

A Work Project, presented as part of the requirements for the Award of a Master's Degree in Management from the NOVA – School of Business and Economics.

How Reporting and Controlling Systems Can Be Effectively Designed to Support the Decision-Making Process: The case of a Software SME

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Abstract

This Work Project (WP) addresses the challenges faced by companies, particularly software houses, in reporting, decision making and controlling project performance activities. It focuses on issues regarding design and implementation of management control systems to support those activities and help achieve strategic goals. The WP suggests courses of action to be followed to improve the quality of information provided by such systems for budgeting and costing projects, and evaluate their performance. A case study approach (Ryan et al. 2002) was followed, applying Pinheiro's (2007) control plan to a real company. The findings may apply to other companies facing similar constraints.

Keywords:

Management Control Systems, Software Projects, Performance Measurement

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I - Purpose of Work Project

The present WP, which is based on an internship at Viatecla, Soluções Informáticas e Comunicações, S.A (henceforth called VIATECLA), aims at answering the following question raised by the Company: “Which type of reporting and controlling systems and related methods should be designed/redesigned and implemented in the Company in order to support its decision-making processes as well as its operation towards effectiveness and performance improvement?”

For the purpose of this WP, we will use the term Management Control Systems (MCSs) to refer to the combination of both reporting and controlling systems, since both provide crucial information for the decision-making and performance evaluation processes in enterprises. MCSs can be defined as the set of *“procedures that help ensure self-interested agents of the organization maximize the value of the organization”* (Zimmerman, 2012, pp. 718). In other words, MCSs must serve to influence the employees’ behaviors (actions, results) so that the organization’s objectives are achieved (Drury, 2012).

VIATECLA (established in 1996) whose headquarters are located in Almada, Portugal, is a B2B¹ SME² competing in the IT³ consulting industry. The company develops, sells, and installs SW packages for content and information management among other purposes, and provides consulting services (including product customization) usually associated with these packages.

¹ Meaning Business to Business – Refers to companies that cater to the business market which is made of *“all the organizations that buy goods and services to use in the production of other products and services, or for the purpose of reselling or renting them for profit.”* (Kotler et al., 2008, pp. 291).

² According to the EU recommendation 2003/361, 2003 *“The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million”*.

³ Meaning Information Technologies – Refers to software (SW) and hardware (HW) usually associated with data processing (e.g. database managing software, servers).

VIATECLA operates in a fast changing industry as evident when comparing Basil *et al.* (1997) with PricewaterhouseCoopers (2013). The emergence of cloud storage, data-mining, software-as-a-service and increased concerns about data security have drastically changed IT consultancy. Besides, developments in web-technology and computing power, globalization, the increasing number and importance of knowledge workers⁴, resource scarcity and tougher competition have led many IT companies to adopt a project-matrix organizational model (Pineiro, 2010). In such organizations, most employees simultaneously apply their sub-set of knowledge/experience to several different projects, work in different teams, and report to different managers. Reporting may become confusing and time consuming and, therefore, control suffers as a result, which is what has been occurring at VIATECLA.

MCSs help identify; 1) where and when man-hours are being spent (*i.e.*, in which projects and tasks); 2) if man-hours spent are in line with what was budgeted; and 3) the profitability of each product/service provided. With this information, top and middle managers⁵ should be able to monitor how projects are developing in real-time and whether the use of man-hours is optimal and consistent with the enterprise strategy. For this to happen, data from projects should be processed in a standardized way and presented in the form of Key Performance Indicators (KPIs) to facilitate project performance comparisons and support decision making. These can be leading or lagging, depending on whether they provide information about current or past performance (Rickarts, 2007), and need to be related to the corporate goals in order to guide the behavior of middle managers and other employees. So, the established goals

⁴Those who have specific knowledge of an area of expertise (e.g. architects, software engineers, lawyers). The number and importance of these professionals have increased dramatically over the last century (Arthur et al., 2008).

⁵For the purpose of this WP, we use the term “top managers” to refer to VIATECLA’s Board of Directors (see Appendix 1) and “middle managers” to refer to all collaborators who have management duties, whether these are project, product or area management’s responsibilities. Middle managers often combine these with programming duties.

directly influence the choice of indicators, which in turn influence the information requirements of MCSs.

Since enterprises are struggling to compete and cash/liquidity management is key for their success, the choice and use of adequate MCSs become a critical success factor (CSF), in particular for a SME, as VIATECLA. According to Boynton & Zmud (1984), the success of a manager or an organization is ensured if CSFs are well addressed by the company via meaningful strategic initiatives and proper choice and communication of KPIs throughout the company. The purpose of this WP was, thus, to find ways to help VIATECLA, and indirectly other similar companies, to redesign their MCSs so that they can better support decision-making, as well as performance evaluation/control and, ultimately achieving their strategic goals.

In the next section the literature on MCSs and KPI development is reviewed, with special attention to high-tech and SME related cases. Section III outlines the methodology used to develop this WP. A brief profile of VIATECLA follows in section IV. Section V depicts the main findings of the WP and the results from a benchmarking exercise. Finally, section VI contains the recommendations and limitations of this WP.

II - Literature Review

The control function of management was defined by Koontz & Weihrich (2010, pp. 376) as *“the measurement and correction of performance in order to make sure that enterprise objectives and the plans devised to attain them are being accomplished.”* For Merchant & Van der Stede (2007), this function can be decomposed in traditional financial management control and strategic control. Traditional financial management control is concerned with operational efficiency, fraud prevention, and non-strategic

factors while strategic control is a broader and more recent subject in management literature and will be explored later on in this section.

Optimal control is the point where “*control losses are expected to be smaller than the cost of implementing more controls*” (Merchant & Van der Stede, 2007, pp. 11). Control losses should be assessed by comparing the performance theoretically possible given the strategy selected with the performance that can reasonably be expected with the existing MCSs. In large companies, potential control losses are huge and so optimal MCSs will likely be further developed than in SMEs. Merchant & Van der Stede (2007) (see also Drury, 2012) enumerate four different types of controls available to managers: result controls (evaluation of outputs, not of the processes/actions to achieve them), action controls (enforcement of desirable employee behavior/actions), personnel controls (incentivizing employees to control themselves) and cultural controls (promoting behavior conformity within groups).

Budgeting, which is one of the most traditional MCSs, fulfills several of these types of controls (Merchant & Van der Stede, 2007). For many decades, budgeting was simply used to help prevent fraud and embezzlement, while keeping operational costs⁶ under check via the establishment of baselines for expenditures, and subsequent analysis of deviations. This gave rise to formal (mathematical) estimation models to help managers obtain unbiased budgets. However, several studies have failed to demonstrate clear superiority of these formal models when compared to the more traditional expert’s estimation, particularly regarding the estimation of SW development projects’ costs (see Jørgensen, 2004; 2007). These studies have shown that expert estimates are often as accurate as, or even more accurate than the formal estimation models. According to Jørgensen (2004; 2007), this might be because industry know-

⁶ E.g. rental of machines to produce goods/services and salaries of workers involved in production.

how and experience are more important in planning SW development projects than in planning projects for other industries, and expert estimation remains the most common method for budgeting. Furthermore, the reasons for preparing budgets have since expanded into coordinating activities, communicating plans to responsibility center managers, motivating them and evaluating their performance (Drury, 2012).

Information systems (ISs) play an important role in providing data for the control process. ISs can be defined as the set of SW/HW combinations (IT) and related practices used to relay relevant information for decision-making. Thus, ISs involve IT but also offer context to it, communicating to employees how IT should be used to the company's advantage. Enterprises often resort to ISs such as Enterprise Resource Planning (ERP) systems⁷ (O'Leary, 2004) and Project Portfolio Management (PPM) solutions⁸ in order to design employee workflows and gather reports on which tasks are being performed, by whom, and how many man-hours have been spent on them. Thus, ISs are essential to ensure employee accountability and control. Wynn (2009) studied 8 SMEs who were offered support to develop/redevelop their ISs. While some of the larger SMEs decided to implement ERP systems, smaller SMEs were more prone to implement point-package solutions⁹ that best suited their existing processes, thereby resulting in complex and fragmented ISs but at the same time avoiding high training costs and the shifting of work practices.

In the IT consulting industry, it is paramount to monitor/control the costs being incurred as a project progresses. One method that can be used is the Earned Value Management (EVM) approach (Koppelman & Fleming, 1998 and Marshall, 2007),

⁷ Which lead to the automation and integration of the business processes and the sharing of common data and practices across the entire enterprise (Deloitte Consulting, 1998).

⁸ SW solutions that handle IS needs of companies, optimizing their project and work management (Gartner, 2011).

⁹ Designed to fix issues in the existing IS (e.g. lack of a newly-required feature) or to fulfill a need not currently addressed by it.

which aims to track project completion rates in real-time to figure out if the work already performed (and associated cost) is in line with what was budgeted. This approach hinges heavily on the concept of earned value¹⁰ and makes use of two KPIs – the Cost Performance Index (CPI) and the Schedule Performance Index¹¹ (SPI) – which are critical for decision-making and control in project-matrix organizations, especially SW enterprises where certain milestones for project completion are associated with the billing process. After conducting a literature review, Marshall (2007, pp. 24) argued that EVM “(1) contributes to project planning; (2) contributes to project control (...); and (3) since (...) these processes are believed to positively influence project performance, it can be inferred that EVM contributes to project success”.

For Pinheiro (2010), enterprises in competitive industries that use a project-matrix approach to manage their business, are more likely to succeed. Thus, the organizational structure is an influential factor when designing an enterprise’s MCSs. Project-matrix, technology-intensive SMEs have several particularities and Pinheiro (2010) performed a study on how to achieve control in such organizations. He suggested the Project Management Body of Knowledge (PMBOK) framework¹² as the basis for a project management plan and enumerated the phases in project management (initiation, planning, executing, management and control, and closing), 9 associated knowledge areas (such as scope, time, cost, quality and communications management) and all the relevant activities in each of those phases. Frow *et al.* (2005) and Rowe *et al.* (2008) pointed out that, as front line empowerment, interdependence of units, horizontal communication flows and multifunctional teams have become common-place in

¹⁰ The budgeted value of work already performed.

¹¹ Where $CPI = \frac{Earned\ Value}{Actual\ Cost}$, being actual cost the expenditure already incurred on work performed up to that point in the project life-cycle and $SPI = \frac{Earned\ Value}{Planned\ Cost}$, being planned cost the budgeted expenditure on work scheduled up to that point in the project life-cycle.

¹² Developed, and firstly published in 1983, by the Project Management Institute (PMI) which establishes terminology and guidelines for project management in the US.

enterprises, the controllability principle, by which employees must only be held accountable for the costs and/or revenues they can control, has been threatened. These trends have contributed to the de-coupling of controllability from accountability, which in Frow *et al.* (2005) case study, led to partial controllability. According to these authors, the latter is commonly found in industries where competitiveness is very high and where there is a constant need to pursue strategic initiatives while being limited by the demands of strict budgeting policies.

Gleich *et al.* (2008) advocated that benchmarking¹³, and MCSs are inextricably linked together and that external benchmarking often requires partnerships with other companies in order to allow for knowledge sharing and meaningful improvement. Companies can resort to internal benchmarking as well, focusing on identifying in-house best practices, and sharing them across departments (Madsen, 2003).

Since the birth of the concept of strategic control, well developed by Kaplan and Norton (1992) with their Balanced Scorecard (BSC) framework, the role played by controlling systems and “controllers” has widened considerably. Strategic control seeks to monitor whether the strategy is being implemented as planned, *i.e.* if the results being achieved are those intended by the strategy (van Veen-Dirks & Wijn, 2002). The BSC is a possible route to put in practice strategic control. The BSC started as a MCS, including financial and non-financial KPIs that provided top managers with a fast and comprehensive view of the business (Kaplan & Norton, 2008; 1996a; 1992). For Rickarts (2007), costs associated with tracking relevant measures and communication throughout organizations, should be seen as a BSC limitation. Nevertheless, Marr & Schiuma (2003) stated that “[p]erhaps the best known PMS is Kaplan & Norton’s (...)

¹³ Ongoing and systematic processes to look for best practices, compare against them, and then implement them, with some changes if necessary, in the organization (Parmenter, 2010).

balanced scorecard; it seems to be the most influential and dominant concept in the field” (see Sousa & Aspinwall, 2010 pp. 480)”.

III - Methodology followed in this Work Project

This WP consisted of a direct research based on an internship done at VIATECLA from mid-September to mid-December 2013. Thus, a case study method was followed where the researcher acted as an “actor” (Ryan *et al.*, 2002). The main sources of information for this WP were:

1) VIATECLA’s Employee Manual, intranet resources, and internal control worksheets;

2) Five product presentations held by product team members allowing the researcher to understand VIATECLA’s product array and its business model;

3) The company’s internal SW supporting the MCSs in use at VIATECLA, such as the ScriptorServer (SS) and Microsoft Project Server (MSPS) PPM solutions, the latter used for reporting man-hours. Both supply top and middle managers with valuable information, as is made apparent in Section V.

4) An online Qualtrics questionnaire¹⁴ (Appendix 1) handed out to all VIATECLA employees who perform hour reporting duties (*i.e.* middle managers and programmers) in order to assess how tight the existing MCSs were and to get feedback from such employees on how the process can be improved;

5) VIATECLA’s Controller was always available for consultation, providing insight into the presently implemented MCSs

6) A benchmarking exercise undertaken with 11 SW houses operating in Portugal (results in Appendix 2) to compare how MCSs are designed and used to support

¹⁴ The response rate was of 100%.

decisions and performance evaluation and make informed recommendations about best practices for VIATECLA to follow. The input offered by an external consultant on this industry was most valuable, since he has extensive experience and knowledge as a benchmarking expert among other roles he has played in the IT consulting industry.

The literature review helped understand gaps in the existing MCSs at VIATECLA, analyze data collected during the internship and make recommendations. Theoretical input (*e.g.* academic papers) was combined with empirical input (*e.g.* from the Controller) to ensure findings are reliable (Ryan *et al.*, 2002).

IV - Company Profile

VIATECLA follows a product development approach to SW development, building modules which can be combined and adapted to serve multiple purposes. This means that if a client wants a basic product, VIATECLA can supply a turnkey¹⁵ solution to meet the client's needs. But if the client wants a custom solution, VIATECLA can also build a product, using its existing SW modules as a starting point. This means that project complexity and required resources can vary widely between clients. Some of these products are sold jointly and developed on top of one another, using common protocols (*e.g.* Nice Reader uses SS to manage content). The company specializes in digital web-based distribution solutions (*i.e.* SW that allows companies to sell/buy, rent or freely distribute their products online). The IT consulting industry is known for its high-pace nature which makes it extremely competitive. The players are highly diverse in terms of size and scope, as well as the clients and their needs. Due to the web-based nature of the industry's services, VIATECLA has to compete not only with enterprises headquartered in Portugal, but also with multinationals operating in the Portuguese

¹⁵Turnkey products are designed to have general utility and do not necessarily require a lot of customization work as they are generally ready to be used from the moment they are bought.

market. *Semana Informática* (2012) provides a list of the industry's 200 largest players in Portugal. Furthermore, some companies fulfill their needs via their own IT departments.

VIATECLA has currently 44 employees, a large part of which are programmers. The company states its mission as: "Create value for our Stakeholders, especially for our clients, employing solutions and services based on sustainable technologies, by building and consolidating knowledge based on a strong understanding of our partners' businesses and the markets where the company operates". Its vision is "to build the future with ambition, continuous innovation and proactivity." Four strategic objectives were defined by VIATECLA:

1. To potentiate revenue, promoting growth and sustainability;
2. To increase presence in foreign markets;
3. To increase notoriety in the core market, as well as academic segments, through associations capable of building landmark, innovative and pioneering solutions in cutting-edge areas (launch at least 3 new products in the next 3 years);
4. To sustain growth by adjusting and consolidating the company's cost structure, and reaching the yearly profitability goals;

Top management has already identified the CSF to be addressed immediately: to implement adequate MCSs for decision making and performance improvement, contributing to the achievement of the 4th objective, since in order to gain knowledge of the cost structure and achieve higher profitability levels, one needs to rely on information provided by MCSs. With this in mind, a diagnosis of the existing MCSs at VIATECLA was undertaken in the current WP. Its main findings are depicted in the next section. VIATECLA's organizational chart and information about its product array are available in Appendixes 3 and 4 respectively.

V - Main findings

1) MCSs in use at VIATECLA and their main challenges/pitfalls

Due to the industry where it is in and its adoption of a project-matrix organization, VIATECLA has to follow a project management approach to control. The main phases of a project at VIATECLA following the PMBOK framework (Pinheiro, 2010), as well as the existing MCSs used by the company and the associated control pitfalls are:

Planning Phase - Engagement Specification

Usually starts with a meeting with the potential client, where a manager and one or more programmers try to understand the specifications of the service required. When clients have basic needs, this phase can move fast, as the client has only to point out which packages it needs, with the aid of a product manager who explains their respective functionalities. In these cases, a price for the service can often be provided in the 1st meeting, as each package has an associated licensing fee. However, when the client has complex needs, it is often the case that he does not possess the IT competences necessary to accurately specify what is required to fulfill them. In these cases, the price of the whole service can only be established after the budgeting process associated with project has been completed.

This planning phase can be cumbersome and costly, since not only man-hours have to be spent before VIATECLA sells any service, but also the specifications of some clients' needs are often vague, according to the employee questionnaire. Such pitfalls arise due to the clients' difficulty in conceptualizing SW services as easily as VIATECLA's programmers, as well as a sense of urgency on the programmers' part in securing the sale. This lack of detail in specification is the 1st pitfall to impact the MCS, making their information inaccurate, and impacting budgeting and project performance later on. It is an industry-wide challenge SW Houses have to deal with.

Planning Phase - The Project Budgeting Process

Basic projects, often for smaller clients, do not usually require custom SW development (a benefit of the product development approach VIATECLA employs). The costs associated with such projects are minimal, since all that is needed is installation and post-purchase support. For the most complex projects, once engagements have been specified, budgets have to be prepared by middle managers and sales are only closed after the budgeting phase, since prices are contingent on the budgets. These projects are riskier, for they entail upfront planning costs without any secured revenues. Thus, middle managers and programmers should plan with a significant level of detail the tasks to be undertaken and the kind of programmer that will be needed, since different programmers represent different costs associated with them. At VIATECLA however, the Controller only has access to the amount of hours budgeted per programmer type (*i.e.* how many hours the project requires from senior programmers, junior programmers, analysts, middle managers, *etc.*), and not on a per task basis. This planning effort already takes place to some extent, as project tasks are discussed by the project team. Middle managers rely on engagement specifications, and personal experience in other similar projects to estimate the amount of hours required.

This lack of budgeting detail is the 2nd pitfall in VIATECLA's MCSs. Drawing on Jørgensen (2004)'s conclusions, this pitfall may not have significant consequences on the reliability of the overall budget, since expert estimates have proved to be as accurate as any formal estimation model. However, the data collected through the employee questionnaire showed that man-hours are often underestimated, particularly in complex, multi-department projects. One of the respondents pointed out a possible reason for such underestimation: an urge to provide the client with a competitive price, since the latter is often contingent on budgeted costs, so that target project margins can be

accomplished (a strategic objective pointed out in section IV). Moreover, this same pitfall impacts the monitoring and control process, as discussed further ahead.

Execution Phase

After the sale has been secured, programming work can begin. The MCS in place at VIATECLA makes use of 2 SW solutions when it comes to controlling the cost and schedule of any given project:

- SS – in-house developed SW, used for a variety of purposes, such as to register project milestones, budgeted man-hours, managing communications with clients, tracking “issues”¹⁶, and posting client surveys.
- MSPS – PPM solution which allows programmers to report the hours actually spent on the “projects”, on their “components” and “tasks”¹⁷.

In this phase VIATECLA’s reporting starts to be challenged, as a lack of hours reported in due time via MSPS has been occurring (3rd MCS pitfall). In other words, there is lacking compliance with the company’s reporting system by programmers/middle managers. Programmers, who are required to report at least 8 hours every day, may take more than one month to do so, which leads to less accuracy in reports, since by the time they start the registration procedure, their exact memory of what they were doing and for which project they were working, is blurred. This extends to the middle managers as they frequently delay the opening of a new project on MSPS to which a given programmer is allocated, making it impossible for the programmer to properly report how many hours he/she spent on it. Furthermore, since no task standardization exists, the programmer has to specify the task he/she has been performing, then submit the specified task to the middle manager for approval. This

¹⁶ I.e. bugs and problems reported by the client after the software has been installed.

¹⁷ “Project” is used to describe a client engagement. “Component” is a part of the “Project”, such as customization of the billing module to the client’s accounting needs. “Task” is the specification of the exact action being undertaken in what regards that “Component”.

renders the process cumbersome and increases the probability for both misreporting hours under wrong projects/components/tasks and task duplication. Some of the respondents to the online questionnaire viewed the task creation process as bureaucratic, and mentioned that, by the time a task was created and hours were reported, that task had often been finished. One respondent characterized it as a “purely administrative” process. This pitfall is exacerbated by the long loading times that are common for MSPS. It may take MSPS more than 10 minutes to load all the projects and tasks a given programmer was assigned, something which prompted one employee to say he sometimes felt like reporting hours under the task “reporting hours”.

Information such as project budgeted hours, milestones, which middle manager was assigned to a given project, its respective scope and how much the client was billed is registered on SS. SS is especially important as a Customer Relationship Management¹⁸ (CRM) tool, since through it, clients can report the issues they are facing, send relevant information to VIATECLA, obtain support, and commission/receive further custom SW development proposals.

The implemented SW solutions are in accordance with Wynn’s findings (2009), and some information overlap/duplication exists (*i.e.* SS records time spent solving issues, and the programmer assigned to them, yet programmers are still required to report how many hours they spend solving issues via MSPS; projects need to be recorded on SS and MSPS separately), an inefficiency the author mentions as common.

Management & Control Phase

In this phase, which takes place concurrently with the execution phase, VIATECLA’s Controller uses MSPS to monitor the amounts of hours reported by programmers/middle managers on each project. The data collected by MSPS is then

¹⁸ The process of developing and maintaining profitable customer relationships, by offering higher-than-average customer value and satisfaction (Kotler *et al.*, 2008)

exported to an Excel worksheet and processed into useful information such as the percentage of hours reported per programmer and the number of total hours reported on any given project. This information is handed out to middle managers on a regular basis, so that they can check who has not been reporting the minimum amount of hours (8 a day), and work with non-compliant programmers to fill the gaps in reporting.

When combining SS data with the one from MSPS (a process that requires the Controller to manually input the data from SS since it cannot be automatically exported and combined), the Controller can calculate the current cost of any project and its expected relative margin¹⁹, the 1st leading KPI computed. EVM critical KPIs, *i.e.*, CPI and SPI (see Koppelman & Fleming, 1998 and Marshall, 2007), are not computed at VIATECLA. Given that budgets do not specify the tasks to be performed for a given project (2nd pitfall), the Controller may know that 3 hours have been spent on a project with 6 budgeted hours, but he does not know the project completion rate. To know that, he relies on monthly project meetings and emails/conversations (*ad-hoc* MCSs) to obtain an estimated completion rate, which he proceeds to enter into, and regularly update on, the Excel worksheet. In fact, the Controller does not know in real-time and based on standard MCSs (*i.e.* MSPS, SS) exactly how many hours have been spent on a given project (given lacking budget detail and compliance with reporting duties, the 2nd and 3rd pitfalls), how profitable it is and if it has recently suffered delays. Moreover, it becomes difficult to decide on the adequate prices/schedules for new projects, as well as managing their cash/liquidity.

Hence, the previously mentioned *ad-hoc* systems take on crucial importance for the Controller to find out from the middle managers how projects are progressing (*i.e.* if they are delayed or going faster than expected), and the man-hours effectively allocated

¹⁹ $Expected\ Margin\ (\%) = \frac{Expected\ Revenue}{\frac{Actual\ Cost}{Completion\ Rate}}$

to each of them. Since these procedures take place on a periodical basis, there exists a delay in the communication of project deviations to the Controller.

A client satisfaction index (the 2nd leading KPI computed), ranging from “Unsatisfactory” (1) to “Excellent” (5), is obtained via surveys (which VIATECLA hands out via SS upon completion of project milestones) to check how satisfied the client is with the product and assistance provided. This way, both managers and programmers can see what the perceived quality of their work is.

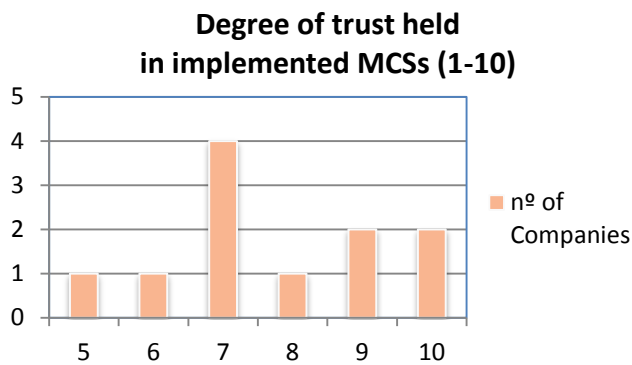
Closing Phase

When a project reaches the closing phase, the Controller alerts the middle managers via email to validate any missing man-hours with assigned programmers who have been in compliant any time during project’s lifecycle. This allows the Controller to determine the actual labor cost, absolute margin (revenue minus cost) and relative margin (revenue divided by cost). When a project is finished, it has to be closed by the middle manager responsible for it on MSPS. Yet, many projects keep expanding, with further development work being proposed either by the client or by VIATECLA. This practice extends the list of reportable tasks (even finished ones), contributing to: (1) longer SW loading times and (2) harder for programmers to find the right tasks.

Customer support is included in the initial contract and hours are allocated for “help-desk” and further development work. Whenever a customer has an “issue”, it can be reported via SS if incorporated in the contract and a priority level will be assigned to it. The most serious “issues” are designated as “Blockers” since they actually prevent the SW from performing its functions.

2) MCSs used by other Software Houses

This information was gathered through a benchmarking exercise with 11 high-tech, project-matrix companies operating in the Portuguese IT consulting market (for details on the size of these companies see Appendix 2). The benchmarking exercise results



follow:

Firstly, all participants rated the degree of trust in their implemented MCSs as 5 or more out of 10. Yet, 55% of these companies display a degree of trust in their MCSs between 5 and 7, implying that they are aware there is room for improvement.

Secondly, the participants use a variety of different MCSs, as follows:

- 10 out of 11 participants allocate man-hours to different projects in order to access their labor costs. 1 out of the 10, allocates man-hours at an administrative level meaning that time is assigned to projects by the day without the need for employees' input. The remaining 9 (like VIATECLA) use reporting SW to keep track of how their employees spend their time between projects, thereby requiring employees to fill out virtual timesheets;
- Out of the 9 benchmarked companies that require employees to report hours:
 - 7 require between 91% and 100% of their employees to report hours;
 - 2 allocate man-hours per project, not keeping track of the exact task the programmer is performing. Of the remaining 7, 5 use standardized tasks for reporting purposes, not leaving task specification to the controlled employee

(as is the case of VIATECLA). Standardization was repeatedly pointed out by managers in interviews as a best practice;

- 7 out of 11 companies had implemented budget manuals. Non-coincidentally, these companies usually employed more people and had higher total business revenue than those who did not, meaning they likely managed more projects than the ones who did not implement budget manuals.
- Certain tasks can take several days to be performed (*e.g.* product development), while others may take less than an hour (*e.g.* client-support). However, when added up, these shorter tasks, related to different projects and clients, may take a large amount of time. In order to accurately record task duration, time-tracking applications and CRM tools are employed (something that SS already does). Companies with automated reporting generally have the highest precision in allocating time, but these systems are often costly and difficult to implement;

Regarding KPIs, benchmarked companies focus mostly on lagging financial indicators such as project margin to appraise overall project performance. Some also make use of client satisfaction indexes as a proxy to control quality, based on surveys/interviews conducted upon milestone completion, or after a project has been concluded. This is in line with KPIs used at VIATECLA. Only one company implements an EVM approach, yet not using its most common KPIs (SPI and CPI) in real-time, but only after the project is finished for project performance review purposes.

VI - Recommendations

As discussed previously, VIATECLA employs a mix of standardized and *ad-hoc* MCSs in order to provide information to control the projects the company sells. This is in line with Frow *et al.* (2005, pp. 283) who also found that, in the enterprise they

studied, socialization (a clear *ad-hoc* system) was seen as a “*means of rendering compatible the dual demands of strategy implementation and budget imperatives that impact on managers*”. However, VIATECLA wishes to rely less on *ad-hoc* systems (which, as discussed in Section V, presently play a crucial role) since these have provided mixed results (see MCS pitfall, Section V). Further information standardization is therefore desirable to make them more reliable, useful, faster and less expensive.

To improve on the level of detail of project specifications (1st pitfall), VIATECLA can make use of project checklists in the first planning phase (a practice used by a benchmarking partner with a set of best practice MCSs in place, and advised by Jørgensen, 2004). These checklists comprise all items necessary to accurately understand what the client’s needs are, making the process more agile while making sure the provided price is in line with target profitability. This documentation will also allow employees to rely less on “personal memory”, one of the main contributors to cost overruns according to Lederer & Prasad (1992).

To provide the Controller with detailed budgeting information (the 2nd pitfall in the MCSs), VIATECLA can draw from the benchmarking exercise results and create a budget manual (an action control recommended by Drury, 2012) with a list of principles for its middle managers to follow and standardized tasks for reporting purposes (Marshall, 2007), allocating costs to them instead of doing it at the project level. This is especially important if EVM KPIs are to be used by VIATECLA. Each task represents a percentage of the whole project. This way, the Controller knows in real time, via standard MCSs, the approximate completion rate per project.

To deal with lacking compliance with reporting duties, the 3rd and most troublesome pitfall, VIATECLA should start by updating its IS (both the server and the

SW being used). In one benchmarking interview, a manager stated that to migrate past control data from one SW package to a different one is a time consuming project in itself. Any change to the IS in place at VIATECLA is therefore bound to be a challenge. The US-based IT consultancy Gartner (2011), provides an analysis of existing PPM SW packages, which VIATECLA might choose from if it opts for this route. Another possibility for VIATECLA would be to build on its SS SW, which already handles client support. If other tasks were also reported through this system, then information duplication would be less likely. It should be noted that as the researcher does not possess IT/IS development skills that would enable him to recommend a specific SW solution, he has abstained from doing so. Whatever SW solution VIATECLA chooses to implement, it is clear from the benchmarking results that standardizing the reportable array of tasks is critical and should become common practice during the project planning phase. Tasks should be categorized into a closed (*i.e.* not easily changed) task tree, and the ultimate description of a task can be left up to the programmer in the form of an “observation” text-entry, as long as the client, project, component and task category have been standardized for control purposes (possibly making use of 4 mandatory response combo-boxes). This is in-line with the reporting systems many of the benchmarking partners had instituted and was considered a best practice by all interviewed partners. In such way, the manager will not have to spend as much time checking if the tasks’ specifications are correct, the Controller will not spend as much time allocating reported hours to specific projects, and project cost comparisons can be easily conducted.

Compliance with hour reporting duties should be a factor that weighs on the employee performance review in-place at VIATECLA, especially for middle managers who have to set up, allocate and monitor the tasks to be performed by programmers.

This review can be seen as an action control (Merchant and Van der Stede, 2007). In addition to this, incentives should be provided to the project teams who better perform their reporting duties (cultural controls). This is especially advisable given that hour reporting is not controllable by one project member alone, but by the team as a whole (*i.e.* one member's compliance in this area cannot compensate another member's incompliance), and so partial controllability is the norm (Frow *et al.*, 2005 and Rowe *et al.*, 2008). As Merchant & Van der Stede (2007, pp. 393) put it, "*punishments commonly manifest themselves through an absence of positive rewards*". This has the advantage of not fostering employee resentment towards VIATECLA while providing increased peer pressure towards compliance. However, these sorts of incentives are only effective in fostering behavioral change if the programmers (and not just their middle managers) perceive that they can individually influence the performance on which the incentive is based on, meaning that in large teams, incentives of this nature have limited utility (Merchant & Van der Stede, 2007). Furthermore, programmers (and their respective middle managers) should be notified by an automated email, programmed into MSPS, of their lacking compliance if they exceed a given amount of days without reporting or have hours unreported in the last week (personnel control), a practice in place at the largest and most experienced of the benchmark partners. They should receive this email on a daily basis until they comply.

Ad-hoc systems should remain in use only in certain situations (*i.e.* implementation of project closure meetings to identify the "lessons learned" which can be carried into future projects and provide project teams with a final evaluation of their performance, a best practice identified in several of the benchmarking interviews). If *ad-hoc* systems continue to be heavily relied upon, an accurate reporting of hours through MSPS (the standard channel) will seem unnecessary to the workforce that has to be controlled.

Once the MCS pitfalls have been addressed, KPIs can start to be computed. The PMBOK framework (Pinheiro, 2007) points out 5 dimensions of performance relevant for VIATECLA's purposes, and Appendix 5 compiles a list of potential KPIs to be used by VIATECLA in order to measure how well the company is doing regarding these performance dimensions. This list should serve as a starting point for a wider in-house discussion to arrive at the final set of KPI's to use on a regular basis. Although implementing a BSC (see Kaplan & Norton, 2008; 1996a; 1992) would be costly and likely beyond the point of optimal control, VIATECLA should choose leading KPIs that allow it to control its SW projects in real time, as the one it presently employs are insufficient to that end. The company would particularly benefit from adopting an EVM approach (see Koppelman & Fleming, 1998 and Marshall, 2007), computing the CPI and SPI for each of its projects and using them as leading KPIs in its day-to-day operations as they supply middle-managers with real-time information of the project's compliance to planned cost and schedule, thereby alerting to overruns. It should be noted that as a business is an ever-changing entity, the relevant KPI's to use should be discussed and updated/changed when strategic changes are enacted or top management deems fit. The use of cultural controls should also apply to these performance dimensions, as internal benchmarking exercises could start being conducted on a regular basis, using team KPIs to identify high-achieving project teams and rewarding the ones that share new best practices fostering healthy cooperation between project teams (Madsen, 2003) and project excellence. The external benchmarking exercise could be repeated every 2/3 years to learn about further developments in control best practices.

All of these recommendations are in-line with Pinheiro's (2010) PM Plan, and their implementation would give us a real live case-study to appraise the value that this approach holds for IT consulting companies.

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A Work Project, presented as part of the requirements for the Award of a Master's Degree in Management from the NOVA – School of Business and Economics.

Appendixes

How Reporting and Controlling Systems Can Be Effectively Designed to Support the Decision-Making Process: The case of a Software SME

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A Project carried out under the supervision of:

Prof^a Inês Cruz

06-01-2014

Appendix 1 – Employee Questionnaire

QUESTIONÁRIO SOBRE O SISTEMA DE CONTROLO E REPORTE

Bem vindo! Muito obrigado por preencher este questionário.

A sua opinião é muito importante, pois ajudará a analisar e propor melhorias para o sistema de controlo e reporte da Empresa. Por favor, responda a todas as questões. Agradecemos desde já colaboração prestada.

1. Que função desempenha na empresa?
 - a. Manager (área, produto, projecto)
 - b. Engenheiro/Membro de Equipa

2. Sabendo que a ViaTecla está organizada em 4 áreas de negócios, qual a Área de Negócio e (caso se aplique) a Equipa a que pertence?
 - a. Software
 - b. Consulting
 - c. Operations
 - d. Labs

3. Alguma vez participou no levantamento de requisitos para um projecto de desenvolvimento de soluções para um cliente?
 - a. Sim
 - b. Não

4. Alguma vez participou na elaboração de um caderno de encargos para um projecto de desenvolvimento de soluções para um cliente?
 - a. Sim
 - b. Não

5. Se sim, quais as principais dificuldades que sentiu a estimar horas a alocar ao projecto em cuja elaboração do caderno de encargos participou?

- a. Aberta
6. Compreende qual a utilidade/importância que o sistema de reporte de horas tem para a Viatecla e/ou para a gestão e acompanhamento de projectos?
- a. Sim (especifique em que medida este é útil/importante)
 - b. Não
7. Indique o seu grau de satisfação com os seguintes aspectos do sistema de reporte de horas, numa escala de 1 a 5 em que 1 significa "nada satisfeito" e 5 "muito satisfeito".
- a. Rapidez do processo
 - b. Facilidade de utilização do software usado (MS Project Server)
 - c. Contribuição para o reconhecimento do esforço
8. Indique o grau de dificuldade por que passa na utilização do atual sistema de reporte de horas na Viatecla relativamente aos aspectos indicados numa escala de 1 a 5 em que 1 significa "grande dificuldade" e 5 "grande facilidade".
- a. Complexidade do processo (muitas tarefas e projectos tornam difícil encontrar a rubrica certa sob a qual as horas devem ser reportadas)
 - b. Demora do processo (o Project Server demora tempo a carregar e gravar as alterações)
 - c. Outra - Especifique:
9. Dentro do processo de reporte de horas, quais as vertentes que poderiam beneficiar de ganhos de eficiência? Como?
- a. Aberta

Perguntas adicionais somente destinadas aos chefes de Área de Negócio/Equipa

10. Consegue acompanhar satisfatoriamente a taxa de concretização e possíveis atrasos dos workflows a seu cargo, bem como o trabalho que estes colaboradores se encontram a desenvolver?

- a. Sim
- b. Não. (Porque não?)

11. Quais as informações em falta no sistema de informação de gestão/reporte da Viatecla que considera lhe seriam úteis na gestão da sua equipa numa base diária/mensal?

- c. Aberta

12. Está familiarizado com os indicadores que permitem medir se os objectivos da sua área estão a ser atingidos?

- d. Sim (Quais?)
- e. Não

13. Se sim, estes indicadores estão-lhe disponíveis?

- f. Sim
- g. Não (Porque não?)

14. Está familiarizado com os indicadores que permitem medir o desempenho das equipas/pessoas?

- h. Sim.
- i. Não

15. Por favor especifique quais os 2 ou 3 mais importantes indicadores que lhe permitem/permitiriam medir o desempenho das equipas/pessoas, e indique se estes lhe estão disponíveis ou não.

- j. Aberta

Obrigado pela sua participação!

Appendix 2 - Summarized Benchmarking Results

Q	Average company revenue in 1000's of € (past 3 years)	0-100	101-500	501-1000	1001-5000	>5000	Total
2	n° of Companies	1	4	1	4	1	11

Q	N° of Employees	0-20	21-50	51-100	>100	Total
3	n° of Companies	5	2	3	1	11

Q	Degree of trust held in implemented MCSs (0-10)	1, 2, 3, 4	5	6	7	8	9	10	Total
4	n° of Companies	0	1	1	4	1	2	2	11

Q	Implemented Budget Manual	Yes	No	Total
7	n° of Companies	7	4	11

Q	Performs project hour allocation for control purposes	Yes	No	Total
11	n° of Companies	10	1	11

Q	Performs hour reporting activities	Yes	No	Total
12	n° of Companies	9	1	10

(This question was only posed to those who answered "Yes" to the previous question)

Q	Hour reporting activity type used	Informal	Formal	Mixed	Total
14	n° of Companies	1	6	2	9

(This question was only posed to those who answered "Yes" to the previous question)

Q	% of employees required to report hours	0-25	26-50	51-75	76-90	91-100	Total
15	n° of Companies	0	0	1	1	7	9

(This question was only posed to those who answered "Yes" to question 12)

Q	Degree of detail used in reporting	Client	Client - Project	Client - Project - Task	Total
16	n° of Companies	0	2	7	9

(This question was only posed to those who answered "Yes" to question 12)

Q	Company standardizes tasks reported	Yes	No	Total
17	n° of Companies	5	2	7

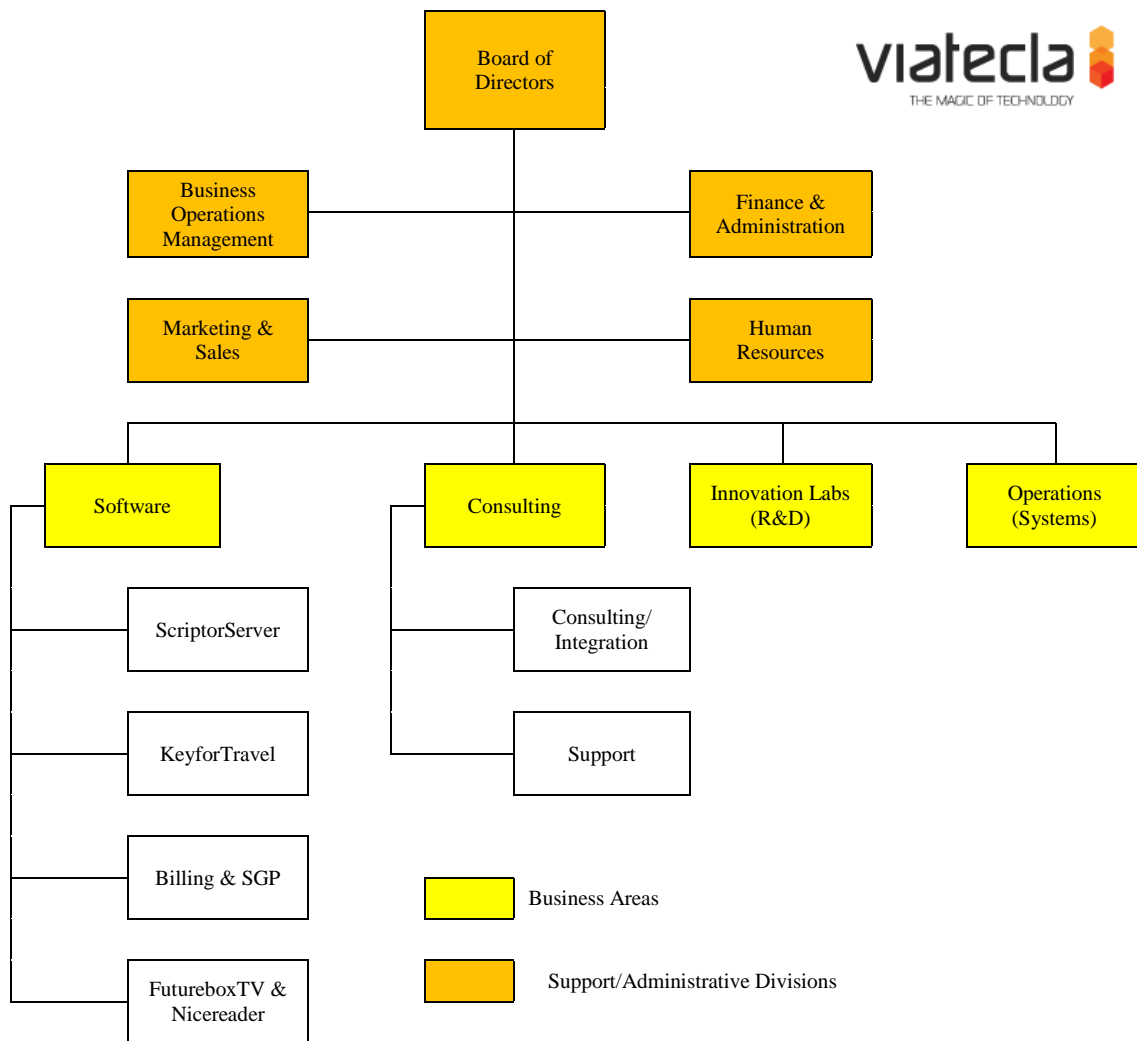
(This question was only posed to those who answered "Task" to question 16)

Q	Hour allocation software method	Auto	Manual	Mixed	Total
20	n° of Companies	3	5	1	9

(This question was only posed to those who answered "Yes" to question 12)






Only quantitative results are displayed in this Appendix. For a summarized analysis of relevant qualitative results, check Section V - Main Findings, Sub-section 2) MCSs used by other Software Houses.

Appendix 3 - VIATECLA's Organizational Blueprint



VIATECLA is composed of 4 Business Areas, around which the structure of the organization revolves. These units are supported by 4 departments and respond to the Board of Directors. The core business of the company is Software and as such, this area incorporates 4 sub-units which are responsible for the software products developed thus far. The latest products (FutureboxTV, Nicereader) were developed by the Innovation Labs and were initially "incubated" inside that area (the people who developed the product work side by side with the programmers who would in the future be responsible for it). As the Labs team moves on to other R&D projects, it teaches other programmers how to work with the new product, and those programmers will eventually constitute a new sub-unit of their own (once the product is launched and the members of the product team are comfortable with it).

Appendix 4 – VIATECLA’s Product Array

Product	Description	Benefits	Target Users	Date Launched*
 bridge4media	End-to-end e-commerce platform for video content	Enables clients to sell/rent video content online in agreement with contracted terms (e.g. DRM laws, release schedules, etc.), managing billing and payment process, and handling communications with suppliers in a easy-to-use environment, allowing for <u>lower costs</u> . It also delivers the means necessary for the client to achieve wider distribution, post adverts, collect and capitalize on consumer data (via built-in CRM component) vital for efficient promotion of contents, <u>increasing revenues</u> .	TV Networks, Large Film Studios and VOD Providers	2009
 futureboxtv	Video distribution platform	Gives clients a platform through which they can <u>communicate with their stakeholders</u> . The product is designed in such a way that it can receive periodical information and generate video content (e.g. graphs, pie charts) with data deemed relevant by the company. It can be used as a corporate TV channel to communicate relevant KPIs and events to employees, or for outside communication purposes, such as posting lectures or company initiatives/achievements to be accessed via any chosen platform (i.e. tablets, PCs, smartphones and TVs).	Corporations, Universities, Government Institutions and NGOs	2008
 keyfortravel	End-to-end e-commerce platform for tourism products	Allows clients to book/pay/sell/rent travel services (e.g. airplane tickets, hotel reservations, car rentals) online, from/to a variety of partners, ensuring a <u>fast selection of best-priced travel packages</u> according to desired criteria. Also handles communication between partners, payment processing, changes made to the travel planning process, and allows clients to monitor/control service delivery from a distance, <u>ensuring service quality</u> . It can be integrated with the client's website to promote selected offerings as these are added to inventory, to help <u>boost sales and profitability</u> .	Hotel Chains, Travel Agencies, Airline Companies, Large Corporations, Destination Management Companies and Consolidators	2000
 nice reader	Web-publishing, E-commerce platform	Enables clients to publish their media products on all major marketplaces (Google Play, App Store, Windows Store, Web) of enriched (inclusion of video/audio/hyperlinks), interactive content, helping companies accelerate and widen distribution, to <u>increase sales and profitability</u> . It also handles payment processing, and allows publishing of content responsive to the consumer's chosen platform (i.e. content adapts to tablets, smartphones, e-readers and to several operating systems), <u>improving consumer experience</u> .	Magazines, Newspapers, NGOs and Research Groups	2010
 scriptor server	Web-based Management of Content & Information	Used to fulfill website back-office management needs (e.g. adding/removing and promoting content), manage workflows and allocating accountability in intercompany and intracompany projects, gathering information in an organized, easy-to-analyze manner. It can also operate as an Intranet/Extranet platform and database management tool, allowing for <u>easier communication</u> and <u>high process efficiency</u> .	Government Institutions, Newspapers and NGOs	2000

*The date of the product launch is not representative of the product's age, since these products are constantly improved/developed (integrating new modules, adding features to existing ones, upgrading & updating the underlying technology).

Appendix 5 – Potential KPIs

Relevant Performance Dimensions (PMBOK Areas of Knowledge)	Potential KPIs	KPI Type
<i>Quality Management</i>	n° of Issues reported in the 6 months after project delivery vs expected	Lagging
	n° of Blockers reported in the 6 months after project delivery vs expected	Lagging
	% of Issues reported in the 6 months after project delivery which are Blockers vs expected	Lagging
	% of Issues reopened in the 6 months after project delivery vs expected	Lagging
	% of Issue queue rate (last 6 months) = n° of issues opened / n° of issues closed	Leading
	Client satisfaction index based on surveys conducted	Leading
<i>Cost Management</i>	$CPI = \text{Earned Value} / \text{Actual Cost}$	Leading
	$\text{Margin} = \text{Project Revenue} / \text{Actual Cost}$	Lagging
	$\text{Net Present Margin} = \text{PV Expected Revenue} / \text{PV Expected Cost}$	Leading
	$\text{Cost Variance} = \text{Earned Value} - \text{Actual Cost}$	Leading
<i>Schedule Management</i>	$SPI = \text{Earned Value} / \text{Planned Value}$	Leading
	$\text{Delay as a \% of Project Length} = \text{Schedule Variance} / \text{Total Scheduled Time}$	Leading
	n° of changes to project delivery date (excluding those that result from priority changes)	Lagging
	% of milestones missed	Leading/Lagging
	% of overdue tasks	Leading/Lagging
	$\text{Schedule Variance} = \text{Earned Value} - \text{Planned Value}$	Leading
<i>Scope Management</i>	n° of tasks created after the project planning phase was completed	Leading
	n° of changes to the specification of the plan	Leading/Lagging
	n° of planned hours per task	Leading/Lagging
	n° of planned milestones vs expected for the duration	Leading/Lagging
<i>Communications Management</i>	% of hours reported via standard channels in the last 30 days by employees assigned to the project	Leading
	Average delay in reported hours per project member (can be measured in days)	Leading
	n° of project meetings held with controller vs n° planned	Lagging
	Reporting errors (hours reported in closed/wrong tasks)	Lagging