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Strategic Performance Measurement of Research and Development: A Case Study

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Abstract:
The paper used an in depth case study to investigate how firms can integrate the strategic performance measurement of R&D with the Balanced Scorecard. Moreover, the paper investigated the crucial role of controller in the decision making process of this integration.
The literature review of R&D management evidenced the limits of Balanced Scorecard to manage and monitor the R&D activities. Therefore, the firms have to create a specific performance measurement system and to link it with the macro-indicators of Balanced Scorecard. The controller has a central role in the selection of non-financial ratio as the R&D measures to introduce in the Balanced Scorecard.
In choosing our case study, we have selected the pharmaceutical industry because of its relevant R&D investment. Within the sector we chose the Italian affiliate of a traditional industry leader, Eli Lilly Italia,that was characterized by the reorganization of R&D performance measurement systems and its consequent simplification.
The Balanced Scorecard of Eli Lilly Italy were categorized into four perspectives: Financial Perspective, Customer Perspective, Competence Perspective and People Perspective. The competence perspective was linked to the R&D dashboard, composed by several key performance indicators: cycle time, cycle time AMR, publication, corporate productivity, capacity, rating audit quality. Furthermore, when the company has implemented the Balanced Scorecard, the controller has assumed a crucial role in choosing indexes and in the organizational learning process connected to the feed-back process.
The study offers an example of integration of R&D performance management with Balanced Scorecard and it contributes to the literature review about the role of controller in a complex system control environment.

Keywords: *Balanced Scorecard, Controller, R&D Dashboard, Competences Perspective*

1.Introduction

Recent business developments and the advent of a new technological era have led to changes both to performance measurement systems and to the role of controllers within companies. This evolution has shed light especially on the process of Research & Development (R&D) that has always been difficult to control; yet, the new systems of performance measurement have allowed to overcome the limits of the traditional systems related to this particular process.

In fact, control techniques used in other business functions have long been considered inappropriate for Research and Development; as a matter of fact, in R&D processes, effort levels may not be observable, project success is uncertain, influenced by uncontrollable factors, and success can be assessed only after long delays.

Therefore, control has often been limited to setting budgets and periodical peer-reviews focused on technological achievements (Roussel at al., 1991). In recent years, however, changing business environments have prompted companies to strengthen the efficiency and effectiveness of their R&D processes, and senior managers' attention is now focused on R&D's contribution to competitive advantages (Wheelwright and Clark, 1992)

Literature on R&D management (Griffin and Page, 1993; Loch and Tapper, 1997; Kerssens-van Drongelen and Bilderbeek, 1999) suggests that there are no final measures applicable to all situations; rather, performance measures need to be flexible and open to change (Pawar and Driva 1999); moreover, it seems that companies often use these systems without linking performance measurements to their strategy. Therefore, we wish to demonstrate that in order to be effective a specific performance measurement system for the R&D has to be integrated with the Balanced Scorecard, even if the BSC in itself can be considered not sufficient for the monitoring and management of it.

Secondly, we shall analyse the controller's role and its relationship with strategic performance measurements (Oliver, 1991; Friedman and Lyne, 1997; Hrisak, 1996; Vaivo, 2004; Sathe, 1982). In recent years, the controller has gradually become an active part in the decision-making process. In fact, the responsibility for control runs from the chief executive officer down through the line organization, which uses information provided by the controller.

Therefore, it can be argued that the more complex the environment and the decisions that the management has to take, as for R&D management, the more relevant and central the role of the controller is.

Based on these assumption, we hypothesise that a positive correlation can be found between the level of environmental and decision complexity and the centrality and strategic nature of the role of the controller.

This research exemplifies the importance of the characteristics of the R&D process that designates a clear-cut performance measurement system and analyses the evolution of the controller's role.

2. Theory and Research Hypotheses

2.1. Performance Measurement of Research and Development

Literature regarding R&D touches different themes, e.g. effectiveness, performance, success, control, monitoring, assessment, measurement, benchmarking, auditing and evaluation (De Bandt, 1995; Brown and Eisenhardt, 1995; Cooper and Kleinshmidt, 1995; Hultink and Robben, 1995; Schumann et al., 1995; Chiesa et al., 1996; Loch et al., 1996; Sivathanu Pillai and Srinivasa Rao, 1996).

The literature on R&D measurement performance tended to focus on financial metrics (Kaplan and Norton, 1992, 1996) and, more recently, on manufacturing metrics (Kochhar et al., 1994) and organizational-measurement systems (Gregory, 1993), but some authors have written on the issues of complexity, success, and failure of product innovation (Griffin and Page, 1996) and on themes of strategy (Barczak, 1995; Zhang et al., 2004). New Product Development (NPD) management has been examined in two surveys (Gupta and Wilemon, 1996; Kerssens-van Drongelen and Bilderbeek, 1996), but they were preliminary studies, because it is not shown how these performance measures were being implemented.

The output of R&D projects is only partially measured if financial measures alone are used. This is because financial measures are too uncertain and too distant in time. Rather, there has been little interest in the measurements necessary to manage the product-development process, existing measurement tools focus on strategy, with minimal attention to the management problems faced by the designers and developers of the products.

Furthermore, there is little evidence of any research having examined performance in the context of product design and development. The few that have considered design and development have done so only as one input into a performance-measurement system. This is clearly inadequate for a comprehensive understanding of management problems in Research and Development (Loch and Tapper, 2002).

The most appropriate set of measures for assessing project-level success and the appropriate measures of a product development program's overall success must depend on the project strategy and on firm's innovation strategy because the performance measurement system in a company has to support the company' strategy (Griffin and Page, 1993).

Using the Balanced Scorecard (BSC) (Kaplan and Norton, 1996), some performance measure of R&D can be developed in the 'learning and growth' perspective that measure the business' internal processes that will have the greatest impact on customer satisfaction and achievability of the financial objectives.

Those measures for the 'learning and growth' perspective are performance drivers that provide the foundation for long-term success as the 'number of patent awarded', 'strategic skill coverage ratio by competency category' and 'percentage of product ideas approved for stage'.

The selected ratios must also reflect the objectives and responsibilities of the person in pursuing the activities that are being measured. It is widely recognised that the measures of performance used have a strong influence on business activities and results (Kaplan and Norton, 1992). It would be fundamentally wrong to measure laboratories that have objectives such as 'identifying future technologies' and 'undertaking basic research', which may first be incorporated in products in a twenty years' time, with traditional short term oriented criteria such as payback or return on investment.

If a basic research laboratory were to be measured on such criteria it would undoubtedly change over time and turn towards work, such as incremental product development, that has an immediate return.

Many different metrics are used in practice. In fact, there is an unlimited number of criteria that can be used to define measures of performance. Metrics that have been identified in the literature can be divided in one or more of five categories – cost, quality, time, innovativeness and contribution to profit. The efficiency, quality, flexibility and innovativeness reflect the critical responses of a firm to the increasing demands of its customers. (Flexibility in R&D is translated into time issues like throughput time and timeliness). Performance on these four aspects should eventually result in performance on the fifth metric: contribution to profit.

The categories described are also aligned with the four perspectives mentioned by Kaplan and Norton in their Balanced Scorecard (1992, 1993, 1996a): quality corresponds to the customer perspective; efficiency and timeliness to the internal processes perspective; innovativeness to innovation and learning and contribution to profit to the financial perspective.

With measures from the first three perspectives, R&D managers can diagnose whether individual researchers, teams, departments, etc. are currently focusing and performing well on those aspects of their work that are assumed to be critical to business success. In addition, measures from the financial perspective help to analyse – be it with a time lag – whether the R&D strategy itself was right.

The performance measure of the R&D is so complex that they cannot be synthesized by the macro-indicators introduced in the BSC. A specific performance measurement system has to be created in order to monitor and manage them. Anyway the link between the two systems is essential for the management to focus on the most strategic aspect of R&D.
We, therefore, hypothesise that in order to be effective a specific performance measurement system for the R&D has to be integrated with the Balanced Scorecard, even if the BSC in itself can be considered not sufficient for the monitoring and management of it.

2.2. The Evolution of the Controller's Role

Controllers have now become an integral part of corporate practice. Yet, theoretical development perspectives are still lacking, despite the challenges currently faced by controllers and the need to modify given aspects of controllership (Oliver, 1991).
Controllers, traditionally responsible for the collection and provision of accounting information for managers, have long been considered mere "bean counters", i.e. accountants producing financial information whose value for the company was quite questionable (Friedman and Lyne, 1997).
The role of financial analysts, dealing with data needed to prepare budgets and reports for the company's managers, is now gradually evolving (Indjejikian and Matějka, 2006). The variety and diversity of companies and the increasing need for decentralization is creating new demands on the financial function of companies (Garrison and Noreen, 2003; Anthony and Govindarajan, 1998).
In some corporations, the traditional activities of controllers still play an important part in their daily work, their duties including budgeting and reporting, both internally and externally, and assisting in the preparation of product-cost calculations (Garrison and Noreen, 2003). Yet, in most companies, controllers' traditional responsibilities are shifting from routine transactions and reporting duties to a more central role on a management level.
Controllers are becoming involved in the company's strategic decision-making, rather than simply providing the information needed. New communication technologies have contributed to said changes: less time is spent on gathering information, and new non-financial measures are implemented, thus giving a better and more precise insight into the performance of the company (Hrisak, 1996; Vaivio, 2004).
It has been argued (Sathe, 1982) that a controller is effective not when he provides qualitative and quantitative information and analysis at given times, but rather when he is an active part in the decision-making process. This can be achieved by recommending given courses of action and by challenging executive plans, thus ensuring that specialist knowledge and expertise are properly taken into account during the decision-making process (Hrisak, 1996).

2.3. The Controller and Strategic Performance Management Systems

When it comes to performance measurement systems, the primary responsibility of the controller is to verify their effectiveness. In other words, the controller needs to check that the strategic management control systems and the formalized control of the organization satisfy corporate needs at all times (Willson-Colford, 1991).
The controller is also responsible for the continuous adjustment of performance measurement systems to changes in external and internal factors affecting the strategy of the company and the feed-back process which facilitates the review of the company's plans (Kaplan-Norton, 1996a; Norton, 2001).
In order to fulfil this task, the controller needs to have a good understanding of financial business ratios, both current and historical (Garrison and Noreen, 2003). Since the controller is primarily responsible for preserving and ensuring the efficiency of management control systems, he needs to have an encompassing knowledge of organizational budgets, plans and financial forecasts as well as of market situations.
Nonetheless in order to provide managers with decision-making information, the controller needs to consider not only financial ratios but also non-financial metrics. The latter indexes are vital in performance measurements, and may be seen as controversial and intrusive in nature (Vaivio, 1999; Kasurien, 2002; Vaivio, 2004). In fact, non-financial metrics trace the very essence of an organization's every day's life; therefore, they increase the company's visibility and might render deeply-rooted local practices difficult to preserve. Through non-financial metrics, new knowledge emerges at a local level, which may play an active role in the process of organizational learning, related to the continuous improvement of strategic performance measurement systems.
The main characteristics of non-financial metrics are also in line with the classical notion of local Management Information Systems (MIS) (Argyris, 1977). These local systems have specific characteristics, as they tend to include concrete descriptions of unique situations in the field, representations of actual operational processes, and implicitly rational logics which are essential elements of knowledge (Nonaka 1994; Nonaka-Takeuchi 1995).
As Argyris underlines, these subjective and intuitive systems cannot easily be transported from one setting to another. And they cannot be used by agents other than the creator of the local system, since it is not easily convertible, scalable and comparable with other systems (Argyris, 1977). Local knowledge can be shared within the organization through interactive, social processes of reflection and communication.
An important precondition for taking advantage of said local knowledge and improvement, which are important especially for the competitive advantage of more mature industries, is that good vertical communication occurs within larger organizations, in which the controller plays a central role (Jönsson, 1996).
An urge towards the combination of financial and non-financial measurements, has also been given by multidimensional reports such as the Balanced Scorecard (BSC) (Kaplan and Norton, 1992, 1996b, 2001, 2003, 2006). From the perspective of the strategic use of non-financial metrics, the BSC is particularly interesting. First, alongside other perspectives, it considers performance through the

introduction of a 'learning and growth' perspective. This identifies intangible assets (Kaplan and Norton 2003, 2006) and uses non-financial measures to monitor their dimension.

Moreover, Kaplan and Norton also discuss the overall 'Scorecard' as a system of double-loop learning (Kaplan and Norton 1996c; Argyris, 1977), suggesting that, as a whole, its measurements provide 'strategic feedback' which facilitates a 'strategy review' (Kaplan and Norton, 1996). The authors argue that important local knowledge-innovative ideas and insights that may suggest a new strategy that can arise from lower organizational levels (Nörreklit, 2000). The BSC does not, however, address explicitly the question of *how* this knowledge can be attained or how said learning process works.

In this research it is hypothesised that the controller can be crucial for this process if his/her competences are extended so as to include the selection of non-financial ratios. In that case it can be said that the professional profile of the controller is extended so as to encompass strategy-related concerns.

Being responsible for developing and analyzing control measurements and for making the recommendations for action to management, the controller would play a central role even if he or she does not make or enforce management decisions. In fact, the responsibility for control usually runs from the chief executive officer down through the line organization, which uses information provided by the controller.

It can be argued that the more complex the environment and the decisions that the management has to take, the more relevant and central the role of the controller becomes. In some companies, as in the case study analysed, the controller is even viewed as a member of the top-management team and encouraged to participate in planning, controlling and decision-making activities (Hansen and Mowen, 1997).

Based on these assumption, we hypothesise that a positive correlation can be found between the level of environmental complexity, the difficulty of the decisions that the management has to take and the centrality and strategic nature of the role of the controller.

3. Research Methodology

To choose a single case study, we followed the criteria shaped by Yin (2003), this ensuring a sufficiently detailed analysis of the complex process and its impact throughout the organization. The aim of our research was to investigate the process at a given company and, on the basis of our findings, to develop a framework for testing it also at other different sites.

The main factors used in selecting the company for our research were, first, to choose a firm with the highest possible investment in R&D; we thus targeted the pharmaceutical industry, which is frequently cited for notable R&D investments. Another important criterion was to select a multinational firm whose affiliates were highly autonomous in defining internal processes and performance measurement systems.

We thus chose Eli Lilly and Company, a traditional industry leader; we investigated changes occurring between 1999 and 2006, focusing on the company's activities in Europe, especially Eli Lilly Italia's. In Eli Lilly R&D is divided in four phases, two of which are delegated to national sites, therefore we could analyse the third and fourth phases while studying the affiliate Eli Lilly Italia.

The period considered was marked by an important change within Eli Lilly Italia, in that the Balanced Scorecard was introduced to replace the pre-existent Management by Objectives (MBO), due to the reorganization of the performance measurement systems of R&D activities and its consequent simplification. Such significant changes resulted in the evolution of the controller's function.

Data collection involved two sources: semi-structured interviews and archival documents, with multiple sources used to triangulate the collected data. Semi-structured interviews, each lasting about two and a half hours, were conducted with the controller and CFO of the company and with the key managers in charge of the single perspectives of the BSC and the R&D Department. Detailed notes were taken and interviews were recorded. Documented sources were used to supplement and substantiate information collected through interviews.

Data analysis involved the new process of creating grounded interpretations and representations on the basis of collected information (Strauss and Corbin, 1998). Therefore, initially detailed case studies were constructed and circulated among interviewees in order to verify their accuracy. Our analysis then involved categorizing data from multiple sources i.e. hard data - such as operating and financial performance results, dashboards of indicators, formal organizational changes over the period considered - integrated with soft data, i.e. the qualitative aspects derived from interviews. The corrections and suggestions coming from the company's managers greatly substantiated the patterns and findings of our research.

4. Case Study

4.1. Company Profile

Eli Lilly, a leading therapeutic and pharmaceutical company with headquarters in Indianapolis, Indiana, was founded in 1876 and incorporated in 1901. It is currently a multinational corporation that develops, manufactures, and markets pharmaceutical products. In 2006, its net sales were 15.6 Billion $, and its research and development (R&D) investment was 3.1 B $ - 20% on sales.

Lilly focuses on five kinds of disease: diseases to the central nervous system, endocrine, infectious, cancer, and cardiovascular diseases. Such focus is due to a specific strategic decision, related to the cost of discovering and developing new drugs.

In fact, it should be noted that today, the average cost of discovering and developing a new drug is estimated to be around 1.2 B $, and the average time to market is in the range of ten to twelve years.

Such cost pressures have also led to the setting up of a large number of mergers and acquisitions in the pharmaceutical industry all over the world, as no single national market can defray the costs of R&D. Rather than merging with other drug firms to become a

major player offering a wide range of pharmaceutical products, Eli Lilly has chosen to focus its R&D expenditures on a limited number of diseases, that represent its core business and in which it has critical R&D capabilities (Prahalad and Hamel, 1990).

4.2. The Evolution of Control Systems at Eli Lilly Italia

Until year 2000, the management control system used by Eli Lilly Italia (the affiliate of the corporation that was studied), was Management by objectives (MBO), which is a systematic and organized approach that allows management to focus on achievable goals and to attain the best possible results from available resources. It aims at increasing organizational performance by aligning goals and subordinate objectives throughout the organization. MBO also includes ongoing tracking and feedback processes in order to reach the objectives defined.

In Management by Objectives (MBO) systems, management identifies the objectives for each organizational level, and individuals are given specific aims and targets. The principle behind MBO should be to make sure that everybody within the organization has a clear understanding of the aims, or objectives, of that organization, as well as awareness of their own roles and responsibilities in achieving those aims, but other instruments, such as the Balanced Scorecard proved themselves more efficient in empowering employees.

The management processes described for the Balanced Scorecard are very similar to the MBO system elements. In essence, both systems are based on goal congruence throughout an organisation, and each details an iterative process based on collaboration between and within all levels of an organisation, but the company changed from MBO to Balanced Scorecard because this is more focused on the collaborative determination of goals and measures than MBO as it prescribes the four categories of customer satisfaction, internal processes, innovation and learning, and financial measures.

The creators of the Balanced Scorecard claim that such explicitness is needed because using open-ended systems has resulted in too much focus on easily quantifiable financials (Kaplan and Norton, 1992). They also argue that the specific targeting of non-financials reminds management of other equally important concerns.

Therefore, in year 2000, the company has implemented the Balanced Scorecard also in order to facilitate the strategic alignment and the internal communication processes and balance the short and long period's objectives.

The process of implementation of the Balanced Scorecard is articulated in the following phases:

- Definition of the mission;
- Creation of the company's Strategy Map;
- Identification of Performance Measures.

The mission defined by the company was "to improve the quality of everyone's life", while the business strategy consisted in increasing the impact on the market, more precisely to double the market share". In order to implement it, it was necessary to employ three strategic levers that were: Speed, Productivity and One team (attitude, ability to work in group of the Human Resources).

In the second phase the company's strategy map was built, in several meetings between the business managers. Those meetings has stimulated the strategic dialogue within the organization and, in turn, this has increased the effectiveness of the implementation. In fact, the employees, as a result of the improvement of the internal communication have become more aware of the objectives of the organization and therefore more aligned to them.

The Balanced Scorecard translates a company's mission and strategy into tangible objectives and measures, connected by cause-effect relations. Therefore, the measures chosen were balanced between the outcome measures and the measures that drive future performance. And the scorecard is balanced between objective, easily quantifiable outcome measures, and subjective, somewhat judgmental, performance drivers of the outcomes measures.

The objectives and measures created in a Balanced Scorecard in Eli Lilly Italia were categorized into four perspectives: Financial Perspective, Customer Perspective, Competence Perspective and People Perspective.

Eli Lilly considers of primary importance the financial objectives, whose key variables are sales and operating expenses, that replaced EVA.

In the Customer Perspective, the objectives are focused on the brand equities of the single brands belonging to Lilly (such as Zyprexa, Cymbalta, Cialis) and some attributes of the Lilly brand such as 'listen and respond' and 'breakthrough products'. Moreover, there are a few indicators focused on benchmarking with companies belonging to the same sector on issues relating to Customer Relationship Management (CRM).

The objectives and the measures of performance used in the perspective of the competences are related to the operating excellence, compliance to rules and regulations, and integration among functions within the affiliate.

Finally, the People's Perspective has a key role within the pharmaceutical company, since the company's values can be synthesized in three words: persons, integrity and excellence. The main metrics being: 'excellence in coaching', 'sustaining a positive, winning and collaborative environment'.

The model of Balanced Scorecard implemented in the company differs from the standard model by Kaplan and Norton, even though the authors themselves maintain that the structure of the BSC must be adapted to the characteristics of every single company. The perspective of internal processes has been replaced by the competences' perspective, thus giving more importance to human resources.

In order to improve internal processes in Eli Lilly in 2006 the management have used the instrument of lean six sigma. Lean six sigma is a methodology that allow, through a specific framework, to analyze, measure, improve and sustain processes within the organization. It has been implemented in order to facilitate the process of measurement and management of the internal performance, without integrating it in the Balanced Scorecard. The internal processes analysed in the Lean Six Sigma are those related to sale and marketing, whereas the performance measurement of processes related to scientific research are measured in the dashboard of Research & Development.

4.3. The Dashboard of Research and Development

The pharmaceutical research is divided into four phases. The process can be exemplified as: the basic research, the experimentation on the animals and, in finish, the experimentation on the men. The type of research performed at Eli Lilly Italia is the clinical research, which consists of three phases:

1. Experimentation on healthy people, to evaluate the security of new drugs;
2. Experimentation on the patients to evaluate both the security and the effectiveness;
3. Demonstration than the created drug is more effective of the known drugs identified as reference therapies for certain illnesses.

If the drug passes phase three and proves itself effective, the company presents a dossier to Ema (Europe) or FDA (in America) for the registration.

The strategic objective of the pharmaceutical research is to develop new products, but reducing the costs, because the Research and Development financial cost is extremely relevant.

In order to measure the results of the R&D complex phases, Eli Lilly has created a performance measurement system that is based on the analysis of drug development and that can be summarized in a dashboard, composed by seven key performance indicators and represented by seven graphs.

The metric CYCLE TIME measures the time between a Clinical Study approval and the visit of the first patient. This has a very important role because the competitiveness of company depends on the straight respect of the research time table. The key variables, that influences the respect of the timing are the approbatory procedures present in the hospitals and in the universities, the internal capacity, and the internal organization.

The metric CYCLE TIME AMR provides a general datum which includes cycle time. The Cycle Time shows the number of days going from the project approval to the visit to the first patient, while AMR measures the time needed to activate experimentation with respect to what planned. Accountability Model measures how far the original plan is complied with on the basis of three indicators: the beginning of the study, the recruitment phase and the end of the study.

The metric PUBLICATION measures if the publication plan was respected. A publication plan is created at the beginning of each year; at the end of said period, its respect is assessed by considering whether the foreseen publications were successful. The date of publication takes into account the phases involved in any given publication, i.e. data analysis, article processing and submission of the article to magazine. By “date of publication”, it is meant the date in which the article is submitted for publication; the effective date of publication does not depend on the company and thus cannot be controlled.

The metric CORPORATE PRODUCTIVITY reflects the relationship between the work load and the total number of people working in the company.

The first graph calculates the number of visits per full-time equivalent, which corresponds to a single person. The latter represents the time dedicated to the project, since there may be personnel 100% involved in the project or personnel 80% involved.

The second graph regards the management of data through CRF. These data are sent to an elaboration centre in Spain, which is a “data entry” centre and which produces queries in the event of mistakes. The number of queries per visit is calculated, thus giving an idea of the quality of CRF production, and of the time needed for each affiliate to answer to queries. Data are measured both in terms of cycle time and from a qualitative point of view. Every mistake is analysed, so as to determine if it depends on erroneous transcriptions or from the fact that the inserted value was out of range.

The metric CAPACITY is the workload measured on the basis of the resources available for planning purposes. Through the histograms, the company can evaluate how many people it needs in the next few months.

The metric RATING AUDIT QUALITY analyses the respect of good quality criteria established by the corporate.

These parameters pursue contradictory objectives: if the company has a significant work load and takes on too many projects, it can hardly work fast. If it works too fast, and the work load is badly balanced, it can be hardly qualitatively competitive. Hence, said parameters must be balanced. It is obvious that it is impossible to go beyond certain good quality limits. Quality is not, in fact, an objective, but rather a standard which needs to be checked on a regular basis.

The metric Cycle Time is considered as the most important for Eli Lilly Indianapolis, the Corporate, because the cost of the time needed for the creation of a new product is higher than the cost of the staff.

The model of performance measurement system is quite complete and objective, even if it is not simple often to compare various projects for which there are various complexities and various situations and the fact that times of development of a project are bigger does not involve a smaller performance. It can depend on the project, from the molecule, from the therapeutic area, from the demands of the drawing of the study. For which the performance measurement challenge involves the identification of objective and not many parameters affected by the project features.

This Dashboard is used by company for compare the performance measure of research and development as project activation times with other affiliate companies.

The macro-indicators of Dashboard are included in the perspective of competences. These indicators of R&D are the cycle time and the number of publications.

This system of Integration between Balanced Scorecard and Dashboard of R&S represents a model for other companies, especially those companies where the research and development has a central role for the value creation.

4.4. The Role of the Controller

In order to test our hypothesis regarding the controller's role, semi-structured interviews and archival documents were used following the criteria of the case study research methodology (Yin 2003). Multiple interviews were recorded with the chief financial officer (CFO) of Eli Lilly Italia and the company's controller, and with other key participants involved in the management control function.

Based on the data gathered, we tried to prove the hypothesis that a positive correlation can be found between the level of environmental and decision complexity and the centrality and strategic nature of the role of the controller.

From an organizational point of view, management control in Eli Lilly Italia is an autonomously identified function, and the function of the controller is played by a team that reports to the CFO. As part of a multinational company, the action of the controller depends on financial targets set by the corporation. The controller has also to balance his actions between the needs of the corporation and the affiliate in which he works.

Moreover, the Controller in Eli Lilly Italia has frequent and complex relationships with the Company's Board, and a critical role in choosing indexes and in the organizational learning process connected to the feed-back process.

The Controller has now assumed a transversal role and an importance which differs from other corporate functions. Such a characteristic is highly developed in Eli Lilly Italia, even if the R&D function can be considered separate from his control; this is due to the importance of the European centre of Eli Lilly and the need for benchmarking with other national Eli Lilly affiliates in Europe, which render the R&D manager responsible for the firm's performance.

The Controller's role does not simply satisfy corporate internal purposes. The controller also needs to satisfy the company's information (and control) needs, since the affiliate is required to follow its guidelines. A Group logic represents the guidelines for corporate action. In accordance with said guidelines, Eli Lilly Italia enjoys a certain discretion when adopting strategic decisions.

Another important function of the controller is to produce reports. The reporting system has been recently simplified, and the number of indicators has drastically diminished. The reporting system includes the production of reports for the corporation, which are standard for all the companies included in the Group, with the aim of allowing the corporation to choose the European affiliates to assign projects to.

The BSC system is only created for internal reporting needs; the information flow that results are used to re-orientate affiliate strategy themes and indexes. The BSC is supported by a computerised system, the 'Hyperion' that has been implemented in year 2006, in substitution of the Management Information System 'Decision Ware', that has been used since 1999. This innovative control system has had a considerable impact on control modalities as a whole. The Balanced Scorecard has undoubtedly introduced an important change in the company, even more for control professionals. It allows the latter to deeply control the key elements determining the firm's performance.

Moreover,the implementation of the 'Hyperion' has shown its effect on the company's processes - even by modelling the existing organizational performance management -, by attributing the company's responsibility in a more clear-cut way. In fact, thanks to the database used, it is possible to identify the responsibilities of single employee in pursuing the single objectives of the firm.

The 'Hyperion' has also contributed to changing the controllers' role. In fact, the typical transversal nature of said role allows for access to information and to multiple problems that, in the past, were left exclusively to other corporate functions. By being directly involved in matters not immediately pertaining to accounting, professional enrichment is acquired, and the role of the controller evolves (Burns and Vaivio, 2001).

The controller in Eli Lilly Italia is now an administrative role that combines traditional accounting-related skills with business managing skills, has a complete view of processes, and is able to perform complex transversal projects. More importantly he is now involved in the process of strategy definition, by choosing the strategic metrics to be included in the BSC and being therefore part of the Board of Directors of Eli Lilly Italia.

Therefore, the findings of our study suggest that in the period considered, which runs from year 1999 to year 2006, the hypothesis identified was verified, as the role of the controller has become more strategic in the affiliate of Eli Lilly that was the object of our analysis.

5. Conclusions

Research at Eli Lilly Italia suggested an evolutionary perspective on the process of strategic control of R&D processes. A number of studies have developed the characteristics of the performance management of R&D, suggesting the need for an independent performance measurement system. Other studies highlighted the importance of the BSC for the monitoring and management of those processes.

However, research at Eli Lilly Italia significantly extends these works, developing an integrated model that proposes the use of an independent dashboard of measures for the R&D management, whose metrics are chosen based on the strategic relevance of the various performance drivers in the R&D area, as indicated in the Company's BSC. A combined strategic performance management system is therefore illustrated.

This study also contributes to the existent literature by suggesting a more complex view of the role of the controller in the process of creation and management of the strategy. The evolution of its role at Eli Lilly Italia resembles the existent literature on the field, hypothesizing a gradual increase of the controller's centrality due to the progressive dismissal of his/hers routine accounting task.

This research and its findings suggests that the controller gradually assumes a more specific management character, by pursuing activities such as analysis and integration of information finalized to the support of the CEO in his/hers process of strategy definition, especially when the decisions that have to be taken are particularly complex as for the case of the R&D processes.

There are limitations in generalizing or interpreting the findings of this research given its focus on a single highly innovative company. However, notwithstanding these limitations, the study highlights the need to pursue an important new research agenda in the management control literature: the need for different performance measurement systems for the different area of interest of the company, especially when they are extremely complex as the R&D, and the definition of a more strategic role for the controller in the phase of the creation and management of those systems.

This paper develops a comprehensive model of the said process based on research at Eli Lilly Italia. Through further testing of the model at other sites, it will be possible to develop more generalizable findings and move toward developing a dynamic theory of strategic control of R&D processes.

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