Exploring Intellectual Capital Investments Policies in a Call Center through A 'System Dynamics' Resource Based View

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ABSTRACT

This paper examines alternative Intellectual Capital (IC) investment policies in a dynamically complex system for explaining differences in firm performance. Such analysis is supported through the use of a System Dynamics (SD) simulation model. This paper is based on the hypothesis that to explain superior performance is not sufficient to look at the endowment of strategic resources, but it also requires an analysis of the dynamics of resources accumulation and depletion processes resulting from management policies. To assess IC impact on company performance, a conceptual framework and a SD simulation model have been built. Finally, alternative scenarios results are commented.

Keywords:

Resource Based View; Intellectual Capital; System Dynamics; Modeling and Simulation; Call Center

INTRODUCTION

This paper examines alternative Intellectual Capital (IC) investment policies in a dynamically complex system for explaining differences in firm performance. Such analysis is supported through the use of a System Dynamics (SD) simulation model. The SD methodology is based on the concepts of feedback loops, delays and non linear relationships between variables and it can be used to investigate the coordination of dynamic resources systems through modelling and simulation. The Resource Based View (RBV) allows to make explicit bundles of unique, difficult to imitate and non-substitutable tangible and intangible resources to explain superior performance. Firms are viewed as a network of resources embedded in closed feedback loops. This paper is based on the hypothesis that to explain superior performance is not sufficient to look at the endowment of strategic resources, but it also requires an analysis of the dynamics of resources accumulation and depletion processes resulting from management policies.

This paper proposes a framework to analyze the impact of IC investments on call center, and firm performance. To assess IC impact on company performance, I first suggest to explore how IC investments influence *business strategic resources*, *drivers* and *performance indicators*. On the basis of such a framework, *investment policies* and *feedback processes* which control IC stock accumulation and depletion processes over time, *performance drivers* and *outcome indicators* are made explicit through the use of a SD simulation model.

The SD simulation model is built with reference to a telecom call center case and it focus IC investment policies. Simulation results shows that IC investments, mainly based on human resources practices lead to higher service qualities, higher average revenues per call and, consequently, higher net revenues per call.

The paper is divided into fourth main parts.

In the first part, benefits of investigating IC through a system dynamic resource base perspective, the IC concept and some key issues in call center management are explored. In the second part, an introduction to the case-study, main company human resources development policies and a conceptual framework to evaluate IC investments are provided. In the third part, the structure of a SD model, describing main feedback loops underlying IC and other firm strategic assets accumulation and depletion processes, *performance drivers* and *outcome indicators* in a call center, are discussed. In the fourth part, the structure of the SD simulation model and an analysis of two alternatives scenarios are commented. Finally, some conclusions and future research are outlined.

INVESTIGATING INTELLECTUAL CAPITAL BY ADOPTING A 'SYSTEM DYNAMICS' RESOURCE BASED VIEW

To maintain a superior performance and a competitive advantage – in terms of unique configurations of resources difficult to imitate by rivals – a growing number of firms focus their attention on investments in intangibles assets, rather than exclusively in tangible resources. Tangible resources are those that are typically displayed on the balance sheet of a company such as machinery, buildings and inventory. On the contrary, intangibles refer to people and their experiences, business processes and routines, company reputations and image.

A perspective that explains superior business performance on the basis of unique, difficult to imitate and non-substitutable tangible and intangible assets is the Resource Based View (RBV) of the firm (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Grant, 1991; Peteraf, 1993; Makhija, 2003). This approach view the firm as complex bundles of resources. The RBV asserts that differences in performance happen as successful organisations possess strategic resources (physical, human and organisational) that competitors do not hold. This perspective also provides an explanation about the various type of competition among firms, as result of differences in resources and capabilities possessed by each organisation (Helfat and Peteraf, 2003). Such resources differences, in terms of nature and value, play a significant role to generate firm profit (Amit and Schoemaker 1993; Peteraf, 1993). Firms able to accumulate resources with rent-yielding potential may increase the amount of rents generated and, consequently, profits (Szulanski, 2003). By adopting this perspective, firm competitive advantage does not result from the industry dynamics, but from the process of accumulation and exploitation of firm strategic resources.

However, some limits of the RBV have to be outlined. First, some authors (McGrant, 1996; Mosakowski and McKelvey, 1997) emphasise the difficulty to identify which firm's strategic resources represent a key factor to achieve a superior performance.

Second, the focus of analysis on the firm level is likely to disregard the industry context (D'Aveni, 1994; McGrant, 1996). In a hypercompetitive environment, firm outcomes result from the interaction of many internal and *external* forces.

Finally, event though the RBV literature conceptually emphasises the need to balance strategic resource exploration (acquisition of new knowledge) and exploitation (use of knowledge already acquired) in organisational learning (March 1991), very often firms suffer of a myopic focus on exploitation (Levinthal and March, 1993). Such phenomenon can result from an emphasis on current resource endowments, considered by decision-makers appropriate to frame the past, but not necessary the present or event the future [1] (Prahal and Hamel, 1994). As consequence, opportunities and threats interpreted through frames based on current resource endowments, rather than a dynamic analysis of resource accumulation and depletion processes – resulting from management policies – can lead to systematic errors in resource allocation decisions (Amit and Schoemaker, 1993). This behaviour can be also due to a lack of methods and tools (Bontis, 2002) which may enable decision makers to investigate organisation strategic resources acquisition, decline and feedback processes that control them and drive their evolution over time thereby influencing firm performance (Warren, 2002; 2005; Morecroft, 2002). The relevance of such concepts has been introduced into strategy literature by Dierickx and Cool (1989) along with the bathtub metaphor reported in figure 1 (Morecroft, 2002).

Insert Figure 1 about here

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[1] Such a myopic approach has been also remarked by Prahal and Hamel (1994). They argue that a firm has a "corporate genetics" (that is beliefs, values, norms, managers know how, biases and assumptions about the structure of the relevant industry, about who the customers are or are not, etc.) that – when environment changes rapidly and radically – may become a threat to survival. In order to effectively cope with such phenomenon, firms must create within themselves a reasonable portion of "genetic diversity" and selectively "unlearning the past". Managers should question their beliefs and their frames and recognise that Intellectual capital depreciates over time and there is the need to continuously rebuild it.

The "bathtub" metaphor emphasises the concept that to understand competitive advantage based on, in particular, nontradeable strategic resources, it is fundamental to comprehend the *inertia* underlying asset stock accumulation and depreciation processes. Assets characterised by non-tradeability can be, for instance, firm reputation for quality of service, human capital, dealer loyalty, R&D capability, etc. These resources are the cumulative result of a set of investment policies over a period of time. On this concern, Dierickx and Cool (1989) remark that "*while flows can be adjusted instantaneously, stock cannot*. It takes a consistent pattern of resource flows to accumulate a desired change in strategic asset stocks".

Through the "bathtub" metaphor the difference between stock and flows can be easily explained. The stock of water is represented by the level of water in the bathtub in a moment of time and it is the cumulative result of the continuous flow of water into the tub, net of the outflow of water. Through the tap it is possible to define a policy to influence the water inflow. Water outflow can result from a "normal" decline process through, for instance, a leak or an explicit decision to empty the bathtub.

Such a perspective shifts the focus of the strategic analysis from a static toward a dynamic resource accumulation and depreciation process. As a consequence, a key role in strategy formulation is covered by the "task of making appropriate choices about strategic expenditures (advertising spending, R&D outlays, etc.) with a view to accumulating required resources and skills (brand loyalty, technological expertise, etc.)" (Dierickx and Cool, 1989).

Although resource accumulation and depreciation processes analysis helps decision makers to understand why firms performance differently, Dierickx and Cool thinking does not investigate in depth – and makes explicit – the managerial policies and feedback processes that control resources flows, resulting from strategic expenditures (Morecroft, 2002).

On the basis of the above analysis, this paper focus on the Intellectual Capital (IC) stock and the flows of investments resulting from management policies aimed to affect firm performance. To assess IC impact on company performance, I first suggest a conceptual framework to explore how IC investments influence *business strategic resources*, *drivers* and *performance indicators*.

Furthermore, in order to make explicit *investment policies* and *feedback processes* which control IC stock accumulation and depletion processes over time, *performance drivers* and *outcome indicators*, and – in particular – to capture strategic resources' dynamics, I propose to apply the System Dynamics (SD) methodology (Forrester 1961; Sterman 2000). This methodology is based on the concepts of feedback loops, delays and non linear relationships between variables, and it can be used to investigate the coordination of dynamic resources systems through modelling and simulation (Crossland & Smith, 2002; Gary 2005; Morecroft, 2002; Norton and Kaplan, 2002; Sterman, 2000; Warren 2002, 2004, 2005).

The analysis of cause-and-effect relationships between main business variables is not driven by a mechanistic approach, according to which a given set of feedback loops is defined *a priori*. On the contrary, SD provides the basis to build a dialectic learning process implying that decision makers' mental models are made explicit and questioned in order to pursue a common shared view of reality emerging from the analysis of the relevant system (Winch, 1993; Vennix, 1996).

The SD model aims to reproduce in a 'virtual context' the system where decision makers operate. Playing with an SD model allows one to simulate in a "safe" environment decisions that would be made in the real world and test their effectiveness in the short and long run, according to alternative scenarios (Davidsen, 2000; Maier & Grossler, 2000; Sterman, 1992). The use of

SD simulation models, supported by a learning facilitator, is likely to foster decision makers' learning processes and question their mental models, with a view to the real feedback structure driving key-variables' behaviour (Vennix, 1996). More recently, some benefits of the use of SD simulation models have been outlined also by Norton and Kaplan (2002: 312-313). Such authors argue that system dynamic simulation models foster "constructive dialogues" between corporate and business unit executives when evaluating the impact of different strategies on firm performance. Through such an approach, "managers could understand better the trajectory of the value creation from a give strategy, and they could fully evaluate strategic alternatives before committing resources for new investments". Modelling business strategic resources dynamics allows managers to clarify and make explicit "key operational drivers of value creation" and to understand the implications of feedback mechanisms on business unit's strategic objectives.

THE CONCEPT OF INTELLECTUAL CAPITAL

In the last decade, Intellectual Capital has been widely analysed by both practitioners and academics. Main reasons often refers to *internal* (e.g., to better allocate business resources to achieve a superior performance) or *external* (e.g., to provide stakeholders information related to expected future growth) purposes. Although there is a general agreement in the field about the strategic impact of IC on firm performance, such consensus can not be detected in the different definitions provided. By mentioning just few examples IC can be referred to intellectual material, such as knowledge, information, intellectual property and experience that can be put to use to create wealth (Stewart,1997); to market, human-centered, intellectual property and infrastructure assets (Brooking, 1996); to human capital and structure capital (Edvison and Malone, 1997); to non-physical sources of value (claims to future benefits), generated by innovation (discovery), unique organizational designs, or human resource practices (Lev, 2001); to more that the sum of human, structural and relational resources of the firm. IC is about how to let knowledge of a firm works for it and have it create value (Chaminade and Roberts, 2003).

Some authors (Bontis 2002; Maar, 2005) argue that definition problems occur as different perspectives or disciplines (economic, strategy, accounting, finance, marketing, human resources) approach this field. On this concern, I strongly agree with the remark that IC field is truly multidisciplinary. However, to explore the concept of IC and to understand its *nature*, I suggest to first analyse the meaning of the terms "intellectual" and "capital".

The term "intellectual" comes from the Latin *intelligere*, i.e. to understand, to learn.

The term "capital" refers to investments in tangible or intangible production factors, leading to an expectation of future yields.

It follows that the concept of "Intellectual Capital" has to be related to those investments done by a firm in order to improve the capability of its people and the organisation itself to understand, i.e. to better frame the system where decisions are made. Therefore, *building IC means fostering the learning capability of the firm to make sound decisions about ends/goals to achieve, and related means*. Such means refer to resources to acquire or build, coordinate and deploy for the achievement of firm ends/goals (Figure 2). Among such resources, the so called strategic assets are particularly relevant, as they often constitute the core of a firm competitive advantage.

As a consequence, managing IC implies an understanding of the net of cause-and-effect relationships that controls firm resources dynamics over time and the impact of strategic expenditures on resources accumulation and depletion processes. In fact, by making explicit firm

main stocks and flows dynamics, decision makers may experiment alternative resources allocation policies to achieve sustainable business goals.

Insert Figure 2 about here

The definition of IC provided above seems to be in harmony with the concept proposed by John Kenneth Galbraith in 1969 (Feiwal, 1975). According to Galbraith, IC does not represent a static endowment of resources *per se*, "intellect as pure intellect", but instead it stands for a means [a learning capability of the firm] to an end [business goal] (Bontis, 1998).

Most firm strategic assets are intangible and cannot be bought on the market (e.g. business image and reputation, quality of service, managers' personal contacts). Others may also refer to tangible resources, which can be purchased from suppliers (e.g. machinery and other technological equipment, warehouses, product portfolio). However, in both cases, if the current endowment of strategic resources is low, the decision to build or acquire specific resources can not be sufficient to pursue such goal. This phenomenon is called by Dierickx and Cool (1998) *interconnectedness of asset stocks*. It implies that the accumulation process of a stock "may depend not just on the level of that stock, but also on the level of *other stocks*", which are complement.

Insert Figure 3 about here

Without learning, leading to a significant IC knowledge stock, a firm may not able to build strategic assets exclusively through investment decisions. Therefore, IC can be considered as a *primary strategic asset* for the acquisition and deployment of others, to foster business growth. Organisational routines (Nelson, & Winter, 1982) and the interaction processes between the firm and its relevant environment, combined with the existing stock of knowledge (i.e. IC), is likely to build up new strategic assets (e.g. customer base, image). However, growth also implies the need to strengthen the body of knowledge on which the firm relies. In fact, managing a higher level – and often wider scope – of strategic assets requires that the company increases its effort to foster individual and organisational learning (see figure 3).

One of the possible limits to IC development is due to *asset erosion* (Dierickx and Cool, 1998). A stock decay may occur in the absence of adequate "maintenance" expenditures to replace such draining process. In fact, in presence of a given obsolescence time, the higher is the endowment of a resource – all conditions being equal – the higher will be the outflow of such resource.

The suggested concept of IC does not only relate to individuals' or business' *know-how*, i.e., the attitude to identify proper resources to achieve desired goals. It also applies to: the know-what and know-why (Garud, 1997). The concept of *know-what* refers to the attitude to detect specific subjects or issues on which to be focused (Kogut & Zander, 1992). The concept of

know-why is, instead, referred to the understanding of cause and effect relationships between issues and events related to business performance, as a result of a learning process which shapes the way of thinking of individuals and the company.

The above said perspective shifts the research focus from the concept of *intellectual property* – associated to the acquisition of patents, trade marks and other intangibles usually posted in a financial statement – to that of *intellectual resource*, i.e., a production factor profiling a capability to frame the relevant system and make proper decisions.

Investments in education and human resource development (leading to human capital accumulation) are only some key-factors of IC. IC also consists of structural capital, which results from the process of individual knowledge elicitation, in order to act on *human capital* as a lever to build up business knowledge (Edvinson & Malone, 1997).

The individual knowledge elicitation process takes place in both internal and external activities. In the first case, investments in organisational and information structures, and procedures generate the so called *organisational capital*. In the second case, investments aimed to build strong and long term relationships with external counterparts (e.g. customers, suppliers, competitors) give rise to a shared knowledge system, which may relate to products, information, distribution systems, etc. This is the so called *customer or relational capital* (Stewart, 1997).

In the next paragraph call center main characteristics are analysed and decision makers main issues in managing a call center are outlined.

CALL CENTER MANAGEMENT ISSUES

In the last decade customer care strategies of service firms and, in particular, of telecom companies received a growing attention. In order to effectively offer to clients a reliable and effective customer service over time, firms very often decide to start an own call center, rather than to outsource it. Today most of the companies mentioned in Fortune 500 list have at least one call center and more that $300 billion is spent annually on this service around the word (Gilson & Khandelwal, 2005).

The decision to start a call center aims to be successful in implementing a customer care strategy that can balance costs, generate revenues and provide to clients a stable level of service.

However, it has been shown that most of these initiatives have neither contributed to keep low costs nor to provide to customers a reliable service (Batt & Moynihan, 2006; Gilson & Khandelwal, 2005). An analysis of US mobile-telecommunications industry (Braff and Leogue, 2004) shows an extraordinary number of dissatisfied customers. One of the main reasons of customers complains refers to repeatedly agents failure to fix a problem, despite several calls the customer makes about it. Customers complain that very often call center agents provide inconsistent advices, instructions or clarifications from one call to the next. In addition, critics are also directed at an inability to provide the help requested due to, for instance, systems limitations and lack of technical available resources. The above difficulties very often generate an increase in the number of number of unhappy customers and company customers lost and, as a consequence, a decline in sales revenues and market share.

These unexpected outcomes are also due to the complexity of a call center. Call centers typically handle more than one type of call, and each call type can be referred to as a "queue";

agents often make outbound calls to customers, either proactively (typically for telemarketing) or as a follow-up to previous inbound calls; each call is of a random duration, as is the work that agents must do after completing the phone call (data entry, documentation, research, etc.) and, finally, employees can be trained to handle one type or all types of calls with different priorities.

Furthermore, in managing call centers decision makers have to deal simultaneously with conflicting targets, such as keeping costs low, maintaining high customer service quality and employee satisfaction. Some important issues that decision makers have to define refer to:

1.   How many agents should the company have on staff with which particular skills?

2.   How many calls of which type does the company expect at which times? How do calls dynamics change over time due to marketing activities or competitors' policies?

3.   How quickly does the company want to respond to each type of inbound call?

4.   How should the company route calls to make the best use of available resources?

5.   How is possible to keep low agents' turnover?

6.   Given a forecast, a routing design, and an agent schedule, how well will the company perform?

7.   Is the overall capacity sufficient?

In order words, in order to effectively manage a call center decision makers must be aware of the net of causalities affecting both tangible and intangibles assets over time, of the accumulation and depletion processes that affect such assets, and how company policies may accelerate in-flows and slow down out-flows of desired strategic resources that are fundamental to defend or achieve a sustainable competitive advantage.

As it is possible to observe from the above analysis to be successful in managing a call center a company has to properly define a customer service strategy (Gilson and Khandelwal 2005) coherent with corporate goals and the endowment of actual and future tangible and intangible assets. On these last concerns, Mehrotra and Fama (2003) remarked the emerging important role played by simulation in exploring alternative scenarios to identify successfully call center management policies.

In the next section of the paper, a case-study is provided and main company human resources policies are commented. This analysis allowed me to build a conceptual framework through which call center investment policies, related to human resources and information systems and organisational structure directly affect company's tangible and intangible assets, call center results and indirectly firm performance.

In a first step, main *policy levers* related to human resources and organisation investments affecting company strategic assets, *performance drivers* and *indicators* are identified. On the basis of such analysis, main feedback loops underlying the structure of key-variables relationships affecting call center and firm performance indicators are made explicit.

INTRODUCTION TO THE CASE-STUDY

Company *Alfa* [2] is a leader in providing mobile telecom (GSM and UMTS standards) and internet services in the domestic market. In the last three years, company market share decreased from 50% to 48,5%. Competitors hold a lower market share. Only one of them, through a very aggressive marketing campaign, reached last year the 30% of the market.

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[2] The name of the firm has been intentionally disguised.

In order to build a sustainable competitive advantage, company *Alfa* has always paid particular attention on the most up-to-date technological broadcasting stations on a side, and on advanced training and development human resources programs on the other side. In fact, the strong image on the market is due to the ability of firm *Alfa* to provide to customers:
- a reliable coverage;
- a proper plan flexibility and
- a timely customer service.

The case-study focus on the call center activities and, in particular, how investment policies related to human resources, information system and organisational structure directly affect call center results and indirectly firm performance.

For this study, a call center that deals with about 6 millions of customers in a given geographic area has been selected. In such area, both company market share and Average Revenue Per Unit (ARPU) are very similar to those recorded by the company in all domestic market. The analysis has been restricted to a particular segment of customers that are defined by the firm as "Gold" customers, i.e., those clients that generate a high level of revenues. Such a customer segment includes almost the 40% of the total customer base in the selected area.

In order to manage the requests coming from the so called Gold customers, in the call center operate about 410 persons. The company uses to have the 80% constitutes by permanent employees that are both full-time and part-time. The other 20%, about 90 human resources, are constituted by temporary workers. It is worth noting that in the last three years a growth number of permanent employees have been replaced by temporary workers. At the end of such period, permanent call center agents were only 260 and temporary workers about 150.

The company Customer Satisfaction Index

One of the main reasons that favoured the involvement of company in this research was the possibility to explore in an innovative way the potential causes underlying Customer Satisfaction Index (CSI) oscillations, which periodically occurred in the last three years. In particular, the project aimed to make explicit and test potential cause-and-effect relationships between investments policies adopted by the company in the last years and the erratic behaviour of the CSI.

The company conceives the CSI as one of the main strategic drivers that affects business results. In the last five years, the company implemented different methods to gather and analyse the level of service perceived by customers. In particular, the company assesses the CSI based on internal surveys and external analysis done by specialised firms. The daily CSI is determined on the basis of a sample of 500 customers, that called the call center the day before. Results are then summarised on a monthly basis. It includes not only the CSI scores [3], but also the main reasons of the calls done by clients (e.g., request of information vs complains).

Insert Figure 4 about here

As it is possible to observe from figure 4, in the last three years the CSI related to "Gold" customers shows an oscillation decline. Oscillations were mainly justified by company personnel involved in the present study due to temporary failure of the information systems. On this issues,

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[3] The customer satisfaction index is an index measure that goes from 0 (Min) to 100 (Max).

during the meetings, I didn't perceive a full consensus. In fact, some company representatives argued that oscillations could be also related to competitors' commercial policies.

The company human resources development policy

As personnel is recognised by company *Alfa* as one the most important strategic asset, the management pays particular attention to human resources investments.

The human resources policy differs for temporary and permanent call center agents. Temporary workers receive an initial training and a period of training on the job, but they do not periodically participate, as permanent agents do, to continuous training initiatives. In the last three years, although the company decided to hire a growing number of temporary workers, the training policy didn't change.

In the last three years, the planned annual length of human resources training programs has been set around 98 hours per each call center agent. These programs cover different areas, such as Organisation, Networks, Information systems, Commercial and Technical issues, Loyalty and outbound, Administration, Communication and Learning On The Job and Safety on the job.

In the last three years, to favour the ability of call center agent to sell add value products, the company decided to promote training programs oriented to increase mainly agents' commercial and sales competences rather than technical and administrative knowledge.

A FRAMEWORK TO INVESTIGATE THE IMPACT OF HUMAN RESOURCES AND ORGANISATIONAL INVESTMENT POLICIES ON CSI AND FIRM PERFORMANCE

The framework here proposed is the result of previous applied researches (Bianchi and Bivona, 2003; 2005). It aims to distinguish the impact of investment policies (related to human resources and information and organisations systems) on strategic resources, which in turn affect drivers and outcome performance indicators.

The framework for such analysis is provided in figure 5.

Insert Figure 5 about here

Figure 5 shows how different primary strategic assets embodying business knowledge are built as an effect of hiring, training, organisational structure and information systems investments.

On the basis of the analysis conducted with company *Alfa* personnel, investments in human resources (hiring and training), organisational structure and information systems may enable the firm to accumulate strategic resources related to business knowledge, i.e., human resources knowledge and competences, and information and organisational systems quality.

Business knowledge (or *know-how, know-what and know-why*) is likely to affect *performance drivers*, such as 'Answer Service Response', the so called 'One Call Solution' and 'Proactiveness' indexes which in turn can influence CSI.

'Answer Service Response' refers to the percentage of calls answered compared to the volume of call received in a call center, in a given period of time.

The second driver, 'One Call Solution', measures the ability of call center agents to solve customers' problems just during the same call. Company *Alfa* personnel remarks that the success of 'One Call Solution' is strongly related not only to agents' knowledge and competences, but also to: a) procedures adopted in the call center; b) information systems efficiency, and c) customer problem complexity.

The third driver, 'Proactiveness', shows agents ability to be successful in proposing and selling new services that may be helpful for the customers. A high Proactiveness produces benefits for both the customers, who is informed about new services, and the company, in terms of higher revenues.

An increase in the three performance drivers generates grows in customer satisfaction, that in turn is likely to influence three synthetic firm outcomes, such as Average Revenue Per Unit, Sales Revenues and Company Market Share.

This framework helps making explicit decision makers mental models about their perceived relationships between policy levers, business strategic resources, performance drivers and financial indicators.

However, such a scheme does not capture how investment decisions affects strategic resources accumulation and depletion processes and, how virtuous or vicious circles may fuel or tackle business growth. Furthermore, it does not take into account delays that may occur between decisions and related effects. As a consequence, decision makers may misunderstand unexpected short term effects originated by their applied policies (perceived as ineffective in a bounded period of time, but successful in a longer time horizon) and erroneously to change their adopted decisions. In order to overcome such limits, I propose to apply the System Dynamics (SD) methodology (Forrester 1961; Sterman 2000). This methodology is based on the concepts of feedback loops, delays and non linear relationships between variables, and it can be used to investigate the coordination of dynamic resources systems through modelling and simulation (Crossland & Smith, 2002; Gary 2005; Morecroft, 2002; Norton and Kaplan, 2002; Sterman, 2000; Warren 2002, 2004, 2005).

A TENTATIVE FEEDBACK ANALYSIS OF THE RELATIONSHIPS BETWEEN STRATEGIC RESOURCES, PERFORMANCE DRIVERS AND PERFORMANCE INDICATORS

In order to make explicit main strategic resources affecting CSI, several group model building sessions (Vennix, 1996) have been conducted with the involvement of company personnel [4]. Most of the people involved in the sessions agreed on the fact that – due to the

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[4] As remarked by Vennix (1996), the purpose of Group Model Building is to analyze/solve a real world problem and not only to gain insight into the dynamics of the system/problem investigated. Building SD simulation models with a group of stakeholders using the Group Model Building approach has shown to

peculiarity of the industry – investments in human resources and information and organisation systems may increase the level of agents' competences and their productivity in dealing with customer requests. These phenomena can be expressed through the use of two synthetic index variables, such as Human Resources Knowledge Index and Organisational Structure Quality Index. Both investments are able to increase agents competences and productivity [5]. A raise in such indexes is likely to positively affect call center production capacity, which can be expressed in terms of total calls answered. Such production capacity can be also increased through new hired employees. A higher level of production capacity enables the call center to increase the number of total calls answered in a given period of time and, consequently, all conditions being equal, to improve the answer service response (i.e., number of calls answered divided by number of calls received in a given time frame). A high answer service response also implies a growth in CSI, which in turn may generate a positive word of mouth and a raise in company customers. A larger customer base implies a high volume of sales revenues and, all conditions being equal, a growing operating income. Such financial resources may enable the company to fuel such a positive phenomenon by making further human resources, information and organisational investments (see positive feedback loop R_1 in figure 6) [6].

Insert Figure 6 about here

Investments in human resources, information systems and organisational structure can also contribute to give rise agents ability to solve customers' problems in just one call. Such phenomenon is indicated as 'One Call Solution'. In other words, as human resources knowledge level and information and organisation quality index improve, call center agents can be more effective in solving customers' claims. As a consequence, a high 'One Call Solution' enhances CSI and positively contribute to win new customers. An increase in the number of clients is likely to augment – through a raise in sales revenues and operating income – financial resources that can be invested in human resources and information and organisation systems and boost further business growth (see positive feedback loop R_2 in figure 6).

Investments in human resources and information and organisation sub systems can contribute also to fuel two growth loops. In fact, these investments may foster agents 'Proactiveness' (i.e., the ability of an agent to be successful in proposing and selling new services perceived by customers as helpful to satisfy their needs), which in turn improves CSI and develops company customer base. It also increases the average revenue per unit. In both

be very effective to support strategic decision-making. In fact, the use of causal loop, stocks-and-flows diagrams and simulations are likely to enhance team learning, foster consensus and enhance commitment with the outcomes.

[5] It is worth remarking that the average training programme length affects agents' productivity. In fact, a too short training programme length (compared to the industry standards) is not sufficient to adequately support agents' knowledge level development. As a consequence agents' productivity tends to reduce as well as the level of the customer service provided.

[6] Figure 6 also includes a customer base draining process related to the effect of CSI. In fact, a reduction in CSI is likely to generate a high rate of customers lost, that will slow down the power of the virtuous loop previously commented. It is worth noting that dot (continue) arrows imply an indirect (direct) relationships between identified variables.

cases, 'Proactiveness' favours two positive feedback loops that may foster firm growth (see positive feedback loops R_{3-4} in figure 6).

The above commented growth mechanism may encounter some obstacles. In fact, as the customer base grows up calls volume also tends to increase. It follows that the answer service response decreases, CSI deteriorates and company customer base falls down. A reduction in company customer base generates a lower calls volume that in turn improves the answer service response (see negative feedback loop B_2 in figure 6). A better answer service response gives rise to CSI. This negative feedback loop generates oscillation recorded in CSI that are not easy to perceive due to delays between answer service response, CSI and customer base accumulation and depletion processes.

An increase in calls volume is also likely to generate a vicious loop. In fact, a high calls volume, by reducing the answer service response, produces 'unanswered calls' (or first abandoned calls), which in turn – in the short term – generates a worsening in the answer service response (see positive feedback loop R_5 in figure 6). In addition, a high number of unanswered calls – due to a long waiting time – in the medium term produces an increase in calls volume through repeated calls. Consequently, the answer service response will go down. It is worth remarking that these two vicious cycle (see positive feedback loops R_{5-6} in figure 6) are likely to amplify the oscillations produced by the negative feedback B_2.

In order to properly manage the incoming calls volume and to provide to customers a satisfactory level of service, the company may cope with the above commented phenomena through both human resources and organisational investments, but also by hiring new call center agents.

On this last concern, it is worth remarking that in the last three years the firm dimensioned the call center personnel sufficiently enough to deal with the calls volume generated by the current customer base. However, it is worth observing that in this period of time, a growing number of permanent agents – who decided to resign – were replaced by temporary workers. This was also due to the financial benefits perceived by the company, in terms of the low salary and training costs of temporary agents.

On the basis of the feedback loops structure outlined above, although the decision to replace permanent with temporary agents allowed the company to also increase call center production capacity, in terms of calls answered, it produces a delayed effect on the average human resources knowledge index. In fact, temporary agents provide a high level of productivity in dealing with customers calls, but they have a low level of knowledge that reduces the average human resources knowledge index (see negative feedback loops B_{3-4} in figure 6). This phenomenon also occurs because the company provides to temporary workers – due to their high quit rate – only an initial training program. A lower human resources knowledge index produces negative effects on both one call solution and agents' proactiveness, which represent two fundamental drivers of CSI and sales revenues.

The current study also makes explicit some causes of the growing number of permanent agents who decide to resign. In particular, it emerged that such phenomenon was mainly due to the decision taken by the company. In the investigated time period, the firm policy to reduce the training time period (from 98 hours to 30 hours) generated agents dissatisfaction and strongly increased permanent agent quit rate.

The above commented feedback loops structure provided the conceptual framework for the development of a SD simulation model to support call center top management to better frame

and manage business knowledge variables (Winch 2001) impacting on customer satisfaction index and business performance indicators.

Facilitated simulation sessions (Vennix 1996) with the involvement of company personnel have been run to support them to understand the interaction between the identified feedback loops and how their planned decisions may influence strategic assets accumulation and depletion processes and firm performance indicators, in the short and medium-long term.

Such an approach intends to stimulate decision makers' capability to better frame cause-and-effect relationships underlying business knowledge and firm performance indicators behaviours. It also aims to match the SD view to the traditional static (accounting) perspective, according to which human and organisational investments are often seen as discretionary costs on which to operate relevant reduction (when needed to come up with positive operating income), without a proper functional analysis of such investments on business performance over time.

THE STRUCTURE OF THE SD SIMULATION MODEL

The SD simulation model consists of four main sectors:
- an input window, which allows the user to customise the simulator, according to different issues, such as: the initial number of agents in each training stage (classroom vs. on-the-job training) or knowledge level (permanent vs. temporary workers), normal training programme length in the industry, normal organisational investments obsolescence time;
- a control panel embodying main policy levers (e.g. monthly permanent and temporary employees to be hired, new hired training programme length, information system and organisational investments, permanent agents overtime) and scenario options (e.g. concerning market growth rate);
- reports including financial, income, and cash flow statements;
- graphs including main variables impacting on human capital, structural capital, company performance drivers and indicators.

An analysis of the past key-variables behaviours and two alternatives scenarios

In order to validate the SD simulation model developed, validation tests have been conducted on both the variables relationships underlined the structure of the model and the sensitivity of key-variables behaviour under different circumstances (Forrester and Senge, 1980). Furthermore, it has been also compared the behaviours of some business key-variables originated from the SD model and company past data. Even though the differences between simulated and actual results have not been verify in statistical terms, company actors proved to be confident on the ability of the SD model to replicate the analysed system [7].

In order to show how the SD simulation model can try to support call center top management to better frame and manage variables impacting on CSI and firm performance indicators, the base run and two scenarios will be now commented.

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[7] Although statistical analysis are relevant to test a model, the SD methodology aims at fostering decision makers learning processes rather than to support them with exact and "true" values or solutions.

Figure 7 shows main variables resulting from the SD simulation model aimed to capture past business results. In particular, the simulated period covers last three years (time is expressed in days).

Insert Figure 7 about here

From figure 7 emerges a decline in permanent workers and a growth in the number of temporary call center agents. Such phenomenon already discussed in the case-study is the result of a company policy. In the observed period, human resources knowledge index (from 0,91 to 0,89) also shows a reduction mainly due to a shorter personnel training program development compared to the industry standard. This also generates a high personnel turnover not only in temporary workers, but also in permanent employees.

The answer service response in the first year falls down and then remains stable. This phenomenon can be explained as a consequence of both the increase in permanent agents quit rate and the reduction in HR knowledge index. Agents' proactiveness and one call solution indexes follows the same path of HR knowledge index over time. CSI goes down and shows also some periodic oscillations. On the basis of these results, business performance indicators, such as average revenue per unit, market share and customer base, turn down. In order to compare alternative scenarios and base run results, initial conditions do not change (e.g., firm variables initial values and market assumptions). Furthermore, to better understand the effects generated by human resources hiring and training policies, investments in information systems and organisational structure are kept normal in both scenarios.

Scenario 1: a myopic human resources developments policy

According to this scenario (see lines 1 in figure 8), the company adopts the past hiring policy. In other words, a number of permanent employees who decide to resign are replaced by temporary agents (see temporary and permanent human resources lines 1 and 3 in figure 8).

To distinguish the effects of the training policy, after the first year human resources training length is increased to the normal industry standard (from 30 to 98 hours per year). Such a raise in training generates also a slighter decline in HR knowledge index. In fact, by comparing HR knowledge index (figure 8) with the base run (figure 7), it is possible to note in scenario one a higher values at the end of the simulation. Company answer service response after the first year significantly improves and, as the number of calls answered growth up, CSI also boosts. It is worth noting that scenario one generates better results than those produced by past company policies (base run). In fact, CSI shows a growing trend rather than a decline and average revenue per unit, market share and company customer base portray higher vales compared to past results.

This scenario is titled as myopic policy because by replacing temporary agents almost exclusively with temporary ones, event thought the firm is able to reduce operating costs on one side, and to provide clients a reasonable customer service on the other side, human resource knowledge level still declines. It follows that low agents proactiveness and ability to solve in one call customer problems do not allow the company to tackle profitability decline (i.e., the reduction in average revenue per unit).

Scenario 2: a sustainable long-term oriented human resources developments policy

Scenario two implies market growth rate and organisational investments assumptions of scenario one.

In this case, it is hypothesised that the company hires a number of permanent and temporary agents equal to those that resign. As previously done in scenario one, after the first year, human resources training length is increased to the normal industry standard.

The adopted hiring policy allows the firm to maintain unchanged the number of permanent and temporary agents in the firm. Further, a raise in HR training development programs stabiles the HR knowledge index. As a consequence, agents' proactiveness and one call solution indexes stopped their decline, likewise the average revenue per unit. In fact, agent ability to be successful in promoting and selling new services to customers strongly contribute to foster the average revenues per clients. This implies that the higher costs sustained by the company to hire and train permanent call center agents could not necessarily influence business profitability, as well qualified employees could stimulate clients to subscribe new services and to increase company sales revenues.

CONCLUSIONS AND FUTHURE RESEARCH

This paper tries to show the potential benefits of adopting a System Dynamics resource based perspective in managing human resources, information and organisational structure investments in a complex system, such as a call center. The suggested approach aims to better support call center top management to better frame and manage firm strategic assets accumulation and depletion processes variables and their impact on performance drivers and outcomes. Making explicit cause-and-effect relationships between main business variables, decision makers can better understand the results created from a give strategy and evaluate strategic alternatives before committing resources for new investments. Simulations may also enable managers to experiment in a "safe" environment such alternatives and to assess their short and long term effects at both business unit (call center) and corporate level.

The case-study shows that although call center are perceived as a "profit center", in which activities are oriented to mainly generate sales revenues with a desired yield, very often – in day-by-day operations – they are threatened as a "cost center", in which cost savings, efficiency and economies of scales are main imperatives. This focus on costs, applied to IC investment policies in a call center, implies – for instance – low level of training (or replacing permanent with temporary agents) resulting in high absenteeism and turnover. A high turnover rate in a call center is a widely recognised problem that leads to poor customer service (Batt & Moynihan, 2006).

Facilitated simulation sessions (Vennix 1996) support company personnel to better understand the interaction between the identified feedback loops and how their planned decisions may influence performance indicators.

In spite of the widespread relevance and influence of asset stock accumulation, explicit formulation and modelling are not prevalent in the strategy literature. This shortfall occurs event

though successful examples nowadays demonstrates the benefits of asset's dynamics modelling and simulation in supporting decision makers to understand alternative corporate diversification strategies (Gary 2005), or performance recovery strategies (Warren, 2005).

Further empirical research are necessary to experiment the contribution of the methodology adopted in the paper to top managers' learning processes, in both educational and planning contexts.

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FIGURES

FIGURE 1
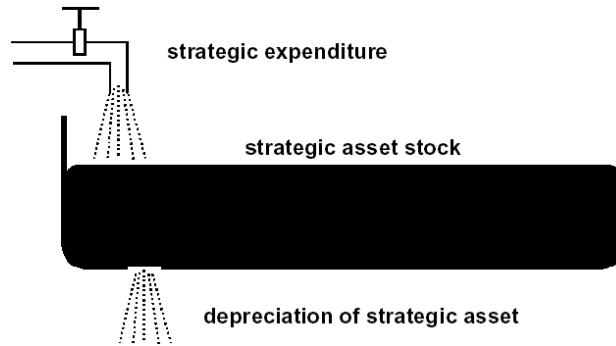
The Bathtub Metaphor, Visualising the Accumulation and the Depreciation of Resources
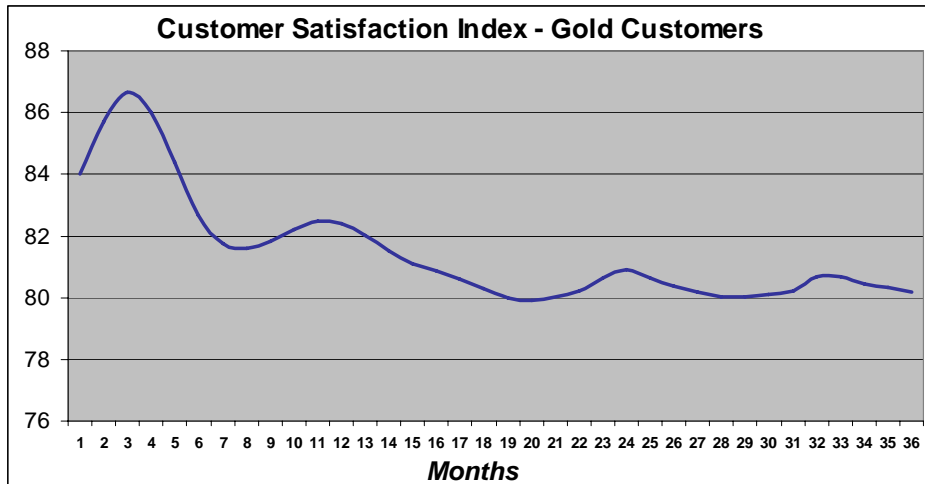
FIGURE 2
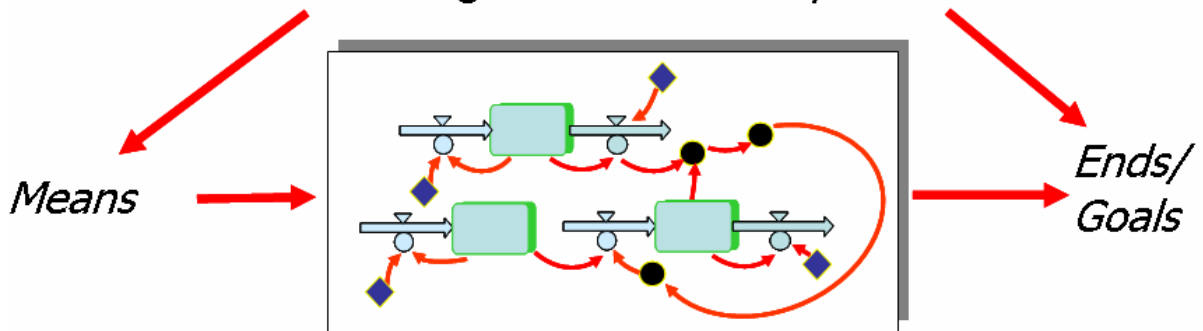
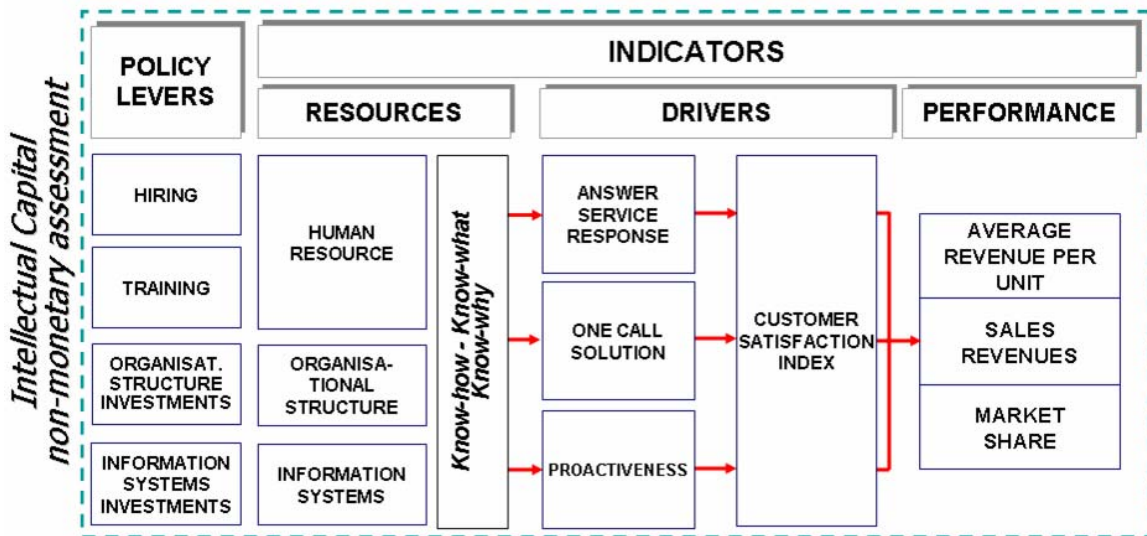**The concept of Intellectual Capital**

FIGURE 3
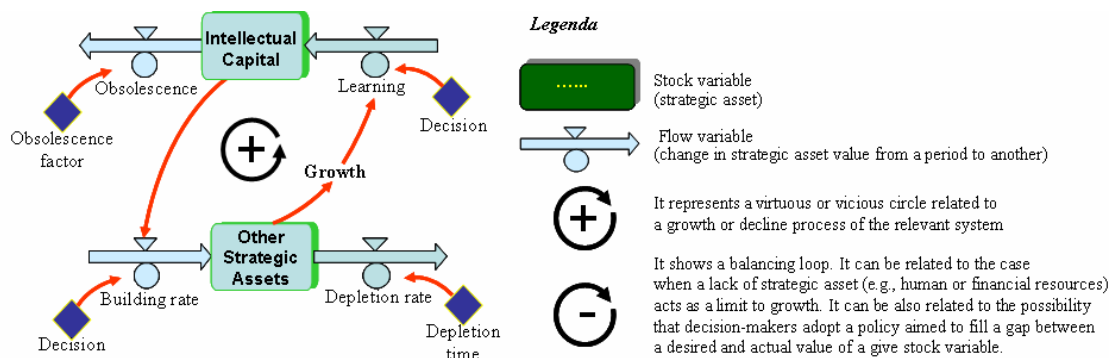
Intellectual and other strategic assets accumulation and depletion processes underlying
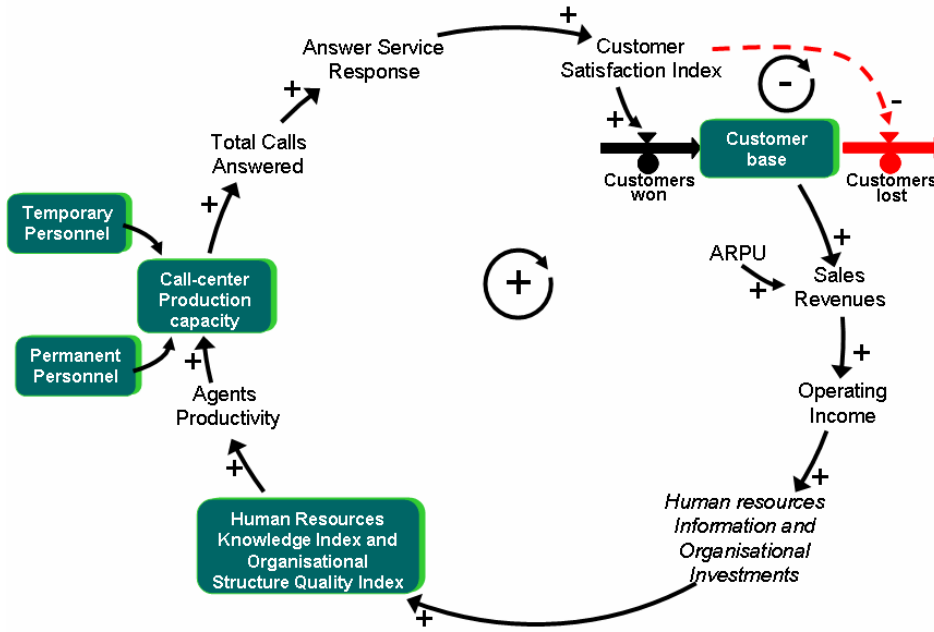
business growth

FIGURE 4

Customer Satisfaction Index of Gold customers
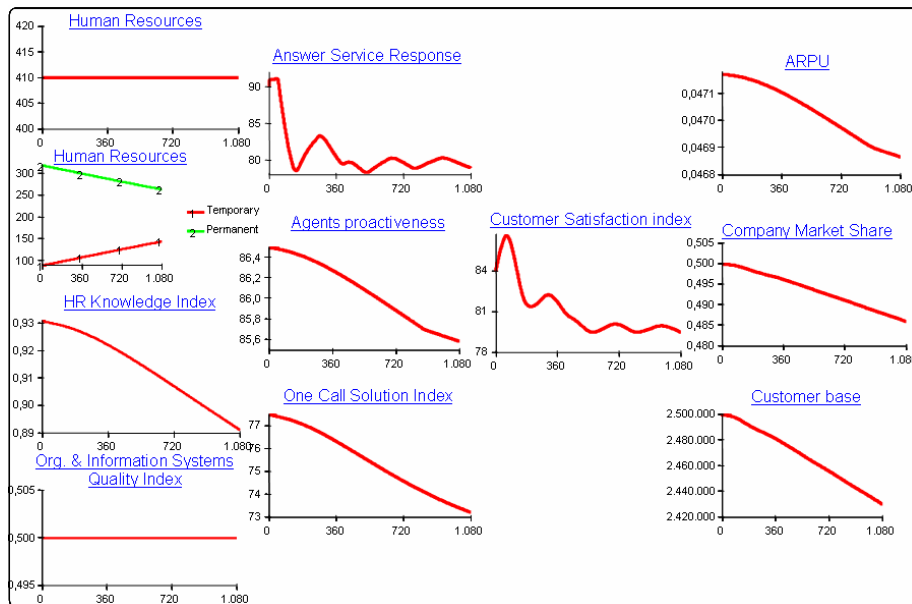
FIGURE 5

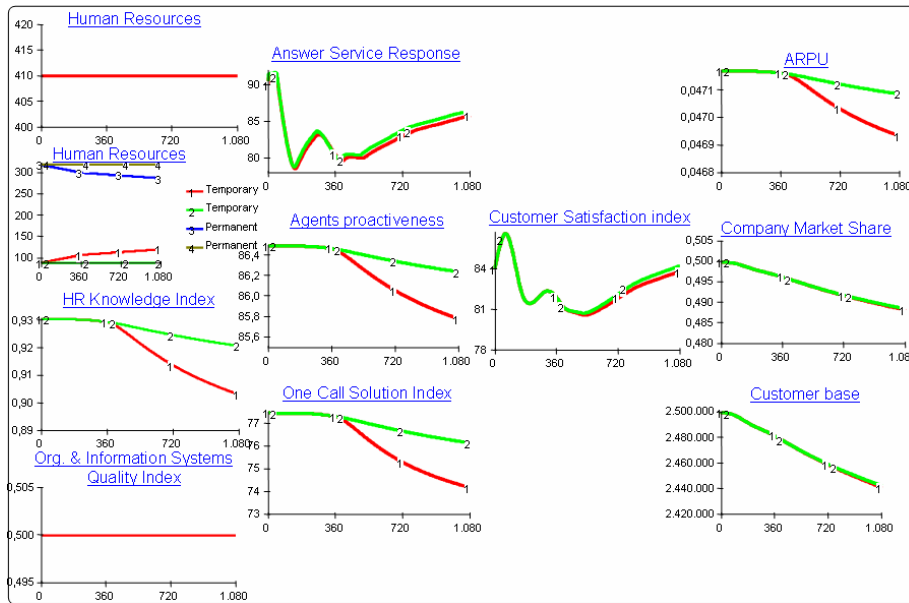**A conceptual framework for Intellectual Capital non-monetary assessment**

FIGURE 6

Positive and negative feedback loops related to the effects of human resources and organisational investments on Company performance

FIGURE 7

Company resources, performance drivers and indicators related to the base run

FIGURE 8

Company resources, performance drivers and indicators related to scenario one (line 1) and scenario two (line 2)