variation of the contingency theory (Miller e Friesen, 1984) aimed at identifying organizational archetypes in terms of strategies, structural features, management style and decision-making processes. Different archetypes coincide with different stages of the life cycle as they are based on strategies, structures and processes, which are mutually supportive (Miller, 1981, 1987a, 1990, 1996; Mintzberg, 1990, Miller e Mintzberg, 1983; Tosi e Slocum, 1984). The internal consistency need has several implications on the management control system which in time adapt itself to balance strategies, structures and processes (Quinn e Cameroon, 1983).

Despite the fact that the life cycle model is quite consolidated, there has been little work that has investigated which are the characteristics of management control systems at different stages of growth of firms. Only recently, Moores e Yuen (2001) have provided an analysis of which issues of management control systems are important for different phases in the life cycle of firms. The authors, in a sample of 49 companies found out that one of the strongest evidence of the life cycle model is the degree of formalization of information in terms of selection and presentation of information. Such degree of formalization increases over time, stabilizes in the maturity stage, increases in the revitalization stage and collapse in the decline phase. However, there is not enough evidence that companies growing older either increase the number of control tools or that the degrees of aggregation and integration of information increase.

Notwithstanding its limitations, we believe that the life cycle model is relevant to our research as most of internet companies are at a very early stage of development of their business ideas which implies, at least, a less formalized definition and use of management control systems (Davila and Foster, 2008).

1.1.3. Organizational complexity and environmental dynamism drivers. The complexity variable has been studied by many authors, in different disciplines, assigning different meanings to this term[1]. In this article, we decided to adopt the view of complexity proposed by Amigoni (1979: 37, 41). Amigoni's definition shows two aspects of organizational complexity. The first one is related to how complex the process of creation of economic performance is: the higher the number of business segments and the higher their interdependences are, the higher the organizational complexity. The second aspect of complexity refers to the organizational structure. The more articulated the structure (the higher the number of responsibility centers and their interdependencies) is, the higher the level of complexity[2].

Also for the definition of environmental dynamism, we relied on Amigoni (1979: 52) who defined such concept by pointing to the fact that it is related both to the intensity of changes and to their predictability. More specifically, environmental dynamism increases both if the magnitude of changes increases and also if such changes are unlike to be predicted.

Other authors defined "variability" – Amigoni's first aspect – as stemming from different causes, such as: the characteristics of the context in which an activity takes place, and which can affect its results (Williamson, 1975); the nature of the transformation objects and the transformation processes (Perrow, 1967); the rate of change and volatility of customers' needs (Hannan and Freeman, 1977).

On the contrary, those authors focusing on "unpredictability" – Amigoni's second aspect – referred to the level of knowledge completeness about the states of the world, the preferences, relationships between causes and effects, behaviors and/or results (Hirshleifer and Riley, 1979). Such knowledge, in fact, can vary from complete knowledge, which exists when individuals are certain of the outcome associated with a given action, to incomplete knowledge, which exists where individuals are uncertain of the consequences of their actions (Thompson, 1967; Ouchi and Maguire, 1975; Ouchi, 1977; Hirst, 1981).

1.1.4. Founder management. When initially approaching the study of the internet based and internet related companies, a number of times we were confronted with cases of relatively young listed start-ups ("born on the net" companies), where the founders still had a strong role in management and day by day operations (Mouritsen, Krenier, 2003; Bergendahl, 2001). We were often told that the extent of direct owner control of managerial decisions and involvement in day to day activities influenced the features of management control systems and namely

[1] For a more comprehensive review on organizational complexity see De Michelis, 1997.

[2] Interdependences increase the coordination difficulties and have potentially increasing implications for control systems as the interdependencies move from pooled (no direct relationship between contiguous processes), to sequential, to reciprocal (Thompson, 1967).

its degree of interactivity. On the subject matter, we were supported by Whitley (1999: 513). In his discussion about firms, institutions and management control, Whitley proposes that the degree of "owner" (founder) management, the diversity of activities coordinated, their rate of change, and shareholder lock-in are key variables in shaping management control systems. Further, he demonstrates that where owners (founders, in our case) directly control firms, they inevitably prefer to retain considerable discretion over decisions and are unlikely to wish to be subjected to the constrains of formal rules and procedures. Clearly the reach of information and the pervasiveness of decision making is affected.

As we encountered more cases, we found that internet based or internet related companies were older traditional companies which adopted web technologies (moved to the "net"). In these cases, ownership and management would not overlap, and the reach of information and the pervasiveness of decision making would not be inhibited by the founder management attitude; rather, the diffusion of information and the pervasiveness of decision-making would be driven by other contingency factors (Grandlund and Taipaleenmäki, 2005).

1.2. Propositions. From the literature review, we can draw the following propositions. First of all, we would expect internet-based and internet-related firms to be increasingly adopting interactive control systems, compared to their traditional counterparts. This leads to the first proposition:

Proposition 1: the higher the leverage on net technologies, the higher the degree of interactivity of management control systems.

However, the same literature review suggests that there could be some contingency factors, other than the use of internet technologies, either fostering (2.1) or inhibiting (2.2) interactivity of management control systems. Thus, the other propositions of our research are formulated as it follows:

Proposition 2.1: the higher the environmental dynamism, the higher the interactivity of management control systems.

Proposition 2.2a: the tighter the founder's involvement in management, the lower the degree of interactivity of management control systems.

Proposition 2.2b: the higher the organizational complexity, the lower the degree of interactivity of management control systems.

Proposition 2.2c: the more mature the company, the lower the degree of interactivity of management control systems.

2. Research design

The research is exploratory and descriptive. It is exploratory because in the management accounting literature, although there are several extant contributions which focused on interactive control systems (Bisbe and Otley, 2004; Bisbe and Malgueno, 2009) there is a dearth of research on Interned-based companies (Granlund and Taipaleenmäki, 2004). Few empirical studies were conducted to investigate the "interactivity" attitude of Internet companies as applied to management control systems (Maccarone, 2002; Mouritsen and Keiner, 2003); therefore, the research will help setting the boundaries of further research. It is descriptive because it focuses on the analysis of what it is and will not norm the interactivity attitude of Internet companies.

The research was conducted by means of a self-administered questionnaire that was sent to the Investor Relators and CFOs of Italian companies listed in the FTSE MIB 40 (the industrial index, except for banks and insurance companies) and in the FTSE Star (once TechStar). The questionnaire included 23 questions, some of which were further articulated. Questions were semi-structured. Ideally the questionnaire was divided into the following sections: company profile, leverage on internet technologies, contingency factors and characteristics, and use of management control systems. The survey instrument was pre-tested with managers and academics.

The administration of the questionnaires was preceded by a phone-call to check the preliminary availability of the respondents. One month after the initial posting, a reminder e-mail was sent to all firms. One month later, we called up the companies not having responded thus far, and we encouraged them to complete the questionnaire.

Notwithstanding the efforts, we received only 14 complete questionnaires (the redemption rate was in the range of 30%). This, of course, poses some limitations to the validity of the results of our study. Therefore, to supplement the data collected through the questionnaire, we extended our research methodology to the use of field-based and telephone survey interviews. We also reviewed archival data of the companies extracted from various sources. As expressed by Tufano (2001: 187), one of the major advantages of such a more clinically oriented research is its "inherently closer examination of purposefully restricted samples". More specifically, this approach has allowed us to ask very specific and qualitative questions about the underlying variables of interest, thus offering a balance be-

tween a mid-sized sample analysis and a single-firm study. In Table 1, a summary of data of respondents is given.

Table 1. List of companies and sales (in millions of Euro)

COMPANIES	Sales (Ml. €)	Main business
AL	232.60	Network Computing/care services/ IT training
AU	3,266.00	Food
BE	2,098.00	Fashion and apparel
CH	67.00	B2C (store on-line)/B2B (application service provider)
CT	70.00	Publisher and retailer of software for entertainment
FI	106.90	Software developer/IT consulting and training
I	55.50	Network application service provider/IT consulting
IT	3,715.00	Utilities
LO	479.85	Entertainment and gambling
RE	60.00	Web integration and consulting
SA	1,923.00	Utilities
TC	199.63	Software developer / IT consulting and training
TE	769.00	Digital technology reseller
TL	30,818.00	Telecommunications

Prior to illustrating the evidence of our study, we would like to summarize the measures we used to track the variables. Given the nature of the study and the research instruments we used (questionnaire mainly, and archival data) we are aware that some measures were somewhat imperfect: when we had a choice we preferred to rely on objectives data rather than perceptions. For a more detailed description of the operationalization of each variable see Table 2.

Table 2. Variables and operationalization

		Main references
INTERACTIVITY	Number of employees involved (as a % of total employees actively involved) in both and independently the planning and the budgeting process	Simons, 1995
	Number of hierarchical levels involved (as a % of total hierarchical levels) in both and independently the planning and the budgeting process	
	Number of meetings required to complete both the planning and budgeting process (each one independently) in relation to the total number of employees involved	
	Presence and use ("popularity") of intranet for the specific use in the planning and control process	Evans and Wuster, 2000
LEVERAGE ON NET TECHNOLOGIES	E-leverage and E-value *. ♦ '* E-leverage: IT investments as a % of the total revenues and volume of on-line transactions ♦ E- value: % of on-line revenues	Evans and Wuster, 2000
ENVIRONEMENTAL DYNAMISM[1]	Weighted average standard deviation of the revenues over the last 5 years	Zoni, Merchant, 2008
	Revenues growth over the last 3 years	Davila, Foster, 2007
FOUNDER MANAGEMENT	The founder management was assumed when the founder possessed (directly or indirectly) the control equity holding	Granlund, Taipaleenmäki, 2005
ORGANIZATIONAL COMPLEXITY	Number of business areas, business segments	Amigoni, 1979
	Degree of diversification measured as difference in the key strategic factors (KSF) of each business area or segment	Amigoni, 1979
	Inter-company revenues	Zoni, Merchant, 2008
MATURITY STAGE	Number of years since constitution	Moores and Yuen, 2001

3. Empirical evidence

Since the size of the sample is relatively small, we decided to analyze the firms individually and then position their cases in different matrixes, one for each proposition. Our aim is not to verify the assumptions we derived from the literature review, but rather to use our proposition as a guiding device for our analysis and for the interpretation of the evidence we gathered. Besides, to better explain the evidence we gathered, we complemented the results obtained from the questionnaire, with follow-up interviews with the respondents. The following analysis is thus based on both the survey and the interviews.

Proposition 1 refers to all respondent companies (14 companies, where propositions 2 are only applicable to internet related or internet based companies).

Proposition 1 suggests that:

[1] Rather than predictability of change as depicted in paragraph 1.1.3., environmental dynamism is operationalized as variability of "change".

"The higher the leverage on net technologies, the higher the degree of interactivity of management control systems".

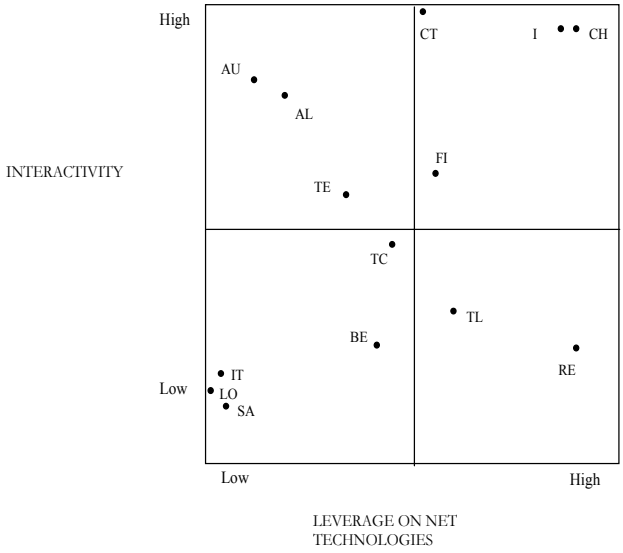

Fig. 1. Leverage on net technologies and degree of interactivity of management control systems

Table 3. Degree of interactivity and leverage on net technologies by company

COMPANIES	INTERACTIVITY					LEVERAGE ON NET TECHNOLOGIES
	№ of employees involved	% (on total number of employees)	№ of hierarchical levels	№ of meetings	Intranet	E-leverage / E-value*
AL	10	5.30%	2	Several	Yes	Internet-related
AU	970	2.40%	2	20	Yes	Traditional
BE	30	0.40%	2	Na	Yes	Traditional
CH	10	10.10%	5	4	Yes	Internet-based
CT	The whole company	100%	Everybody	30	No	Internet-related
FI	30	3.90%	2	20	Yes	Internet-related
I	20	7.30%	4	10	Yes	Internet-based
IT	All units	Na	2	Na	Yes	Traditional
LE	10	1.20%	2	Na	Yes	Traditional
RO	9	1%	2	Na	Yes	Internet-based
SA	100	0.80%	Na	10	Yes	Traditional
TC	10	1.30%	2	Na	Yes	Internet-related
TE	15	2.20%	2	Na	Yes	Internet-related
TL	100	0.10%	2	Na	Yes	Internet-related

In Figure 1 (based on Table 3), the relation hypothesized in proposition 1 is confirmed in 9 (low, low and high, high combinations) out of 14; we believe that is quite a good result. Further insight can be gained by clustering the respondents into traditional and internet-based and internet-related companies.

Traditional companies (low E-leverages, low E-value) such as IT, LO, SA, and BE show relatively low degree of interactivity. AU is the only exception.

The internet related and internet based companies show a high degree of interactivity in the majority of cases (AL, TE, FI, CT, I, CH); in a minority of cases, they show low degree of interactivity (TC, TL, RE).

TE and RE (lower, right area in the graph) show an high leverage on net technologies, which, interestingly enough does not translate into high interactivity of management control systems, e.g. they possess the technology, but apparently they do not use it for the purpose of increasing the interactivity of their management control systems. AU, AL and TE (higher, left area in the graph) show the high degree of interactivity, but a low leverage on net technologies. The general understanding in these cases is that, the determinants of interactivity of management control systems are not related to technologies.

Overall, the inverse relationship between leverage on internet technologies and the degree of interactivity of management control systems shows an asymmetry.

Whereas in the cases of AL, and TE the inverse relationship between interactivity and leverage on net technologies does not surprise, it does strike that companies which thrive on "interactivity, at large", and for which decision speed is essential, will not use web technologies to promote interactivity. Apparently even in the presence of adequate technologies, the use of such technologies is not extended to management control systems. Alternative explanations could be that those companies, either do not need interactivity or they would need it but have not perceived the need, or simply deliberately they have not implemented it for other reasons (Simons, 2000).

In the subsequent part of the analysis, only, we focused on internet-based and internet-related companies to spot which contingency factors, other than the use of internet technologies, either fostering (2.1) or inhibiting (2.2) interactivity of management control systems.

Proposition 2.1 suggests that:

"The higher the environmental dynamism, the higher the interactivity of management control systems".

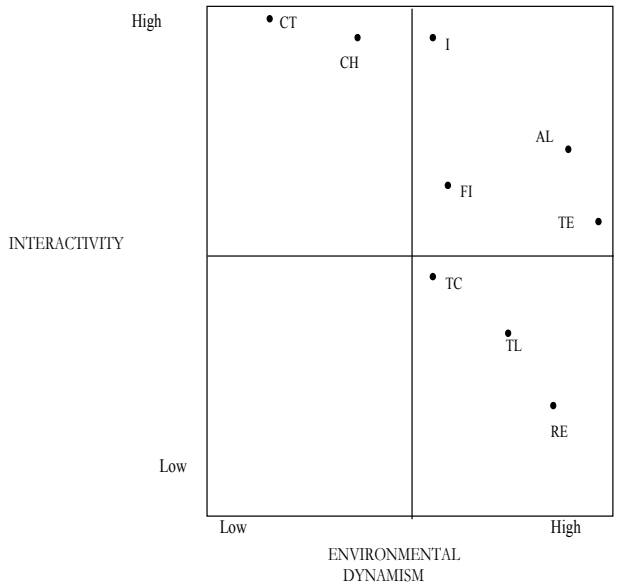

Fig. 2. Environmental dynamism and degree interactivity of management control system

Table 4. Environmental dynamism by company

COMPANIES	ENVIRONMENTAL DYNAMISM	
	Weighted average standard deviation of the revenues over the last 5 years (millions Euro)	Revenues growth over the last 3 years
AL	40.49	34.89%
CH	8.69	6.03%
CT	0.8	4.92%
FI	18.38	34.33%
I	14.63	44.21%
RE	15.16	45.50%
TC	18.4	23.89%
TE	235.55	44.35%
TL	401.5	8.60%

As Figure 2 evidences, internet-based and internet-related companies struggle with environmental dynamism with the only exception of CT and CH (see also Table 4).

Given the dispersion of the observations the positive relationship between environmental dynamism and the degree of interactivity of management control systems is not as strongly evidenced as needed to identify a general pattern: only 4 out of 9 companies show a positive relationship between interactivity and dynamism.

However, the 5 cases showing opposite relationship between the variables suggest additional insights. As we discussed with CT and CH management (high interactivity and low dynamism), we realized that internet technologies provided both the technological infrastructure and the cultural background to promote the degree of interactivity of management control systems regardless of the very low environmental dynamism. TC, TL and RE, notwithstanding a dynamic environment and an available technology, did not show interactivity in their management control systems. A possible explanation for this apparent paradox lies in a "deliberate" choice of their way to cope with over-complexity (see below).

A second set of factors would inhibit the degree of interactivity of management control systems; the extent to which the founder(s) is still managing the business is the first one of those. Proposition 2.2.a suggests:

"The tighter the founder's involvement in management, the lower the degree of interactivity of management control systems".

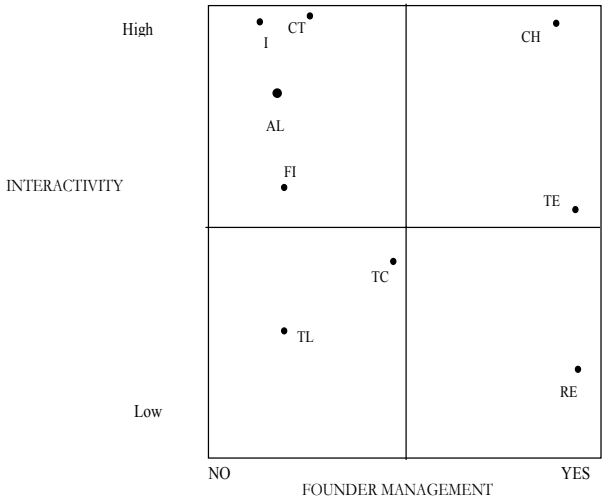

Fig. 3. Founders management and degree of interactivity of management control systems

Table 5. Founders management by company

COMPANIES	FOUNDERS MANAGEMENT
AL	No
CH	Yes
CT	No
FI	No
I	No
RE	Yes
TC	No
TE	Yes
TL	No

As one can see from Figure 3, proposition 2.2.a is theoretically relevant, however, we realized that in the sample of companies just 3 out 9 companies were showing founder management and only 2 of those – RE and TE – reported a low to a moderate degree of interactivity. During interviews with these companies we were informed that one of the problems in promoting interactivity of the man-

agement control had to do with the personality and the management style of the founders, who still enjoyed a relevant role in management.

Overall the relationship between degree of interactivity of management control systems and founder management was confirmed in 6 out 9 cases – RE, TE, CT, I, AL, FI. The remaining 3 cases were TL, TC, and CH. In these remaining cases, the explanation for their degree of interactivity of management control systems is given by other factors as the organizational complexity and the maturity stage (see below).

As a second factor that might inhibit the degree of interactivity (2.2b), we proposed organizational complexity:

"*The higher the organizational complexity, the lower the degree of interactivity of management control systems"*.

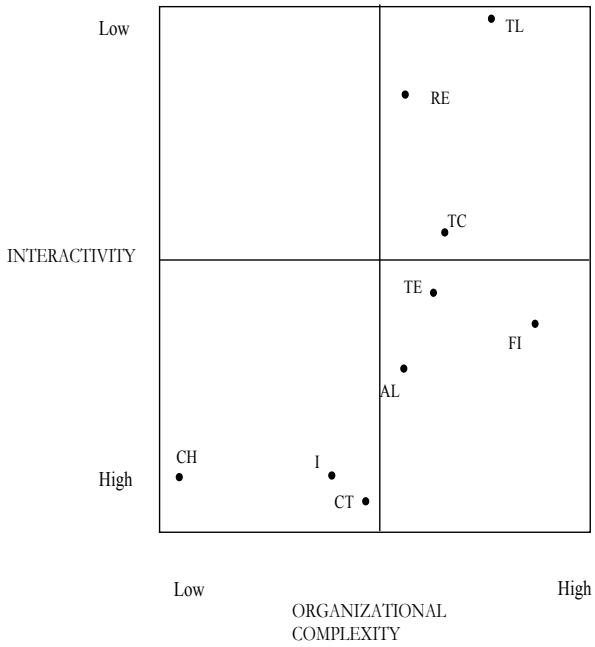

Fig. 4. Organizational complexity and degree of interactivity of management control systems

Table 6. Organizational complexity by company

COMPANIES	ORGANIZATIONAL COMPLEXITY		
	№ of business areas	Degree of diversification	Intercompany revenues
AL	4	Low	6%
CH	2	Low	_
CT	4	Medium	_
FI	3	High	30%
I	2	Medium	4%
RE	5	Low	_
TC	3	Medium	10%
TE	2	Low	21%
TL	7	Low	14%

When considering the relationship between organizational complexity (see Table 6) and degree of interactivity of management control systems in internet-based and internet-related companies, we observed that in 6 out of 9 cases the two variables are inversely related. Hence, the clustering of companies is particularly consistent with the proposition 2.2b.

On the one side, we find companies as TL, TC, RE, which respond to complexity with a low degree of interactivity of the management control system. Within this cluster TL and TC are older companies equipped with relatively routinized and stiff management control systems, mostly diagnostic tools used to trace critical factors of success. Reply is an exception in this cluster. On the other side, we find companies as I, CT and CH, which seems to be counterbalancing complexity with interactivity of management control systems.

A third group of companies – FI, AL, TE − appear to oppose to a high degree of interactivity to a high organizational complexity.

The third factor inhibiting the degree of interactivity (2.2c) was identified with the stage of maturity of a company as stated in the following sentence: "*The more mature the company, the lower the degree of interactivity of management control systems"*.

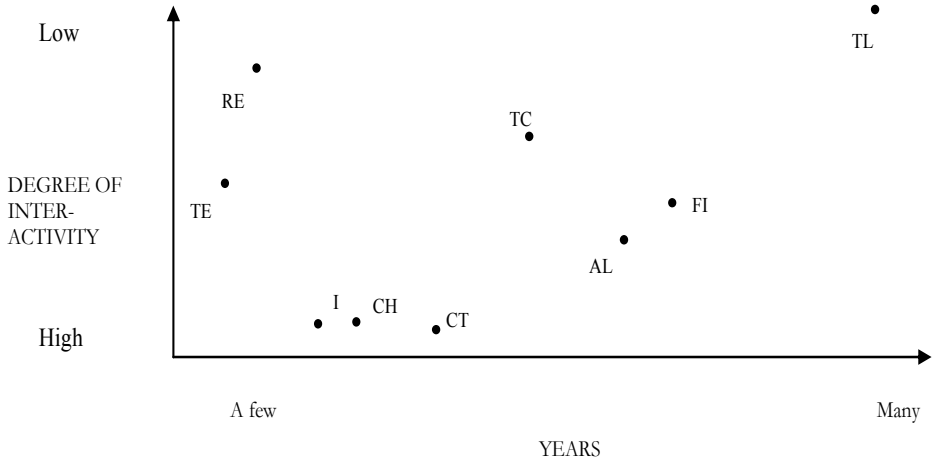

Fig. 5. Years since constitution and degree of interactivity of management control systems

The proposition 2.2c suggests a possible pattern in our sample. In fact, most of the companies showing a high degree of interactivity of the management control systems are relatively young. These are the cases of RE, I, CT, CH, TE.

On the other end "older" companies show lower degrees of management control system interactivity. These are the cases of TC, FI, TL. Among these cases, as evidenced by the follow-up interviews, TL seems to present the stereotyped version of the bureaucratic company, wearing the "procedures straitjacket" and, therefore, inhibiting interactivity of management control systems. AL instead represents one exception. Interestingly enough, however, this firm combines an *old* core business of hardware and software product with younger business in the areas of network computing technologies, support and monitoring services and training, so in effect independently from its age we could maintain that AL has been recently revitalized with more innovative business.

Discussion and conclusions

As we are approaching the conclusions of our analysis more and more we realize that each case shows a peculiar interactions of variables, which simultaneously influence the degree of interactivity of a specific management control system. This is consistent with Malmi and Brown (2008), and yet poses challenges to come to conclusions with statements generally applicable.

In Table 7, we summarized each of the nine cases of internet and internet-related companies by reporting the status of each influencing factor we included in our analysis.

Table 7. Summary of cases (all companies)

	INTERACTIV-ITY	LEVE-RAGE	DYNA-MISM	FOUNDERS MANAGE-MENT	COMPLEX-ITY	MATUR-ITY
AL	H	L	H	N	H	O
TE	H	L	H	Y	H	Y
TL	L	H	H	N	H	O
RE	L	H	H	Y	H	Y
CH	H	H	L	Y	L	Y
CT	H	H	L	N	L	Y
FI	H	H	H	N	H	O
I	H	H	H	N	L	Y
TC	H	L	H	N	H	O

Notes: H = High, L = Low, N = No, Y = Yes, O = Old, Y = Young, color areas identify relationships not consistent with the propositions.

From the analysis of our cases, internet technologies seem to influence the degree of interactivity of management control systems. The role of internet technologies is twofold: on the one hand, internet technologies provide the technological infrastructure for interactivity consistent with Chenall (2006); on the other hand, internet technologies provide the cultural background for interactivity consistently with Granlund and Taipaleenmäki (2005). Hence, internet-based and internet-related firms adopt relatively more interactive control systems, compared to their traditional counterparts. However, a limited number of cases evidences that technology provides a partial explanation of management control systems interactivity. This confirms the role of technology as enabler for the interactivity of management control systems. Particularly interesting appear to be the cases where the presence of internet technologies is matched with low interactivity of management control systems.

Where internet technologies are unable to explain the degree interactivity of management control systems, the suggestions stemming form the life cycle theory as well as those related to complexity appear to provide a quite powerful explanation.

Particularly, the life cycle suggests that companies growing older tend to lower the degree of interactivity of their management control systems. Those systems have been in place for years, and unless "revitalized" for some reasons they tend to become very stiff. The same appears to be true in internet-based and internet-related companies. This is consistent with Davila, Forster (2007).

As far as complexity is concerned, the companies considered in our analysis seem to "fear" that too much interactivity could induce loss of control of the business and, therefore, their complexity coping pattern would not include management systems interactivity.

Factors as environmental dynamism and founders management, did not provide sufficient explanations for management control system interactivity. Founder management was not relevant in the sample; here we acknowledge that we have an adverse selection problem as in the sample we have included only listed companies – listed companies are less likely to have preserved their founders in the management team.

When considering single cases in Table 7, we noticed that we had a number of them, which appeared the paradigmatic cases: I, CT, and CH. Ideally, these are the "handbook cases". With the exception of CH, all of the companies have a good financial record.

A second cluster of companies includes TC and FI. These are peculiar cases: FI is a relatively old company, that, recently, entered the internet-based (e-business) and internet-related business (security). In essence, the company has been revitalized recently and the degree of interactivity of its management control system is particularly high. TC, as opposite, despite its environmental dynamism has got all features of an older company and as such behaved. Additionally we had the impression that the high environmental dynamism contributed to create new control needs that were either not perceived or not satisfied yet (Bruns, Scapens, 2000; Almqvist, Skoog, 2001).

The third cluster of companies included: TL, RE, AL and TE. TL similarly to RE appear to have deliberately reduced the degree of interactivity of its management control systems. Particularly, both TL and RE are complex companies; additionally TL is the largest size and oldest company among the respondents whereas RE is still managed by its founders. Thus, complexity and either maturity or founders' management have a strong influence on the degree of interactivity of TL and RE management control systems. On a different side, AL and TE counterbalance high complexity with a high degree of interactivity of their management control systems. Both AL and TE confront highly dynamic environment and react to this with an in-creased degree of interactivity of their management control systems. In addition, TE is also relatively young and, therefore, it retains the interactivity of younger companies.

To conclude, though we are perfectly aware that our discussion is based on a limited sample of companies, our evidence suggests that companies leveraging on internet technologies will not necessarily leverage upon the same technologies to foster interactivity of their management control systems. On the contrary, considering the simultaneous effects of the identified contingency factors, as advocated by Malmi and Brown (2008) we may conclude that the presence of the founder in the management team and the relative stage in the life cycle may have a stronger influence than technology on the use of management control systems.

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