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**MANAGEMENT CONTROL IN A MAKE-TO-ORDER
PRODUCTION BUSINESS. ACTORS, TOOLS AND
RELATIONSHIPS: THE LOCCIONI CASE STUDY**

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INTRODUZIONE

In base al modello produttivo adottato dalle imprese è possibile distinguere prevalentemente due tipologie di aziende: quelle che *producono per il magazzino* e quelle che *producono su commessa*.

La differenza consiste nel fatto che le prime basano la produzione sulle previsioni delle future vendite, mentre le seconde avviano il processo produttivo solo in presenza di un ordine del cliente. Queste differenze spingono le imprese ad adattare il modello organizzativo e la gestione dei processi a seconda che sia adottato l'uno o l'altro modello produttivo.

Questo elaborato mira a fornire un'analisi dell'organizzazione delle imprese che producono su commessa, focalizzandosi sul supporto che il controllo di gestione può offrire a questo tipo di organizzazione.

L'elemento chiave che caratterizza le imprese che producono su commessa è il *progetto*, che consiste in un processo temporaneo finalizzato alla realizzazione di un prodotto (o un servizio) unico che corrisponde alle specifiche dettate dal cliente e verso il quale tutta l'organizzazione deve essere orientata.

Al fine di garantire la corretta realizzazione dei progetti le aziende adottano un sistema di project management che mira a definire un processo lineare nella gestione efficace ed efficiente dei progetti. Generalmente, la responsabilità di un progetto viene assegnata ad un *project manager* che deve occuparsi della gestione

e della realizzazione del progetto rispettando i vincoli di tempo, costi e qualità sui quali al termine delle attività sarà valutato.

L'attività di project management viene definita come un processo composto da varie fasi che segue il ciclo di vita del progetto, in cui è fondamentale un'accurata pianificazione delle attività che andranno svolte e il successivo monitoraggio dei risultati per assicurare che i risultati ottenuti siano allineati con gli obiettivi prefissati.

Entrambi i modelli necessitano di un sistema di controllo di gestione che garantisca l'efficacia e l'efficienza dei processi al fine di soddisfare la domanda, di essere competitivi sul mercato e raggiungere gli obiettivi aziendali preposti.

Nella fase di controllo dei risultati risulta quindi essere determinante il supporto del controllo di gestione, che collabora con il project management nella fase di monitoraggio delle commesse con un focus non soltanto orientato al passato (come avviene nelle aziende che producono a magazzino) ma soprattutto al futuro, cercando di determinare i cosiddetti *costi a finire* con l'obiettivo di comprendere l'andamento del progetto. Questo tipo di approccio, noto come *feedforward*, risulta essere molto efficace in quanto mira all'individuazione di potenziali inefficienze nei processi a lavori in corso, dando la possibilità al management di porre in essere azioni correttive volte ad allineare i risultati attesi agli obiettivi prestabiliti.

Ad integrazione dell'argomentazione della tesi, è stato effettuato lo studio del caso Loccioni, un'impresa marchigiana che opera su commessa e specializzata nella fornitura di soluzioni ad alto contenuto tecnologico per la misurazione della qualità. L'analisi del caso parte pertanto dallo studio del modello matriciale adottato dall'impresa per poi analizzare tutto il flusso di attività per la gestione dei progetti, dall'attività di definizione dell'offerta, per attraversare tutte le fasi fino al servizio post-vendita. Successivamente viene analizzato il supporto che la funzione offre al project management nella gestione dei processi, nonché le prospettive, i limiti e le potenziali aree di miglioramento che il modello adottato offre.

INTRODUCTION

The background in which nowadays companies operate is increasingly dynamic and characterized by a high level of competitiveness. To succeed in this kind of context, the fundamental objective that companies must pursue is the customer satisfaction, by orienting their processes towards the customer needs but also ensuring the effectiveness and the efficiency of processes to get the expected results. To achieve these goals, a company should implement an informative and organizational structure that favors the flexibility and the consistency of processes. In this sense, the management control represents a crucial function that supports the organization through the achievement of the company's objectives.

The aim of this thesis is the analysis of the support that a management control system can provide to a company producing to order, where the production is not standardized and the size of projects requires a feedforward control, that monitors the performance of projects during the execution of the activities allowing to define potential corrective actions to ensure the expected results.

In the first chapter the analysis starts with the description of the model adopted by companies producing to order, focusing on the distinctiveness of its production model with respect to companies producing to stock, and on the organizational structure model that characterizes this kind of business. Then, the research moves

to the project management system, analyzing its procedures and tools as a guide to all processes and the role of the project manager within the organization.

The second chapter, after having described the evolution of the management control function and the role of the management accountant within the organization, focuses on the management control system in a company producing to order, analyzing its objectives and tools for the implementation of the process.

The third chapter consists in a case study research referred to the Loccioni Group, a company producing to order and specialized in the supply of high-tech solution for the quality measurement. The chapter will analyze the organizational structure model of the company, the organization of the project management function identifying three distinct moments (pre-sale management, execution management and after-sale management) and then reflections will be made on the support that the management control function can give to the organization during the management of these stages.

To conclude, the research focuses on the strengths and weaknesses of the model, trying to define potential improvements to make more effective the support that the management control function could provide to an organization producing to order.

CHAPTER 1 – MAKE-TO-ORDER PRODUCTION MODEL: CHARACTERISTICS AND PROCESSES

1.1. THE PRODUCTION TO ORDER

In order to classify industrial companies according to their production model, the main distinction to take into account is between two substantial classes: companies producing to order and companies producing to stock (Innocenti, 1997).

The choice of which production model to apply to the business is crucial, since it will affect the whole company's organization, from a structural point of view to a purely operational one.

Make-to-order (MTO) denotes a business production strategy that allows consumers to specify the features of the project according to their needs and, as a result, to purchase products (or services) completely customized, realized following their technical requirements (Calori e Perego, 2009).

This kind of production, therefore, establishes that firms must realize the project requested by the clients, respecting all their specifications; this means that in each contract there are two subjects: the customer and the firm.

Since the project is the result of the agreement between the client and the supplier, besides the specifications of the product, also the total cost and timing of production

are set in advance and this enables the firm to estimate quite accurately all the factors required to achieve the goal (Montemari, 2018).

From the previous analysis it is possible to deduce that the production process, in a make-to-order production model, originates from a customer's order; this operational cycle differs from the one taking place in a firm producing to stock. As already highlighted above, in a MTO production model, the whole process will only start when the customer confirms the order; then all the other phases can take place. Indeed, the most important difference between the two business models lies in the fact that in a firm producing to order the customer is already acquired and the company is going to realize the object of the project complying with the characteristics imposed by the contract, thus obtaining a project unique and different from all the other. This is the first distinctiveness which differentiates the analyzed model from the traditional Make-to-Stock (MTS) model, whereas, the first step is the supply of raw materials for the production which is strictly related to sales predictions for the period and where the characteristics of product are imposed by the supplier¹ (Innocenti, 1997). In other words, in a make-to-order model the sale represents the starting point of the process, while in a make-to-stock is the last step.

¹ This is the most relevant difference, since MTS, basing the production process on predictions and not on confirmed orders, takes the risk of unsold product.

Due to this aspect then, it can be inferred that in a company producing to order, revenues are fixed *a priori* in the agreement, except for the case of an eventual variation to the project plan requested by the customer, that will lead to a revision of the order and to the increase of the price previously set². This requires the firm to accurately estimate the costs of the project's realization since the definition of cost estimates determines the costs budget of the project and the objective of cost for the project execution (Anthony, 2007).

On the other hand, in a MTS production model, what is uncertain does not concern costs, which have already been borne in advance, but the revenues, since companies cannot exactly predict the amount of sales, but just estimate them.

The fact that the product, in a MTO model, is customized according to the clients' needs, makes each single product different from the others and this aspect affects also the number of product that firms will produce. Indeed, in a MTS organization the number of products is elevated, due to the standardization of manufacturing, while in a company producing to order, the number is lower since the production

² The flexibility of the price depends on the form of the contractual agreement. It is possible to identify two main types of contract:

- *Fixed-Price contract*. This agreement commits the contractor to complete the project by a specified date at a specified price. This leads the supplier to assume all the risks related to the realization of the project since the customer will pay the amount previously agreed. This form of contract is used when uncertainty related to the project execution is low;
- *Cost-Reimbursement contract*. This agreement requires the customer to pay the realization costs plus a profit. In this case, the price that the client will pay is not set in advance but depends on sustained costs for the realization of the project and this leads the customer to be involved in the costs control to ensure that resources are used in an efficient way in order to pay a fair price. This form of contract is mainly used when the scope, schedule and costs of the project cannot be estimated reliably in advance (Anthony, 2007).

of each single product is complex and different from the others (Calori e Perego, 2009). Moreover, the complexity of projects leads to a strong collaboration between the customer and the organization during the design phase. This implies that the firm has an intense relationship with customers based on mutual trust, making worthless the use of the “traditional” marketing tools and strategies (Montemari, 2018).

These are the main differences between the two production models but even companies adopting the same production model could present different organizations: each company is characterized by the features explained above but it internalizes them to better fit the company’s core business and organizational values.

1.2. THE ORGANIZATIONAL STRUCTURE

In the previous paragraph, all features that differentiate MTO from MTS production models have been described.

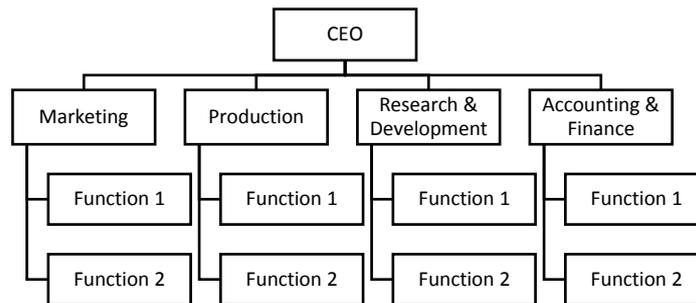
Obviously, the main difference lies in the production process and in the nature of products, but the whole system, in order to work efficiently and effectively, needs a specific organizational structure. The organizational structure is the base of a company's organization and is essential to implement a structure as coherent as possible to the core business of the company and its dimensions (Isotta, 2003). The correct choice of the organizational structure leads to a coherent work division and a correct assignment of the responsibilities, in order to guarantee the fulfillment of objectives (Brusa, 2004).

Even if, as already said, companies try to outline an organizational structure which fits company's requirements to maximize the performance, we can identify three main organizational models adopted by the companies, which can be divided according to their characteristics: *functional structure*, *divisional structure* and *matrix structure* (Mercurio e Testa, 2000).

In the next paragraphs we are going to analyze these three models, with a greater focus on the last one, which is the model that companies producing to order usually adopt.

1.2.1. The functional structure model

Figure 1.2 – *The functional structure*



Source – Brusa, 2004, p.116

This organizational structure model is the most widespread among small companies. The functional structure is focused on the internal dimension (input) and is organized by functions, so that each portion of the organization is grouped according to its purpose and its competencies (Isotta, 2003).

This model is based on a strong hierarchical structure composed by three different organizational levels (Brusa, 2004):

- Top management;
- Middle management;
- Operational management.

The top management aims to the general management of the company, taking strategic decisions and its role is to coordinate all the functions towards the company's middle-long term objectives.

The middle management refers to the direction of each function according to the objectives defined by the top management.

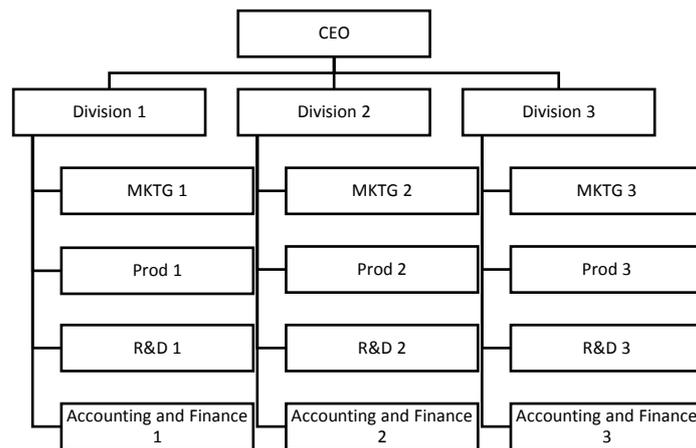
The operational management represents the lower hierarchical level of the structure, whose goal is to put into practice the directives of the middle management and to perform elementary tasks (Brusa, 2004).

From this brief analysis we can highlight some pros and some cons of this model.

The advantage of using this structure is that workers are grouped by their functions and this leads to an improvement of their competencies thanks to the sharing of knowledge (Mercurio e Testa, 2000). On the other hand, this structure is not still adequate when company's dimensions increase and when production diversifies (Isotta, 2003).

1.2.2. The divisional structure model

Figure 1.3 – *The divisional structure*



Source – Mercurio e Testa, 2000, p. 241

The divisional structure model is an organizational structure model characterized by the presence of *divisions* that typically correspond to business units, clients or geographical areas in which the company operates (Brusa, 2004).

The main features that characterize this organizational structure model are the *organization by output* and the *decentralization of responsibilities* (Isotta, 2003).

The first characteristic refers to the organization by division that guarantees a strong focus on the output, since each division manages the processes and the information related to a specific business/client/geographical area.

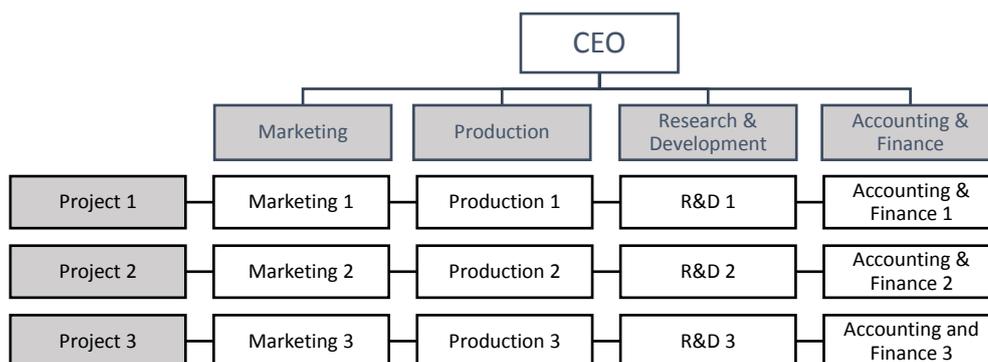
The second peculiarity refers to the structure of divisions; due to the decentralization of responsibilities, each division can be considered as a “company in a company, since each one has its own functions and is endowed with the

necessary resources to manage the business autonomously, being responsible of its decisions and its profits (Brusa, 2004).

The main advantage of adopting this organizational structure model refers to the focus on the output, that guarantees an accurate and effective control on the businesses while the decentralization of responsibilities makes this model attractive for companies characterized by a high business diversification and for multinational companies that operate all over the world since it reduces the interdependencies between the divisions and favors the development of the general management competencies (Isotta, 2003).

1.2.3. The matrix structure model

Figure 1.4 – *The matrix structure*



Source – Mercurio e Testa, 2000, pag. 246

Companies producing to order usually adopt a matrix organizational structure, that is considered the model that better fits the production model of this kind of companies (Mucelli, 1995).

The peculiarity of this model is that it considers at the same time two different dimensions, combining the focus on functions with the focus on projects (Brusa, 2004). In other words, this model is a mix of the previous two, with the horizontal dimension focused on the output (how much is needed for each project) and the vertical one inclined to the input (what is available in each function for all projects) (Montemari, 2018).

A Matrix organization leads to the coexistence of functional managers and project managers, that share responsibilities, and this can cause conflicts since both managers are responsible for the results and the workers receive orders from two different subjects; this is a critical aspect of the model, but it represents also its strength because it allows to assign resources in a balanced way (Montemari, 2018). According to the level of joint responsibility between the managers of the two dimensions (input and output) it is possible to identify three types of matrix structure (Brusa, 1986):

- Weak matrix;
- Balanced matrix;
- Strong matrix.

In the weak matrix, the project managers' authority is low and usually the project budget is managed by the functional managers.

The balanced matrix assigns a higher authority to project managers and so, the project budget is managed from both the functional and the project managers.

Lastly, the strong matrix is characterized by a high decisional power of project managers who is the main responsible of the project budget (Brusa, 1986).

From this analysis it emerges that this model guarantees the efficiency related to the technical know-how, which is a peculiarity of the functional model, and the effectiveness as the orientation towards the clients, that is typical of divisional models (Mercurio Testa, 2000).

Thanks to the flexibility that characterizes the matrix organization, it is possible to combine the requirements of each project with the available resources and to ensure a balanced distribution of resources (Montemari, 2018)

As far as disadvantages concerned, the main one refers to the conflict that could arise from the coexistence of two different managers, both responsible of the same resources; to avoid this situation, it is crucial that responsibilities are assigned in a proper way, that ensures a balanced management of processes and resources (Isotta, 2003). As a consequence, the adoption of this organizational structure model could be source of uncertainty and anxiety among managers, for reasons related to the conflicts with the others, and workers, that simultaneously are under the responsibility of two figures. To avoid this situation, it is fundamental that the top

management ensures the spread of a managerial culture among workers (Brusa, 2004).

1.3. WHAT IS A PROJECT?

After having defined what is a company producing to order and how it is organized, to better understand the context of this topic it is important to give a detailed definition of *project*.

The Project Management Institute (PMI) defines a project as “*a temporary endeavor undertaken to create a unique product, service or result*” (Project Management Institute, 2017, page 4). This short definition of project is very concise and effective in the same way; it includes some key words that are crucial to understand exactly what a project is:

- *Endeavor*. This aspect refers to the cycle life of the project and refers to its temporary nature since it has a definite beginning and end;
- *Product, service or result*. The objective of a project can have different nature, it could be a product to be produced, a service to be performed or a result to be obtained. In any case we are talking about a certain outcome towards which work must be directed and the word unique, in this definition, refers to the peculiarity of each project that is different from others.

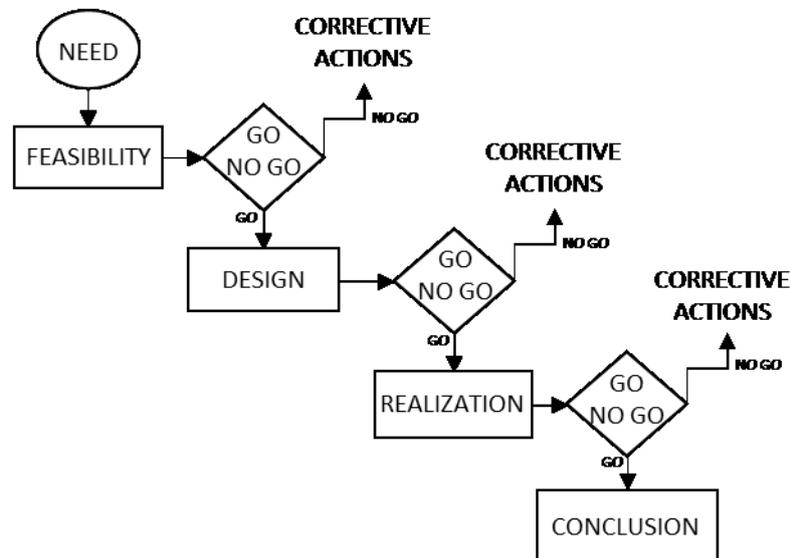
From an operational point of view, we can define a project like a set of activities subject to time, cost and quality constraints and oriented to a specific result (Protto, 2006).

The success of a project depends on the final result, which must coincide with the specifications of the client defined on the order (Project Management Institute, 2017).

As already said above, a peculiarity of projects is that each one is different from the others; notwithstanding it is possible to identify some steps that compose the general project cycle life. What is typical of projects is that all of them originate from an impulse (the order of a customer), starting from the identification of the customer needs and ending with the realization and the delivery of the product to the customer. The set of activities needed to satisfy the customer requirements compose the project cycle life that is made of different phases³ (Archibald, 2003).

³ “A project phase is a collection of logically related project activities that culminates in the completion of one or more deliverables”. (Project Management Institute, 2017, p. 547).

Figure 1.5 – Project cycle life



Source – Protto, 2006, p. 38

Looking at the picture 1.5, we can identify four different phases in a chronological order that take place from the identification of the customer's need (Roman, 1986).

- *Feasibility*. This is the first step, which consists of the analysis of the future project and the consequent definition of general technical requirements needed for the realization of the project.

This analysis also allows to develop time and cost estimations, which are relevant information to make the cost benefit analysis of all potential alternatives to make a rational decision and the output is a general forecast of costs from which it will be computed the selling price to propose to the customer. This activity is up to the commercial department and the technical

one, that will arrange an offer for the client, which satisfies at the same time the customer's technical requirements and the economic needs of the company.

- *Design*. Once the customer accepts the offer, that becomes an order for the company, the organization performs the design phase that consists in a more detailed analysis which leads to the identification of all technical information and processes needed to realize the object that satisfies the customer's need. The output of this step is a document containing all technical information to realize the project and that provides a more detailed cost and time estimation of activities;
- *Realization*. This phase consists in the execution process in which the object is realized following the specifics defined in the previous phases. At this stage it is fundamental that the organization monitors the project, to ensure the alignment between expected and actual results;
- *Conclusion*. When the object of the project is realized and deliver to the client, s/he will start to use it to satisfy his/her needs. This is a crucial moment for the project, since it represents the checking phase in which the customer verifies if the object specifications have been respected; if the customer officially accepts the quality of the result, the project can be closed and invoiced⁴;

⁴ The invoicing of a project depends on the terms of the contract.

At the end of each phase there is a comparison between the expected results and the actual results. This step is known as “Go-No go” (or “Toll gates”) and is a crucial moment for the future of the project since it consists in the analysis of the results and activities carried out, with the aim to verify that there is consistency between what has been realized and what should have been realized. These phases represent the bottle necks of the whole process and for this reason they must be fulfilled at the end of each phase and before the beginning of the next one⁵ (Protto, 2006).

If the outcome of the analysis is positive (Go), the project manager authorizes to go ahead to the next step, while if negative (No go), it is necessary the definition of corrective actions to fill the gap between expected and actual results (Roman, 1986).

⁵ Nowadays, due to the market’s speed, company must minimize the time between the design phase and the realization phase. For this reason, sometimes, “Go No go” phases are suppressed. An example is the *concurrent engineering* which consists in the overlapping of design and production to make faster the process. This should not undermine the project’s quality and conformity to customer specification, because the most relevant decision have been taken in the previous steps (feasibility and design).

1.4. THE PROJECT MANAGEMENT PROCESSES

“Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. [...] Project management enables organizations to execute project effectively and efficiently”. (Project Management Institute, page 10).

From this definition we can understand that the project management is a formal management discipline whereby projects are planned and executed according to a systematic and repeatable process (Archibald, 2003).

The efficiency and the effectiveness of the project management is considered a strategic competence within the organization since it allows to compete more effectively in the markets and, especially, it responds to the impact of business environment changes on project by adjusting project management plans.

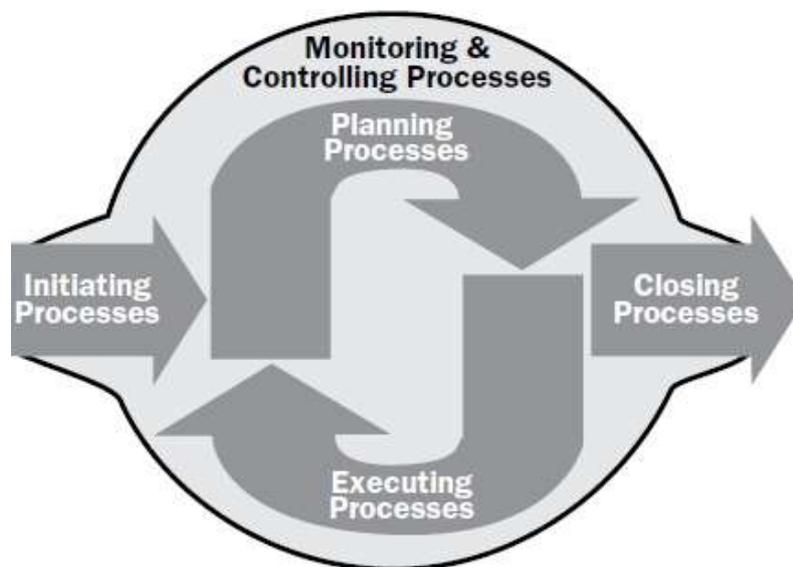
Referring to the definition of project, we can state that it is bounded by its result, time and resources, that are key parameters among which is necessary to make tradeoff. Thus, the project management aims to the maximization of the effectiveness of the tradeoff decisions (Bowen, 1996).

The project cycle life, analyzed in the previous paragraph, provides the basic framework for managing the project, and leads to a set of activities which is similar for any project, regardless of the specific work involved.

For this reason, even if projects differ from each other according to the specifications given by the client, it is possible to map the typical set of activities that compose the management of a project.

Project management process is the set of activities aimed at the realization of the project respecting the three parameters of cost, time and quality and for this reason we could bound it from the entrance of the order to the delivery to the customer, identifying five main set of activities (Process Groups) with the unique aim of realizing the objective of the project (see figure 1.6) (Project Management Institute, 2017).

Figure 1.6 – *The project management processes*



Source – Project Management Institute, 2017, p. 562

1.4.1. The initiating process

The success of a project is usually determined by the clarity of its objectives among all of those involved in a project. For this reason, the Initiating Process represents a fundamental step since it consists of a set of activities with the purpose of aligning expectation of stakeholders with the project purpose, defining the initial scope and the initial financial resources and appointing the project manager⁶. The involvement of all subjects related to a project during the initiation phase is crucial for the creation of a shared understanding of the success criteria (Proto, 2006)

Within this first process it is possible to identify some key steps to set up activities to carry out. Firstly, it is important to establish the project organization, ensuring that all roles and responsibilities are clearly understood and that the authority and responsibilities of the project manager are delineated. An effective output of this phase is the *project team roster*, which allows everyone to know who is involved in the project and which is his/her role within the team (Archibald, 2003). Then, it is important to define which are the project parameters in order to ensure that energies are expended in an effective and efficient way. For this reason, the *POS* (project objective statement) has great importance. It is a short definition of the

⁶ “A stakeholder is an individual, group, or organization that may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project. Project stakeholder may be internal or external to the project, they may be actively involved, passively involved, or unaware of the project [...]” (Project Management Institute, 2017, p. 550)

project which establishes the project's scope, the schedule and the resources available without going deeply with technical details. It ensures that all of those involved in a project are aware of what to do, by when and how many resources have available (Bowen, 1996).

1.4.2. The planning process

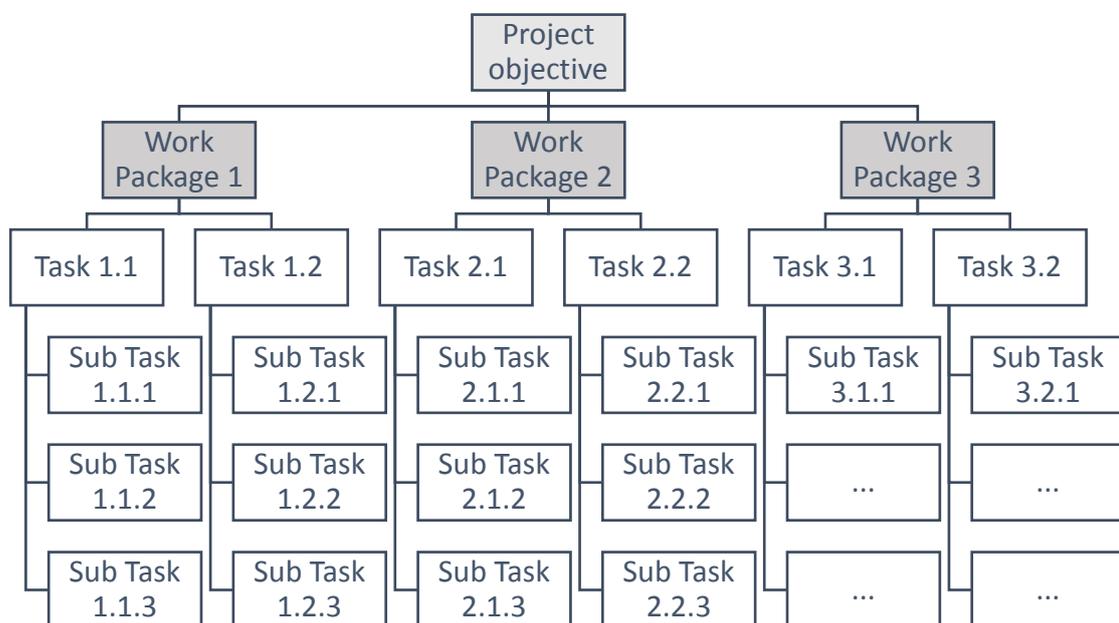
Once the project parameters have been defined, the goal of the organization is to ensure that they are respected, providing the result of the project with respect to time, cost and quality. To accomplish this goal, the *Project Management Plan* represents a key document, which consists in the definition, preparation and coordination of all plan components and consolidates them into an integrated plan, to provide the basis of the whole project work and how it will be performed (Project Management Institute, 2017).

After the main activities that compose the whole project has been identified, the planning process moves to the creation of the *Work Breakdown Structure* (WBS), that consists in subdividing project works into smaller and more manageable components with the aim to define in detail the operational activities to carry out, to reach the project objective (See Figure 1.7) (Bowen, 1996).

The WBS is a hierarchical organization of tasks, with different levels of activities, which starts with the identification of *work packages* that could consist with the

main activities defined in the previous step. Then, each work package is divided in tasks and sub-tasks according to the level of detail in which the activity is described (Proto, 2006).

Figure 1.7 – Work Breakdown Structure



Source – Bowen, 2002, p. 18

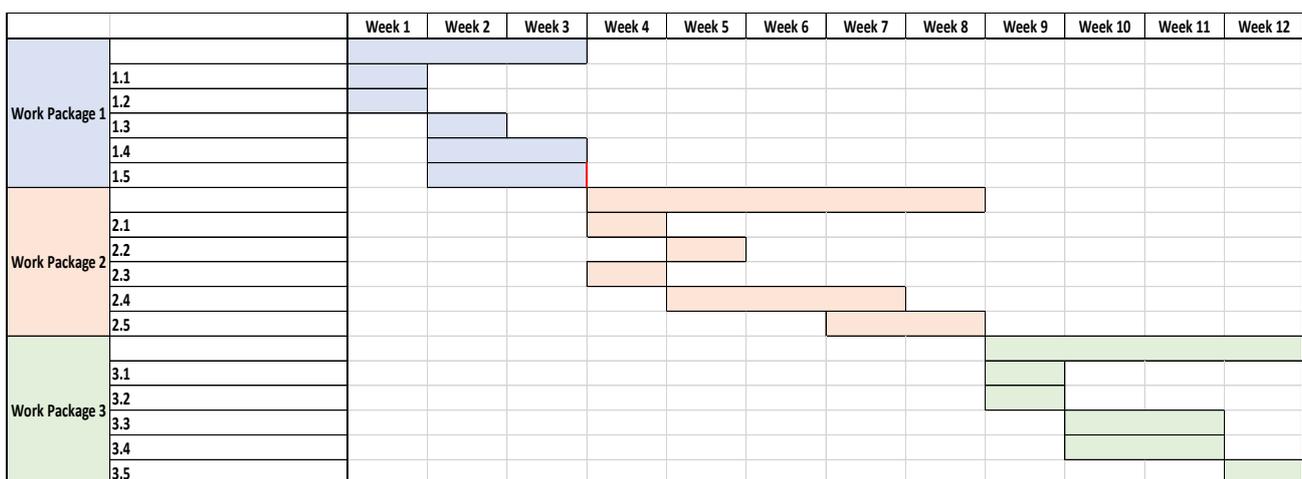
For the success of work packages and so, of the entire project, it is necessary that each task has an “owner” which is responsible of the development of the activities and this means that must be qualified to perform the task (Archibald, 2003).

Once activities and responsibilities have been defined, the organization needs to develop the schedule, which estimates the time needed for completing each task in

order to ensure the respect of the time constraint, and to sequence the activities, that means to define the most efficient logical sequence of work⁷ (Proto, 2006).

At this point, with the timing and the dependencies of each task well defined, a useful tool to control these parameters is the *Gantt Chart*, which plots tasks over time and is popular because of its ease of reading and understanding (see Figure 1.8) (Bowen, 1996).

Figure 1.8 – Gantt Chart



Sources – Designed by the author

⁷ It is possible to identify three types of logical relationships among activities:

- *Finish-Start*. The most common and easiest, states that a task cannot begin until a previous (predecessor) task has been completed;
- *Start-Start*. In this case different activities are carried out in parallel and one task cannot start until the other one has begun;
- *Start-Start with a Lag*. Is a variation of S-S whereby there is a delay between the beginning of the tasks but then, they can be carried out meanwhile.

In the definition of the project's timetable, it is important to define some milestones, that represent the checkpoints to which management attention is required. A milestone refers to a key moment for the project's realization in which it is important to verify that everything has been completed and it is possible to go on, and for this reason it is necessary to define it carefully.

The division of tasks in elementary activities allows also to analyze in a more reliable and detailed way the resource requirements and it is a strategic activity to ensure efficiency and effectiveness to the executing process since it guarantees an accurate resources allocation (Project Management Institute, 2017).

After having completed all the steps described above, project plan is precisely defined and the project lifecycle can move on to the executing process.

1.4.3. The executing process

The executing process consists of those processes performed to carry out the activities defined in the planning stage and to achieve the goal of the project by respecting cost time and quality constraints (Bowen, 1996).

This process is characterized by the realization of the project objective and is the one in which a large portion of the total budget is expended.

Looking at the processes path of the project management (See Figure 1.6), what stands out is that the executing processes and the planning ones does not follow a

chronological order but they are part of the same step in a continuous flow since, once the planning phase has been completed, it is possible that the executing process generates change requests that must be shared with the customer and, if confirmed, will lead to the modification of the management plan (Project Management Institute, 2017).

The management during this phase must ensure that the quality of the activities carried out is coherent with the management plan; this is crucial to increase the probability of meeting the objectives and to identify ineffective processes that reduce the project's quality (Bowen, 1996).

The success of this process is strictly related to the quality of the outputs of the previous steps, but this is not enough since during this phase the organization starts the operational activities that require an effective and an efficient resources management.

During this phase the role of the project manager is fundamental since s/he should manage the team by promoting the communication among coworkers with the aim to enable an information flow that makes everyone aligned with the work progress status and ensures the effective and efficient employment of resources to enhance the project's performance (Project Management Institute, 2017).

1.4.4. The monitoring and controlling process

The monitoring and controlling process is the main topic of this dissertation and it will be analyzed in detail in the next chapter. The aim of this paragraph is to analyze what the function of this process is and where it is placed within the project management flow.

This step of project management does not take a precise position within the flow, rather, it guides and supports the whole process and plays a crucial role for the success of the project (Project Management Institute, 2017).

The starting point is the collection of data that then are analyzed, providing performance measures. Once the information of the actual performances are available, the control phase takes place during the project execution by comparing real data with the planned performance. This kind of analysis, based on variances, allows to identify and anticipate some critical situations and so, to evaluate possible alternatives to ensure the respect of project's constraints (Archibald, 2003).

The success of this phase depends on the output of the planning processes, since what is relevant at this point is the accuracy of the planned performance that is taken as benchmark for evaluating activities carried out and their performances (Roman, 1986).

1.4.5. The closing process

This is the last process group of project management and it is performed with the aim to formally close the project. It consists in the check of all previous steps to ensure that they have been completed with respect to customer's specifications and the project constraints defined in the planning phase (Project Management Institute, 2017).

To this phase takes part also the customer that wants to make sure of the quality and characteristics of the project's object and tests the quality of the output. The result of these tests will confirm the output compliance with the required characteristics or will highlights some issues that could be object of a negotiation between the customer and the organization.

This final step is fundamental for the improvement of processes, since it aims to the evaluation of performed activities and allows to identify inefficiencies and their sources in order to avoid the same errors in the future (*lesson learning*) (Roman, 1986).

1.5. THE PROJECT MANAGER

To achieve the success of a project, a company must define an effective and efficient process of project management; this is a necessary condition but not a sufficient one. What is crucial for the success of a company producing to order is to appoint project managers that put in place project management knowledge and processes to take care about projects and their results (Baroni, 2007).

Before starting the analysis of this person and his/her role within an organization, it is important to highlight that, as for project management process, that is tailored to fit the organization, also the role of project manager may vary from organization to organization.

However, the scope of this paragraph is to provide a general description of this figure, analyzing his characteristics and his responsibilities.

In the past project manager was considered as an occasional and temporary position, while nowadays s/he has an emerging role that is rising its importance within the organization and this can be inferred by the birth of international organizations that provide formal courses with the issue of international certifications (Madaio, 2006).

The project manager is the person that is responsible for the project's success, assigned by the performing organization to lead the project towards its objectives' achievement with respect of time, cost and quality constraints (Project Management Institute, 2017).

In general, a project manager can practice his/her knowledge on a unique project or on many projects in the same time; usually this choice depends on the business's organization and the project's size.

The main task of a project manager is the realization of the object of the project, respecting the customer's specifications and the terms of the contract. For this reason, the project manager plays an important role within the organization, since s/he represents the main touching point between the internal organization and the external environment. S/he communicates with customers for what concerns the work progress status, but also with the top management and the functional managers for the negotiation of resources needed and the possible solutions of a potential problem (Franco, 2002).

Another crucial task is the creation and leading of a project team, that is the factor that most affects the final result of a project, and since the project manager is the only one that formally is responsible for the success (or unsuccess) of a project, it must be his/her care to motivate and coordinate the team ensuring a mood that maximizes the teamwork and makes each team member looking in the same direction.

Obviously, project managers are required to possess specific technical skills, according to the type of projects they are going to manage, and general management proficiencies, but all the tasks described above require also some soft skills, crucial to achieve project's objectives (Project Management Institute, 2017).

To manage a project is a responsibility that is affected by uncertainty, due to uniqueness of the object and to the length of the cycle life. For this reason, project managers must be able to manage risks and to do this, problem-solving and negotiating are crucial requirements to ensure success even in emergency situations (lack of resources, delay in production etc.).

Since the project manager faces internal and external requests and s/he is the leader of a team, interpersonal capabilities and attitude to people are fundamental to obtain a good performance (Madaio, 2006). In particular, a project manager must be able to manage and coordinate a team of people working to the same object and to do this are necessary skills as leadership, team building, motivating, communicating and conflict managing.

CHAPTER 2 – THE PROJECT MANAGEMENT CONTROL

2.1. THE MANAGEMENT CONTROL

In order to achieve the business's objectives, companies should ensure an *effective* and *efficient* use of resources (Mucelli, 1995).

The *effectiveness* refers to the achievement of the companies' objectives and can be evaluated by comparing objectives to the actual results. The coherence between expected and actual results regards different characteristics of the output, as quality, quantity, timing of delivery etc.

The *efficient* employment of resources, that consists in their minimization to realize the output with the aim to maximize the profit, is determined by the comparison between employed and required resources (Brusa, 2012).

In this sense, it becomes crucial to guide all company's operations to ensure the respect of these two parameters and the management control plays a crucial role in this important activity (Brunetti, 1992).

Before analyzing in depth the management control system, it is necessary to describe in wider terms what is meant by management control in a company.

R. N. Anthony defines it as “*the process by which managers influence other members of the organization to implement the organization’s strategies*” (Anthony, 2007, p. 6)⁸.

According to this definition, the management control function lies between the strategy formulation and the task control (See Figure 2.1).

Figure 2.1 – *General relationship among Planning and Control Functions*



Source – Robert N. Anthony, 2007, p.7

The distinction among these three different dimensions was made according to the focus on long period objectives rather than on short period ones.

⁸ Robert Newton Anthony, economist and organizational theorist (September 6, 1916 – December 1, 2006)

Strategy formulation refers to the definition and monitoring of long terms objectives and strategies for attaining these goals and it provides information about the economic and financial objectives in the long run of the company.

Management control consists in the implementation of the strategies planned in the previous phase, by translating long period objectives into short period ones and monitoring activities in order to get the expected results. The aim is to verify if there is coherence among achieved results and business objectives and to ensure an efficient and effective employment of resources needed to carry out production processes.

Task control is the lowest level of control and is focused on elementary activities; the goal of this control is to ensure that each task is performed in an effective and efficient way. (Brusa, 2012; Anthony, 2007).

However, this model provides a model of control characterized by an excessive rigidity that makes the organization not able to quickly react to changes and innovation that nowadays are even more frequent and unpredictable (Riccaboni, 2013).

In fact, this traditional layout of control is characterized by a centralization of decision-making power at top management level and the whole control process is organized to provide information to top managers.

This consideration is leading companies to entrust more decisional power all over the organization and this requires management control to take on the additional

function of improving awareness and economic knowledge and sharing the managerial culture at each level of the organization (Riccaboni, 2013)⁹.

For this reason, the management control should be considered as a managerial function strictly related to the strategic planning and a touching point between the top management and the operational staff.

After having contextualized how the control has changed within the organization, this paragraph will go on with the analysis of this business dimension.

The management control can be defined as a system of tools, procedures and roles that aims to influence the managers' behavior to implement the organization's strategies, ensuring that carried out activities are aligned with long term objectives. This process takes advantage of analytical measures to evaluate individual performance holding managers responsible of their results (Anthony, 2007).

In a company, the management control process includes different phases:

- *Objectives and budget definition*. This is the starting point of the process and it consists in the definition of the objective to which companies will be oriented. This phase represents the connection between the management control and the top management since the control function supports the top management in the definition of long-term strategies and then it participates in the translation of

⁹ This phenomenon is known as “decentralization of decisions”.

these objectives into short term ones ensuring the coherence between strategies and planned activities;

- *Measurement of results.* Since the management control aims to guide activities towards the company's objective, this phase is fundamental since it provides information regarding the results of the implementation of strategies and consists in the measurement of performances; it can be carried out throughout the realization process or at the end;
- *Comparison between objectives and results.* This is the crucial phase of the control and consists in the evaluation of activities' performances by comparing results and objectives. This step is dependent from the previous one, since the analysis of the variance between the two dimensions can be carried out only when performance results are available and as for the measurement of results, also the analysis of variances can be carried out during the production process or at the end;
- *Corrective actions.* Once variances have been computed and information regarding the performance of activities have been shared with the managers, to make the analysis useful for the business performance improvement, it is crucial to define the corrective actions to put in place on time if needed (Marchi, 2013; Brusa, 2012; Brunetti 1992).

The set of activities just analyzed that compose the control, can be structured following two different paths: *feed-back* and *feed-forward*, according to the moment when the corrective actions are taken.

Figure 2.1 – *Feed-back mechanism*



Source – Brusa L., 1991, p. 30

The feed-back mechanism is a model where measurements of results are done once the activities have been carried out and so, the variances analysis and the definition of corrective actions will be carried out at the end of the realization process, comparing expected and actual results (See Figure 2.1) (Brusa, 2012)

This methodology starts with the definition of the objectives, it has a wide vision of processes management but it provides information to improve the results of activities only at the end of the production, making impossible to put into practice on time performance improvements.

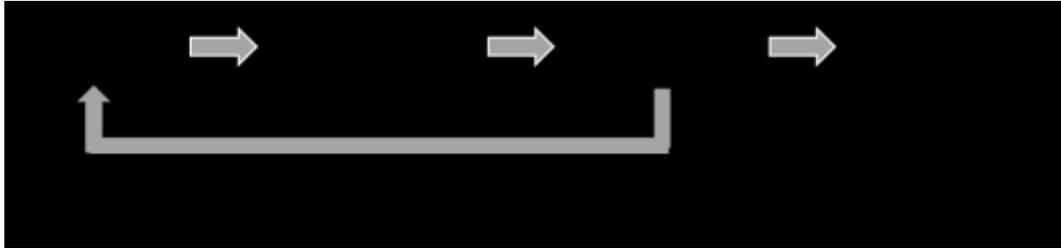
However, this method provides details about the production that become effective information for the next period, allowing to avoid inefficiencies that took place in the current period (Mucelli, 1995).

The limit of this model depends on the measurement of results that is done at the end of the period, making impossible to have information while the process is being carried out but providing only general information regarding processes efficiency.

An alternative that companies could take to fill the gap of the timing of information is to split the annual objective into periodical objectives, in order to make the comparison between expected and actual more frequently. This solution does not look at the future, since the monitoring is still past oriented, but it ensures a recurring control throughout a period making possible to highlight inefficiencies and to take corrective action for the improvement of the residual production (Marchi, 2013).

This kind of analysis fits organizations producing to stock, since this production process is repetitive, and operations that will be carried out in future are at least similar to those carried out currently.

Figure 2.2 – *Feed-forward mechanism*



Source – Brusa L., 1991, p. 29

Feed-forward mechanism represents an effective alternative to the feed-back method, especially for companies producing to order, since it provides information “work in progress” and for this reason allows to take decisions to improve processes before they have been carried out (look at figure 2.2) (Mucelli, 1995).

This technique is future oriented that means that the analysis is based on forecasts since it compares objectives and expected results; in this way, the analysis of variances is carried out previously and the peculiarity is that this model allows to highlight potential negative results before they come true (Brusa, 2012).

This mechanism, that will be deeply analyzed in the next paragraphs, is more efficient and effective than the one analyzed above, since the analysis of future development, even if it is based on uncertain information referring the future performance of activities, allows the organization to make changes in procedures or objectives on time, in order to achieve the expected results.

2.2. THE MANAGEMENT ACCOUNTANT

In the previous paragraph, the management control has been defined as *a set of tools, processes and techniques* and it is clear that to ensure efficiency and effectiveness of processes, the company have to set the organization by appointing a figure that will be responsible of these procedures and that guides the control process through its objectives (Steven, 2000).

The *management accountant* (or *controller*) is the person to whom is assigned the control function and who is responsible for supporting the organization with data elaboration and analysis, contributing to the definition of actions to improve processes and meet the company's objectives. (Brunetti, 1992)

However, this figure has not always had the same function within the organization, and his/her evolution mirrors the change in the concept of management control analyzed before (Sabbatini, 2002).

At the beginning (from 60's to 70's), the controller was known as a "*bean counter*", a person unrelated to the operative dimension of the business and in charge of analyzing results of activities, providing information to the top management (Leone, 2010).

This concept of management accountant was source of discord and misunderstanding among controllers and managers, since the activity of the formers

was interpreted mainly as limited to identify and recognize mistakes of management for the evaluation of performances.

The development of information technologies, that took place in 80's, made the activity of the controller almost automated and the management accountant became a more rational agent who was requested to manage innovative tools to provide well-timed information to managers.

Since 90's, the economic and financial language was known by all managers of the organizations and this represented the definitive transition to the controller as it is known nowadays: a figure that works on managers' side providing information and supporting them on decision making to ensure the effective use of data (Leone, 2010).

This evolution is coherent with the shift of the decision-making power from the top management to the lower levels (decentralization), that leads to the creation of new multifunctional teams within the organizations where the controller is directly involved in business activities to ensure the achievement of the strategic objectives.

The new scenario in which the controller came across, defines the main features that must characterize this figure and his/her functions within the system, to carry out the control activity in the possible best way.

Starting from his/her position within the organizational structure, management accountant is considered a supporting staff¹⁰; this means that his/her main goal is to support the whole organization to improve its economic and financial performance rather than to carry out operational activities (Aprile, 2018).

His/her objective can be translated into two different tasks (Brunetti, 1992):

- *Controller as an “architect”*. To improve the performance, controller must analyze and elaborate information that provide information to managers and support the decisional process.

This goal requires to design an efficient control system and to make it work.

- *Controller as an “educator”*. As already said before, an obstacle to the control refers to the different culture of roles involved in an organization.

The main problem is related to the idea of control that usually collaborators could have; in fact, a common feeling is that the control is a process by which top management controls the activities of lower levels and represents an obstruction to the correct implementation of control (Brunetti, 1992). This requires the controller to be an expert of organizational dynamics, trying to let all people within the organization understand and accept the control system, sharing the values and aims of this process.

¹⁰ Supporting staff are all those function that are present within an organization according to the size of a company, introduced with the aim to standardize the organization; their goal is to support the organization trying to simplify the work of collaborators.

According to the objectives and functions of the management accountant, we can easily deduce the characteristics that this figure should have in order to conduct the control to ensure the achievement of company's goals.

Skills of controllers can be divided into hard, i.e. related to the technical role within the organization, and soft, that refer mainly to the second function explained which needs that the controller is inclined to work with others.

The first type refers to the *ability to use information technologies* and *economic competences*. These skills are strictly related to the control activity, since the controller must be able to manage information, elaborate and give them value. Soft skills refer mainly to the role of controller as an educator, in fact it is crucial that this figure is inclined to the *teamwork* and *communication* in order to be a controller rather than a bean counter that only works with data and to perform the role of educator, by sharing economic knowledge within the organization (Leone, 2010).

Other characteristics are *problem solving* and *decision making*, since the new concept of controller requires that s/he is involved in decision-making process cooperating with managers.

The control consists in the monitoring of results to ensure the achievement of objectives and, since objectives could change currently underway, the controller is required to be flexible, adaptable and proactive.

To conclude the description of this complex figure, it is necessary to highlight that these are the features that characterize the controller, but this role within the organization may vary according to the company's size, the industrial sector in which s/he operates, his/her experience and the control system available and so, each company will outline the boundaries to the controller's power and responsibility according to the scope of the control system that the organization wants to set (Ostinelli, 2000; Aprile, 2018).

2.3. THE COST ACCOUNTING

The management control is defined as the set of *activities* intended to ensure the *efficient and effective employment of resources* with the aim to *maximize the profit, by minimizing costs* (Brunetti, 1992).

This explanation is considerably general and to provide a correct interpretation of it, it is necessary to examine in depth what is intended by "costs" since they can be classified and clustered according to different criteria, according to the scope of the analysis (Cremonesi, 1996)¹¹:

- *By nature*;

¹¹ For a full discussion, see: Cremonesi, 1996; Brusa, 2012.

- *By cost center;*
- *By their variability according to the production volume.*

Profit maximization by minimizing costs, pursued by management control, depends on the profitability of all activities carried out by the company which in turn are the result of the profitability of each project (Protto, 2006).

For this reason, companies need to gather, analyze, classify and allocate costs to the cost center that produced them and to do this, the organization needs a system of accounting.

Within a company it is possible to identify two types of accounting: financial accounting and management accounting.

The *Financial accounting* is a procedure focused on the nature of costs rather than on their destination and is aimed to the collection and recording of financial and economic operations for the drawing up of the profit and loss account and the balance sheet (Facchinetti, 2007).

However, the information provided by the financial accounting are not sufficient for the analysis of projects' profitability, since they are focused on the nature of costs to support the top management to monitor the economic and financial performance of the company.

In order to get more effective information for the economic analysis of projects, companies resort to the management accounting, in particular the *cost accounting*, that is a procedure that supports the management, starting from the same

information of financial accounting but elaborating and providing data with a focus on costs destination (Campra, 2007).

This orientation to the dimension that generates costs, reflects the main objective of cost accounting that is to allocate costs to the proper project in order to compare the actual and budgeted costs and estimate profitability, providing an indicator of the efficiency of the employment of resources (Protto, 2006).

This point is crucial for the economic success of a business, since the identification of variances between actual and planned allows to define the most effective corrective actions to put in place to improve the performance of activities and it allows to define which is the contribution of each project to company's profitability.

The costs allocation to projects can follow two different approaches: the *direct costing* or the *full costing* and the main difference between these two approaches regards the choice of allocating to projects indirect costs or not (Facchinetti, 2007).

The direct costing considers only costs strictly related to the realization of a project and whose amount is related to the production volume¹².

¹² Usually, in a company producing to order it is possible to identify direct costs related to:

- *Design*. These costs refer to the development of project and they are direct according to the volume of projects that a company manage, because higher the number of projects that a company manages, more difficult is to allocate costs to the right project;
- *Raw materials*. They refer to materials employed in the realization of a certain project;
- *Labor*. They are costs related to the manpower employed in the realization of a project. The allocation of these costs is not easy, since human resources usually are not engaged in a unique realization but work on different project in the meanwhile;
- *Other costs*. These costs refer to other activities carried out for a specific project, like subcontracts, external services, depreciation of specific machineries employed only for a project, etc.

This cost configuration allows to have a cost allocation that, even if not complete, is not affected by the subjectivity of the responsible, since the main difficulty regarding the allocation of indirect costs refers to the discretion that could undermine the objectivity of the information.

The full costing, instead, considers direct costs plus a part of indirect costs¹³, providing a cost configuration more complete but that depends on the method used to distribute costs among projects (Montemari, 2016).

As far as full costing concerned, it can be computed in three main different ways:

- *Industrial full costing*. This method considers the total amount of industrial direct costs and the share of indirect costs referring the industrial process of a project;
- *Industrial-Marketing full costing*. In this cost configuration, the indirect share of costs is composed by industrial costs plus marketing costs (all those costs referring the promotion of a product on the market). This method is used mainly by those companies most oriented to the market;
- *Total full costing*. It is the cost configuration that considers all types of indirect costs, adding to the previous configuration also the amount of costs referring

¹³ Typically, indirect costs refer to:

- *Manpower* employed in more than one projects simultaneously, and for which will not be convenient to split their activities among projects;
- *Structural costs* related to the functioning and maintenance of offices (facilities, services, electric power etc.).

administration and all other general costs (Capodaglio, 2011; Calori e Perego, 2009).

There are several approaches to compute the share of indirect costs attributable to a project and this assortment of techniques leads to different costs configuration depending on the method chosen. The main procedure to allocate indirect to costs are¹⁴:

- *Cause and effect*;
- *Cost centers*;
- *Activity Based Costing*.

In spite of these considerations there is not a best approach to use, since the choice depends on the scope of the analysis; if for example the aim is to set the price, the best solution is the full costing method since it considers the threshold in which a project is profitable, covering both the direct costs and the share of indirect costs.

If, instead, the scope is to analyze the projects' result and performance, it is better to use the direct costing method, since the evaluation of results will be impartial and will not consider parameters that project managers cannot control, making the evaluation of the responsible more reliable.

¹⁴ For a full discussion, see: Marasca, Pettinari e Chiucchi, 2013

2.4. THE CONTROL OF A PROJECT

2.4.1. The project key parameters

After discussing what management control is, who the controller is, which his/her responsibilities are and how cost accounting supports his/her activities, the focus of this analysis moves on management control in a company producing to order.

As far as this kind of framework concerned, it is firstly necessary to identify which are the main elements of a project that are subject to control, and as have been repeated more than once in the previous chapter, the main constraints of a project, on which the attention falls, are *quality*, *time* and *costs* (Brusa, 2012). All these three parameters are crucial for the project success and are necessary conditions that must be fulfilled to get the expected results.

The quality of a project consists in the coherence between the output and the customer expectations and the control process consists in the monitoring of activities and their results according to technical specifications included in the documents of project drawn up in the initial phase of the project.

The work breakdown structure, analyzed in the previous chapter, represents a useful starting point for this analysis, since the partition of a project in elementary activities allows to identify many objectives that must be achieved in order to get the expected result (Protto, 2006).

The second relevant parameter to control in order to ensure the success of a project is the time, since the company promises a delivery date to the customer when s/he confirms the order and this constraint leads the project manager to organize activities in order to conclude and deliver the project on time, and then he must monitor the project execution to be sure that the plan is respected.

Monitoring of the schedule of a project requires the identification of some checkpoints (milestones) during the fulfillment of the project where will take place a comparison between planned and actual to define if the schedule is respected or if the realization is on delay.

The effectiveness of the planning phase of a project assumes a crucial relevance for the control of the schedule, since the tool that supports the project manager in the monitoring of this parameter is the Gantt Chart, analyzed in the previous chapter, that represents the set of activities that compose a project and their schedule. The time control is based on the partition of activities in the WBS, since it is possible to define the advancement of a work package, by checking the status of elementary activities that are assembled in the work package (Anthony, 2007).

However, it is not possible to evaluate the progress of an elementary activity since it is not divisible in smaller tasks so, project manager can just confirm its realization or not and then, s/he can estimate the percentage completion of the work package starting from the work progress status of elementary activities.

A recurring update of work progress status allows to identify potential delays in the execution process, in fact by comparing what has been done until a certain moment to what was planned to be done, project manager is able to verify which are activities that caused the delay and can estimates how much time they need to be completed (Project management institute, 2017).

Since the delivery date has already been agreed, project manager must manage remaining activities trying to recover the delay, according to the dependencies between tasks, by better distributing resources and taking into account that the extension of a delayed activity will subtract resources from other tasks (Protto, 2006).

However, these two parameters (quality and time) are mainly under the project manager control, that has a stronger perception of them since s/he is the responsible of the success of the project and follows the whole realization managing resources to satisfy customer's requirements.

The third element on which the success of a project is based is the cost, that is a parameter on which the attention comes from inside the company, since the profitability of a project depends on the minimization of costs.

This variable is crucial for the company since it affects the economic result of a project, the economic margin, that is given by the difference between revenues and costs.

$$\text{Revenues} - \text{Direct costs} = \text{Economic Margin of a project}$$

From the equation above it emerges that the variable to which the organization must pay more attention to get the expected margin are costs sustained to realize the project, since the price of a project usually is determined before its execution starts and does not change except if the client requires a modification of the project that was not contained in the initial order. For this reason, costs need to be monitored for the whole duration of the project, and the control is made by the collaboration between the controller and the project manager.

The management control system in a company producing to order is focused on the single project, and since each project is different from others, great importance assumes the cost estimate, that is a fundamental analysis that includes all planned costs that the organization must support to realize a project and is drawn up according to the specifications of the customer (Anthony, 2007).

Since, usually, the realization of a project is a long process, it is important to monitor and review estimates at work in progress, to identify critical situations and implement corrective action, trying to ensure to the organization the expected margin.

The future orientation is the peculiarity of the management control in a make-to-order production business, that is based on a feedforward mechanism and allows to make prediction on the final results of a project, trying to evaluate if the budget will be respected at the end of the project (Combattente, 2001).

However, since the goal of the management control is to implement the company's strategies by turning them into short term objectives, the function of the management accountant is not limited to the analysis of project costs but aims to coordinate all projects towards the achievement of company's objectives (Anthony, 2007).

Regarding the monitoring of a project it is possible to identify a procedure made of different activities that can be linked to assemble two distinct processes, the estimate process and control process, that take place simultaneously within three different and consequential steps, according to the progress status of a project: *ex ante*, *in itinere*, *ex post* (Brusa, 1991).

2.4.2. Ex ante control

The characteristics of the production process of a company clearly affect the preparation and the application of the control system and, in a company producing to order, the main features in this sense are that projects are characterized by a great complexity and are tailored to the customers' requirements (Calori e Perego, 2009). The control process in this kind of business starts with the identification of a potential customer's needs and a generic definition of the features that the object of the project must have to satisfy the requests of the clients.

This first step, that consists in the planning of a project, is crucial for both the future of the project life and the achievement of company's objectives, since it aims to the determination of the correct price that must be carefully computed to ensure the expected economic result to the company and at the same time to lead the customer to confirm the order (Piras, 2000)¹⁵.

Since, at this moment, the project has not been confirmed yet and there are not specific information about the object to realize, the output of control is a rough *estimate* of activities and costs to define the correct price of a project and to transform the offer into an order economically convenient for the company, that means that the expected result of the project will contribute to the fulfillment of business objectives (Anthony, 2007).

The correct estimate of project's costs starts with the partition of the project into smaller activities since it is easier to determine costs for elementary activities rather than for the whole project, since usually elementary activities have already been carried out for other projects and the company has a greater knowledge of the amount of resources needed to accomplish an activity. The success of this phase depends on the accuracy of the planning process, in particular on the implementation of the work breakdown structure (Cremonesi, 1993).

¹⁵ The price of a project is a measure derived from the estimate of costs plus the economic margin that the company wants to get by the project.

Once the customer accepts the offer and confirms the order, the company proceeds with the development of a more accurate *estimate*, that originates from the previous one but is characterized by a greater level of details since the contract has been signed and more updated and precise information regarding the object of the project and its characteristics are available (Montemari, 2018).

This document represents the *official budget* of the project, it constitutes the economic objectives of the project and is an effective basis for comparison with actual costs, to verify the work progress status of a project.

The implementation of this estimate is a long process, since it requires that all subjects involved in the realization quote the amount of resources needed to carry out their function. The determination of costs for the project budget should be as accurate as possible, considering the quantity needed for each resource and its unit cost (Combattente, 2001).

The effectiveness of procedures analyzed in this subparagraph is fundamental for the control and the success of a project, since an accurate budgeting allows to set a fair price that ensures the company to get expected results (Montemari, 2018).

2.4.3. In itinere control

Once ex ante control is concluded, the customer has confirmed the order and the organization has available all necessary information for the implementation of the project, the realization process can begin.

The control during the execution process aims to the monitoring of the margin achieved and is based on *updated estimates* of costs, that represent reviews of the project budget according to the work progress status.

The information contained in these documents represent the latest update of costs and consist in the sum of actual costs and expected costs:

$$\text{Updated Budget} = \text{Actual Costs} + \text{Expected Costs}$$

The periodical update provides increasingly certain information since completed activities are more and more than activities still to realize and so the actual cost is even more higher than the expected one (Brusa, 2012).

The editing of updated estimates and the comparison with the initial ones can follow prearranged deadlines, to check the work progress status of the project, or can be set at the end of critical phases (milestones) when the control is required (Anthony, 2007).

This step of the control process in a company producing to order represents its main peculiarity since the orientation to the future through feedforward mechanism

allows the project manager to understand if realized activities have been accomplished in an efficient and effective way and especially if going on in the same way will lead to the expected results.

As already said above, in itinere control aims to the monitoring of the achieved margin at a given time period, which can be computed as the difference between revenues and actual costs at that time.

The identification of actual costs referring to a certain period is not a difficult operation, thanks to the support of information technologies that allow to record all costs concerning a project when they are sustained, whereas the definition of corresponding revenues is a more difficult operation since they are recorded only at the moment of the invoicing (Montemari, 2018).

It is possible to identify two main different paths that the management can follow in order to determine the correct amount of revenues to allocate to a given time period:

- Determination of revenues according to the work progress status in terms of incurred costs at a given time period;
- Determination of revenues according to the work progress status in terms of activities carried out.

The first method consists in the *cost to cost* procedure, that determines revenues according to the work progress status in terms of costs using the following formula:

$$R_t = TR * (C_t / TC)$$

Where R_t is revenue concerning the time period analyzed, TR is the total revenue of the project, C_t is cost sustained in the analyzed period and TC are total cost budgeted for the realization of the project (Brusa, 2012).

The second procedure is based on the physical progress of the project taking as references variables like labor hours and computing the amount of revenues of a period considering the number of hours worked on the total of labor hours planned (Combattente, 2001).

Information about actual costs and revenues are necessary to fulfill the analysis of variances that is the core activity of management control in a company producing to order.

The control made during the execution of a project consists in the recurring comparison between actual costs and cost estimates with the aim to identify variances between planned and actual (feedback analysis) and to make more accurate expectations regarding the future performance of the project (feedforward analysis) to support the project manager in managing the project, providing on time information to take the necessary corrective actions. (Anthony, 2007).

The feedback analysis of the project is made by comparing the project budget defined in the planning phase of the project and the actual performance with the aim to monitor the work progress status and evaluate the effectiveness of project

management. This kind of control can lead to the identification of two types of variances:

- *Variances at level of work progress status.* These variances depend on the earned value and are computed as the difference between work progress status estimate at a certain time period and the actual work progress status. This kind of analysis leads to the determination of delays in the execution of a project, since if the work progress status is not the expected one it means that planned activities to be done at that moment have not been carried out yet;
- *Variances at level of efficiency and price.* These variances refer to the economic dimension of a project and are more difficult to determine due to the uniqueness of each project that does not provide a reference model to determine the optimal level of efficiency. For this reason, this analysis relies on subjective estimations (Brusa, 2012).

Once the feedback analysis has been carried out, it is necessary to evaluate how the current situation will affect the expected results of a project.

The feedforward analysis allows the organization to define the trend of a project, its potential problems and the possible alternatives to put in place to ensure a more effective project management in terms of schedule, costs and quality (Mucelli, 1995).

The analysis oriented to the future starts with the drawing up of updated costs estimates, that can be done periodically, at the occurrence of variation requested by the customer or if planned costs are deemed not correct (Innocenti, 1997).

Feedforward mechanism is based on the comparison between the project budget, considering the amount of costs already incurred and the remaining costs, and updated costs estimates, that consider possible variation occurred during the project execution (Montemari, 2018).

The strength of this method consists in the identification of future variances and allows to define corrective actions to improve the future project performance in order to meet the expected results, by providing the project manager a report containing all relevant information for a consistent decision.

The corrective action that a project manager can implement could be divided into two main categories: actions designed to reduce the amount of expected costs by reviewing remaining activities and actions aimed to the customer, in order to convince him to modify the agreed price due to the necessity of additional work to complete the project (Innocenti, 1997).

2.4.4. Ex post control

The control of a project goes on even after the project have been completed and delivered to the customer.

This step of control, even if it is not aimed at improving the performance of activities, is fundamental for companies, since it evaluates projects on two different aspects: the results obtained and the performance in executing the project (Anthony, 2007).

The analysis of the results of a project is useful to collect information regarding costs and is made by comparing the project budget and actual costs at the end of the project (Brusa, 1991).

The evaluation of activities at the end of the project is crucial since it provides useful information to make more accurate estimates of costs for future project and it allows to identify if a project has contributed to the company's objectives.

The other goal of the control after the completion of a project is to evaluate performances of the project's responsible, since project managers are evaluated on achieved results (Anthony, 2007).

2.5. EARNED VALUE METHOD

In the previous paragraph the control process in a company producing to order has been described as a procedure composed by different steps that complies with the work progress status of the project.

The aim of this paragraph is to introduce and explain a methodology to carry out in the best possible way the monitoring of activities ensuring the respect of cost and time constraints: *Earned Value Method* (EVM).

This technique was born in the United States at the end of 19th century as a solution to improve the efficiency of the production process, and since 1960 has spread as a tool in support of project management; the first using this tool was the US government that wanted to monitor work progress status of some projects in which had invested huge public financial resources (Corvasce, 2012).

EVM is considered one of the most effective performance measurement tools for managing projects and is based on the principle that trends in the past can be good predictors of the future.

It has been called “*management with lights on*” since it allows managers to define clearly and objectively where a project is and where it is going – as compared to where it was supposed to be and where it was supposed to be going (Project Management Institute, 2005).

The *clear* and *objective* help that EVM gives to project managers, allows them to define if the project is behind schedule or over budget, to identify which is the reason of the variance, if the problem is critical or not and also to implement the right corrective action to get the project back on track.

This methodology aims to guarantee an integrated control among time, costs and quality of a project (Protto, 2006).

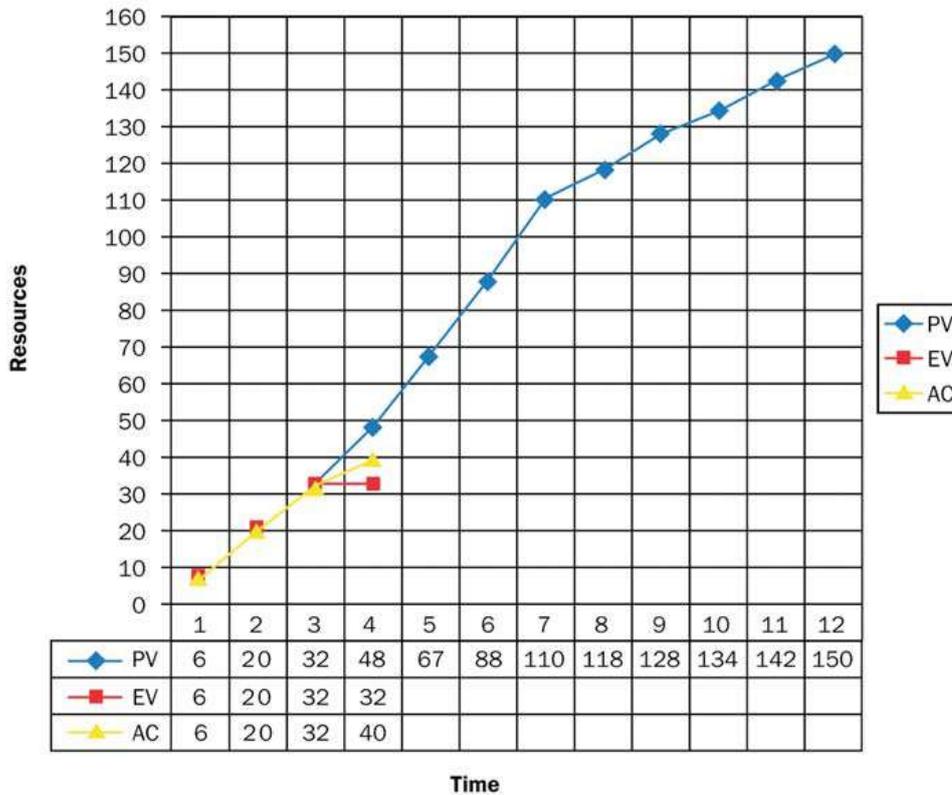
Earned Value Method is a quantitative methodology that ensures an effective and efficient control on projects and is based on three key data points: *Planned Value*, *Earned Value* and *Actual cost* (See Figure 2.3).

Planned Value (PV), also known as *budgeted cost of work schedule*, is a numeric reflection of the value of budgeted work that is scheduled to be performed and is usually charted representing the cumulative resource budgeted across the project schedule.

Earned Value (EV), or *budgeted cost of work performed*, represents the amount of work that has been accomplished in a given time period expressed as the planned value of resources planned to be used for that work.

The last parameter analyzed on which the EVM is based is Actual Cost (AC), or *actual cost of work performed*, that represents the amount of resources that have been expended to achieve the actual work performed in a given time period (Di Napoli, 2003).

Figure 2.3 – Cumulative Planned Value, Earned Value and Actual Cost



Source – Project Management Institute, 2005, p. 14

The definition of these three parameters, plus the *Budget at Completion* (BAC) that is another element that allows EVM to provide effective information and that represents the total Planned Value for a project, are the fundamentals for the definition of two margins that provide information about work progress status and highlight variances among planned and actual: Cost Variance (CV) and Schedule Variance (SV).

The *Cost Variance* allows to identify whether a project is under or over budget and can be expressed as absolute value, determined by subtracting the Actual Cost from the Earned Value or as a percentage, determined by dividing the Cost Variance by the Earned Value:

$$\mathbf{CV = EV - AC} \qquad \mathbf{CV\% = CV/EV}$$

This difference can lead to three different types of variance:

- $CV < 0$: When cost variance is negative it means that the project is over budget and that have been spent more than was expected (extra cost);
- $CV = 0$: When cost variance is equal to zero, it means that actual costs is consistent with the plan;
- $CV > 0$: When cost variance is positive, it means that actual cost is lower than planned cost and that the project is under budget (saving).

Schedule Variance is an indicator of the coherence between planned schedule and actual schedule of the project and helps to determine whether a project is ahead of or behind the plan; it can be calculated by subtracting the Planned Value from the Earned Value or as percentage, by dividing the Schedule Variance by the Planned Value:

$$\mathbf{SV = EV - PV} \qquad \mathbf{SV\% = SV/PV}$$

According to the result of the difference, we can identify three hypotheses:

- $SV < 0$: When the schedule variance is negative, there is a delay in the project schedule, since it has been achieved less than expected;
- $SV = 0$: When the schedule variance is equal to zero, the actual schedule is consistent with the plan;
- $SV > 0$: When the schedule variance is positive, the realization of the project is ahead with respect to the schedule (Corvasce, 2012; Project management institute, 2005; Di Napoli, 2003).

In addition to the margins just analyzed, EVM allows to express costs and performance variances as indexes.

Regarding costs of a project there are two main indexes: *Cost Performance Index* (CPI) and *To-Complete Performance Index* (TCPI).

CPI is an indicator of the cumulative cost efficiency of a project that explains how efficiently resources are being used and it is determined by the ratio between Earned Value and Actual Cost.

- $CPI < 1,0$ indicates a trend to spend more than what is produced (not efficient use of resources);
- $CPI = 1,0$ indicates a trend of expenses aligned to the plan;
- $CPI > 1,0$ indicates a positive trend of resources employment and production (very efficient use of resources) (Protto, 2006)

TCPI supports the project team in determining the efficiency to achieve on the remaining work to respect the total budget of the project (BAC).

The TCPI for achieving the BAC is calculated by dividing the *work remaining* by the *budget remaining* (Project Management Institute, 2005):

$$\text{TCPI} = (\text{BAC} - \text{EV}) / (\text{BAC} - \text{AC})$$

For the monitoring of the schedule there is a main index that support the organization in respecting the schedule of a project: *Schedule Performance Index* (SPI).

The SPI is an indicator of efficiency of time utilization to realize the project and it is calculated by dividing Earned Value by the Planned Value.

- SPI < 1,0 indicates that the project is behind the schedule and that time is not being used at highest efficiency;
- SPI = 1,0 indicates that the production is conform to the schedule and there are not waste of time;
- SPI > 1,0 indicates that the actual production is more performing than it was expected.

The variances and indexes analyzed above are useful performance measures that, if considered jointly, allow to define objectively and clearly how the realization of the project is going on, for what concerns costs and time.

In the figure below are summarized the results gained by the analysis of these parameters (See Figure 2.4) (Di Napoli, 2003).

Figure 2.4 – Interpretation of Basic EVM Performance Measures

Performance Measures		Schedule		
		SV > 0 & SPI > 1.0	SV = 0 & SPI = 1.0	SV < 0 & SPI < 1.0
Cost	CV > 0 & CPI > 1.0	Ahead of Schedule Under Budget	On Schedule Under Budget	Behind Schedule Under Budget
	CV = 0 & CPI = 1.0	Ahead of Schedule On Budget	On Schedule On Budget	Behind Schedule On Budget
	CV < 0 & CPI < 1.0	Ahead of Schedule Over Budget	On Schedule Over Budget	Behind Schedule Over Budget

Source – Project Management Institute, 2005, p. 16

However, the Earned Value Method is based simultaneously on the analysis of the past and the prediction of the future performance of the project, so, once the analysis of performed activities has been carried out and the trend of activities is known, it is possible to estimate how the project will go on, by defining some other measures. As far as costs concerned, the *Estimate to Complete* (ETC) represents a cost estimate for residual activities to carry out while the *Estimate at Completion* (EAC) is a measure that provides the estimate of total costs at the moment of the monitoring and can be also defined as an update of Budget at Completion based on the actual performance of the project.

EAC can be computed in several ways. The first method is just the ratio between the BAC and the cost performance index; in this way the total budget of the project is adjusted according to the trend of costs in the realization of the project.

Another way, known as “*EAC bottom-up*”, considers the Estimate at Completion as the sum of Actual Cost and Estimate to Complete:

$$\mathbf{EAC = AC + ETC \textit{ bottom-up}}$$

This method is the most accurate, since it computes the value of residual activities according to the analysis of remaining work.

Finally, EAC can be also calculated starting from the Actual Cost and assuming that remaining activities will be carried out respecting the budgeted cost:

$$\mathbf{EAC = AC + BAC - EV}$$

After having calculated the Estimate at Completion, it is possible to compute the *Variance at Completion*, which is the difference between the BAC and the EAC and indicates if the project will finish under or over budget and that can be expressed as a percentage by dividing VAC by BAC:

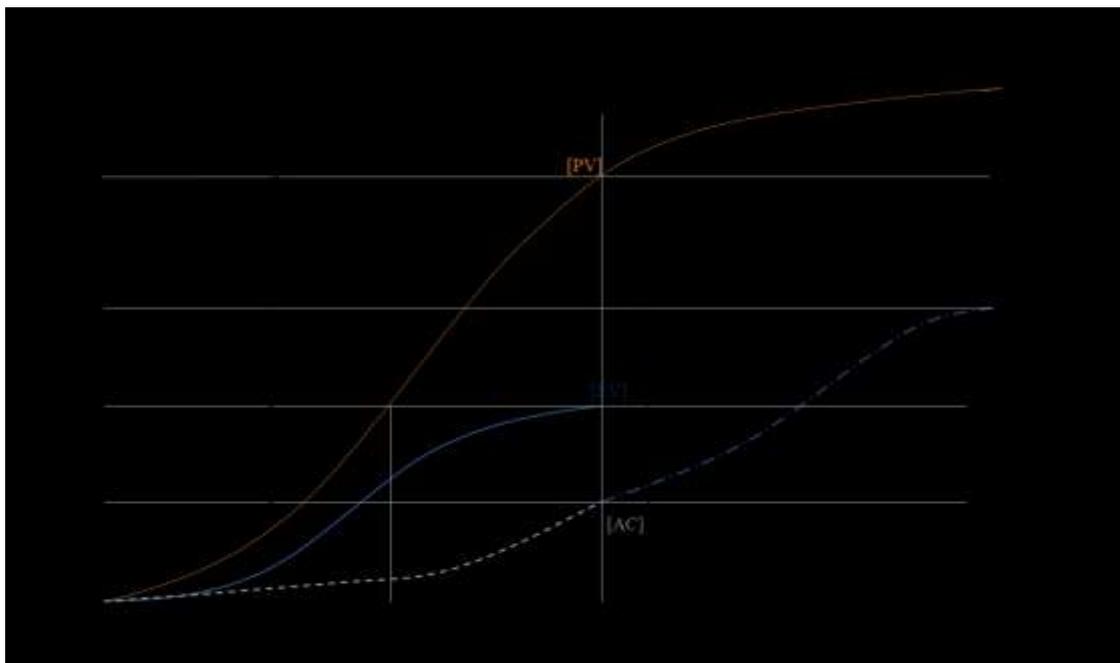
$$\mathbf{VAC\% = VAC /BAC}$$

The same kind of analysis can be made to monitor the schedule of a project and an efficient measure is the *Time Estimate at Completion*, which indicates when the work is expected to finish if the realization process continues at the current rate.

This parameter can be computed using the following formula, that considers the Schedule Performance Index and allows to know how much more time is needed to realize the project, considering how the project is going on (Corvasce, 2012):

$$EAC_t = (BAC/SPI) / (BAC/months)$$

Figure 2.5 – *Graphic representation of the Earned Value Method*



Source – Protto, 2006, pag. 203

From the analysis of this interesting method it emerges that the Earned Value Method represents a valid tool to monitor and measure the project's performance. Especially for companies producing to order, this system provides reliable and objective data that management uses to implement strategies in order to respect the budget of a project.

The greatest strength of this method is that it represents an integrated control system that can be applied to all kinds of project and encourages integration among different professional figures since, thanks to the clarity of its measures, EVM can be easily adopted by all management levels (Di Napoli, 2003).

CHAPTER 3 – THE LOCCIONI CASE STUDY

3.1. WHAT IS A CASE STUDY?

Before starting with the analysis of the Loccioni case study the aim of this paragraph is to provide a definition of a case study research.

The case study research has been defined as an empirical enquiry in which the researcher investigates a contemporary phenomenon within its real-life context, having a direct in-depth contact with the target of the empirical examination over a considerable period of time (Chiucchi, 2012). The contemporaneity is a binding requirement since it allows the researcher to directly observe the object of the analysis and interact with those that participated in the analyzed phenomenon.

The purposes of a case study research could be various and, since the field of this research is the management accounting, the main types of case study research in this sense are¹⁶ (Chiucchi, 2012):

- *Descriptive case study;*
- *Exploratory case study;*
- *Explanatory case study.*

¹⁶ For a full discussion, see: Chiucchi, 2012.

The development process of a case study is composed by some steps that lead to a linear procedure regardless of the aim of the analysis (Chiucchi, 2012).

1. *Definition of research questions;*
2. *Selection of the case/cases to analyze;*
3. *Planning of the activities;*
4. *Data collection;*
5. *Data analysis;*
6. *Case study report.*

The process starts with the identification of the research questions which will guide the research process; this step is fundamental since it helps the researcher to focus on the purpose of the analysis and not to be overwhelmed by the volume of data. A case study research can concern a unique case or multiple cases; the choice of the case/s to analyze depends on the objective of the research. Before starting the analysis of the case study, it is necessary to define the procedure to follow, the object of the analysis, the expected output, in order to have a guideline that support the researcher during the activity. The core activity of a case study research is the data collection, that can be carried out in several ways (document consultation, interviews, direct observation, questionnaires, etc.) (Chiucchi, 2012). During this stage it is fundamental to be supported by a *gatekeeper*, the touchpoint between the researcher and the organization, that allows the researcher to be accepted within the organization and guides him/her throughout the activity of research.

During the data collection, the researcher must analyze the gathered information, providing a personal contribution, since the collection and the elaboration facilitates the elaboration of the result of the research.

The last step of the case study research consists in the sharing of results through the drawing up of a report. During this phase it is important that the researcher, in addition to the result of the research, specifies the method adopted, the activities carried out, the people involved in the analysis to make the analysis as reliable as possible (Chiucchi, 2012).

The approach of the researcher to the case study can be non-interventionist or interventionist according to his/her involvement to the process. In the first case the researcher limits him/herself to analyze the phenomenon trying to do not influence the results. In the second case, the researcher has an active role, since the goal of the analysis is to solve a specific problem and to improve the theoretical knowledge of the topic of the research. In the field of management accounting, as far as the direct intervention and the involvement of the researcher is concerned, it is possible to identify two main approaches: *action research* and *constructive approach* (Chiucchi, 2012). Both approaches imply a direct action of the researcher but in the first stance, the researcher limits his/her influence by posing questions or suggesting actions. In the second stance, instead, the researcher acts and cooperates with the organizational actors to obtain a certain result. In management accounting this consists in introducing new models, tools (constructions) (Chiucchi, 2012).

3.2. THE RESEARCH PROCESS IN THE LOCCIONI COMPANY

The research for the Loccioni case study lasted approximately three months during which I stayed within the organization, to investigate the processes of the project management and the support that the management control function provides to the organization, with the aim to analyze the model and then to identify its strengths and weaknesses.

The research started with the identification of the objective of the research, that thanks to the interactions with the company and the literature analysis has been progressively refined in “*how management control supports project management*”. The *gatekeeper* that facilitated the research process was Alberto Basili, responsible of the administration, planning and financial control within the organization, that suggested me who to interview to get effective information:

- *Genny Primucci (Controller);*
- *Daniele Lanari (Responsible of the project managers team);*
- *Damiano Antonelli (Senior project manager);*
- *Luca Renga (Responsible of the spare parts team);*
- *Davide Lo Bello (Responsible of the automotive service team);*
- *Luca Marassi (Responsible of the automotive business unit).*

Moving from the aim of the research I started defining the questions to ask to my interviewees in order to maintain the control of the conversation. However, the

questions were a guideline for the speaker that, after having identified the topic of the interview, has been free to organize the speech and led to highlight their opinion about the topic of the research. After each interview, the information have been rearranged following a logical order to simplify the writing of the final report. In addition to the interviews I have analyzed some business documents and tools to integrate information provided by the interviewees.

In particular, I have analyzed the *business unit annual budget* to better understand the structure of Loccioni's business and then the tools used by the management accountants to carry out the control on projects, such as *STAVALA* (stato avanzamento lavori) that is the source of data concerning actual costs and *GESTOFF* and *Scheda commessa*, that are tools used by project managers for the budget definition and the project monitoring.

3.3. THE LOCCIONI GROUP

The Loccioni Group is an Italian company founded in 1968 by Enrico Loccioni and Graziella Ribichini and settled in Angeli di Rosora (Ancona).

It started as a manufacturer of industrial electrical systems and then, thanks to the opportunity that Loccioni took with its customers, it started specializing in quality measurements¹⁷.

The core business of the Group is the realization of high-tech solutions, tailored to fit the customers' needs with the aim to improve the quality, the comfort and the safety of their lives. Loccioni develops measurements and control systems to help manufacturers performing at their best, saving time and money while respecting human safety and the natural environment.

Nowadays, after 50 years of activity, Loccioni counts approximately 500 employees with an average age of 34 years and branches in Germany, USA, China, Japan and India that aim to develop the commercial relationships with new customers and maintain and reinforce the partnership with the older ones¹⁸. The international presence reflects the *vision* of the company, that is to “work together

¹⁷ The input to develop quality measurement systems came from Merloni, an Italian company close to Loccioni producing electrical appliance, that had a problem with the testing phase of washing machines and asked to Loccioni to solve this issue.

¹⁸ The design and the realization of project are made in Italy and branches support the organization in terms of customer care and commercial activities.

with the world-class enterprises and leaders in their industry” and build *communities* with them to improve the quality of their products and processes¹⁹.

To work with the best in the world requires to satisfy the clients and create a deep relationship with them, trying to figure out together new solutions to their problems and going beyond the commercial relationship, building a partnership based on mutual trust. The importance of the client is part of the Loccioni culture and is largely widespread among all collaborators, that for this reason are used to look every possible action from a customer perspective.

The *mission* of the company is to improve the wellbeing of people and the planet. Loccioni considers the profit as “*an instrument to share culture, wealth and innovation with the territory*” and this can be inferred by the many projects that the company is carrying out that are not related to the core business but aim to the improvement of the environment wealth. An example is “ARCA” (Agricoltura per la Rigenerazione Controllata dell’Ambiente) a project in which Loccioni took part, deciding to invest revenues for the improvement of environment quality, ensuring a safe relationship between humans and nature.

What makes this company unique are the *values* on which the organization is based.

Enrico Loccioni says “*you cannot force someone to do something that you do not*

¹⁹ Especially in the HumanCare business, communities represent a strength since all the best actors of this business in the world periodically meet each other to discuss about future developments and innovative solutions. This knowledge exchange has a double value since it allows Loccioni to reinforce the partnership with clients being up-to-date about market developments, but it also improves the quality of life and health of people.

want to do”, and for this reason the company has been defined a “*play factory*”, a place where people can work creatively that, thanks to the flat organization, promotes the continuous flow of information among collaborators. This aspect facilitates the teamwork, a crucial aspect that ensure the success of the company, where everyone is important and there is a natural exchange of knowledge among the more expert people and the younger ones.

Nowadays, Loccioni, thanks to the investments in R&D and its typical function “Research for Innovation”, operates in many lines of business like *Automotive, Industry, Energy, Environment, Train & Transport, Humancare, Aerospace, Avio.*

3.4. THE ORGANIZATIONAL STRUCTURE

The Loccioni's organizational structure reflects the business production model that characterizes the company. Since it produces to order, the most effective organizational structure is the matrix model, that Loccioni has adapted to its needs and characteristics.

However, Loccioni has not always adopted the same organizational structure model. From the establishment to late nineties the company was organized differently, using a functional model where few people were responsible of the entire organization.

The growth of Loccioni has led to the identification of some aspects to implement and that required the company to modify the organizational structure, moving to the matrix model:

- *“Young company” to diversify the risk.* Since Loccioni has a long-term vision, being a young company means to explore and conquer new lines of business for future developments. The presence of many different markets makes the organization more complex since it increases the share of responsibilities within the organization;
- *Increase the number of responsible within the organization.* From the previous point comes the need of increasing the number of responsible, and the best way to do it was the implementation of the matrix model.

The model that nowadays Loccioni adopts, is the result of the company's developments during the years and the main factors that lead the improvement of the organizational model are the introduction of new business units and the establishment of new international companies.

Figure 3.1 – Matrix organization in Loccioni

COMPETENCIES (FUNCTIONS)	LINES OF BUSINESS				International branches		
	Industry	Automotive	Environment	...	Loccioni Deu	Loccioni USA	...
<i>LEVEL 1</i>							
Business Unit responsible							
R&D							
Key account managers							
Offer							
Project Managers							
Design							
Project Engineer							
Buyers							
Laboratory (mechanical, electronics, mechatronics etc.)							
Software							
Service							
<i>LEVEL 2</i>							
Administration							
Human Resources							
Facility							
Hospitality							
IT							
<i>LEVEL 3</i>							
Business Innovation							
Research for Innovation							
Identity Lab							

Source – Designed by the author

Looking at the figure 3.1 it emerges that the Loccioni matrix model is organized on three distinct dimensions: lines of business, competencies (functions) and international branches.

The vertical dimension refers to the business and the focus on markets divides the organization in many different Business Units, while the horizontal dimension refers to the internal organization by functions (that Loccioni prefers to call

competencies). From an organizational perspective, it is possible to divide the *competencies* into three main levels:

1. *Level one*. At this level there are all the core *competencies* of the organization, that offer a direct support to the core business and are organized to satisfy the needs of each business line, representing a direct cost for the company since they are strictly related to the project execution process. The functions included within this level follow the realization process of a project and for this reason we have firstly the business unit responsible that, together with the R&D and the Key Account Managers, defines the three years plan. Following the flow of activities to execute the project, there are those responsible of the offer definition, a project manager and a project engineer that manage the project and the team, the buyers that have a crucial role since Loccioni's machines are made of different components bought from external suppliers, the technicians that assemble machines, the software team that makes the machines "alive". A fundamental function for Loccioni's business is the service that supports the customers after the sale, since the goal of the company is not only to supply the machine to the customer, but mainly to offer a service contract for the machine, that ensures the organization a profit for the next years and a lasting relationship with the clients.

All these *competencies* are specialized to support each line of business, with an adequate distribution of resources to ensure the execution of the activities.

2. *Level two*. This level refers to the staff functions that do not work for a specific business line or a specific client but support the whole organization and for this reason they represent indirect costs for the company. *Competencies* included at this level are *Administration, Human Resources, Facility, Hospitality, IT*.
3. *Level three*. This is the peculiarity of this organization, since usually companies define the organizational structure considering only the previous two levels that allow the company to get profits, subtracting direct costs (level 1) and indirect costs (level 2) from the total revenues.

Loccioni decided to invest its profit for future developments of the company and the brand. At this level of *competencies* there are the *Research for Innovation* function and the *Business Innovation* function, that aim to the future development in new technologies and new markets, the *Identity Lab* that is responsible of the brand and the Loccioni's image, but also of all those project that Loccioni is carrying out to promote the local territory, to strengthen the relationships with schools and universities (Vivaio, Blue zone etc.).

The third dimension of the organizational matrix of the company refers to the international branches that Loccioni has established to be closer to its customers.

The international branches have a crucial role within the organization since they support the organization by nurturing the relationships with customers and providing them the after-sale service. For this reason, they are characterized by a first level of *competencies* that fits the core business and that has been decentralized,

empowering branches especially for what concerns the relationship with customers and the after-sales service, while level two and three of competences have been kept centralized and managed from Italy²⁰.

3.5. THE PROJECT MANAGEMENT IN LOCCIONI

3.5.1. The history of project management

Before starting to analyze how the project management in Loccioni is organized it will be analyzed how it was born and it has been developed through the years until today.

Nowadays Loccioni is characterized by a well-structured organization that reflects the complexity of the businesses in which it operates but it has not always been the same and the organization has followed an evolution path based on the growth and the evolution of the company.

The formalization of the role of the project manager and his/her responsibilities within the organization has started around the nineties. Until then the project

²⁰ The organization of the international branches varies according to their structure. Those branches that are more structured and developed has their own administration function.

manager was responsible of the whole project, from the commercial relationship with the customer and the definition of the project's specification and cost estimates, to the design phase and the execution of the project.

There were no boundaries to the project manager responsibilities that was also the responsible of managing the resources, and this organization model gave rise to conflicts with the responsible of functions that perceived the empowerment of project managers as a threat to their power.

Since the mid of nineties, the organization evolved and the role of the project manager had been better defined, also thanks to the redesign of the organization and the birth of new figures like the sales responsible. The redefinition of the project managers responsibilities insured a balance between project managers and responsible of functions, where the formers were responsible of the execution of projects and the latter were mainly responsible of resources. The weakness of this organizational model referred to the lack of coordination between projects and functions since the functions' responsible were focused mainly on resources rather than on the business.

From the twenties the project manager role has been better defined and this reflects the formalization of the figure that occurred internationally (international schools, certification, etc.)

An important milestone that has led to the current organization is the introduction of a new role within the organization: the *project engineer*. Around 2009, the

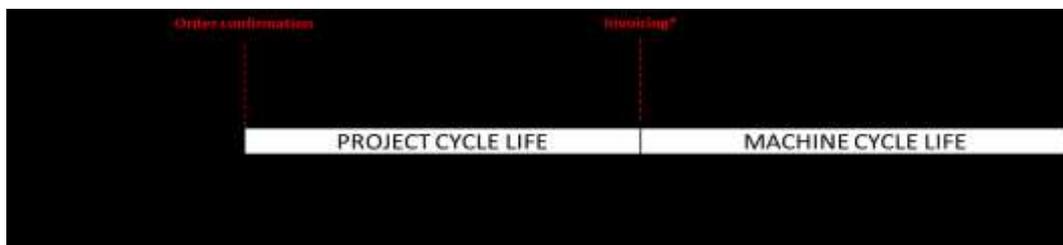
increase in the number of projects had caused problems to project managers, making them stressed and overtired since they were responsible of both the technical aspect and the management of the project. This situation has led to the introduction of the project engineer that supports the project manager, being responsible of the technical aspect of the project. In this way the project manager, that is still responsible of time, quality and costs, can concentrate on the management of a project without dealing with the technicalities of the project. This evolution within the organization has changed the competencies that a project manager must have. Since the core business is the supply of high-tech solutions, the technical aspect is fundamental and who manages the project must have technical skills, but the support of the project engineer allows the project manager to do not have necessarily a technical background and to focus more on the monitoring of the economic aspect of the project. For this reason, nowadays, the project managers' team is intentionally made of PM with different skills, some with a greater aptitude for the technical aspect and some others more oriented to the relational and economic aspect, to guarantee a continuous flow of knowledge between them.

Nowadays Loccioni boasts a well-structured organization with project managers and project engineers, grouped by business unit, that manage the whole process from the pre-sale activities to the after-sale assistance, ensuring a professional and continuous support to the customer.

3.5.2. The project cycle life

In order to better understand the following paragraphs, it is necessary to make a distinction between the project cycle life and the machine cycle life (look at figure 3.2).

Figure 3.2 – Project cycle life vs Machine cycle life



Source – Designed by the author

The project cycle life consists in the process made up of activities aimed at realizing the object of the project. It starts once the individuation of the customer's needs has been completed and the problem of the client has been converted into an official order to execute and ends with the invoicing of the project²¹.

The machine cycle life is different since it starts once the machine has been delivered and has started to work in the customer plant and lasts for the entire

²¹ The closure of the project and consequently the invoicing may vary according to the terms of each contract and depends on who will be responsible of the Machine Qualification 2. If this step is under the responsibility of one of the international branches, the project will be closed and then invoiced after the shipment of the machine, while if the MQ2 is carried out by the team that has realized the machine, the project will be invoiced at the end of the process, once the customer signs the Final Acceptance Letter.

duration of the machine activities at the customer's plant and finishes with the dismantling of the machine.

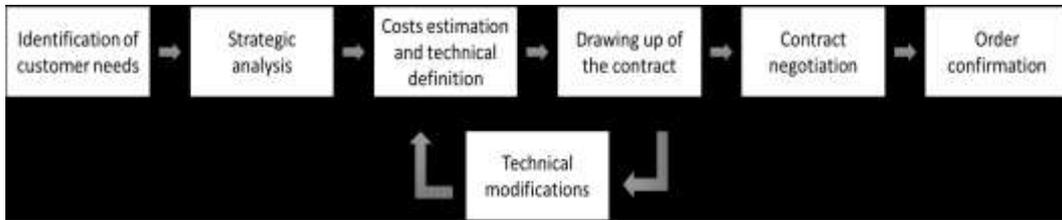
The objective of the organization is not limited to the realization of the machine but consists in the establishment of a long-term partnership with clients that goes beyond the supply of the machine, so the project management is based and organized on a process made of three moments: *pre-sale management*, *project management* and *after-sale management*.

3.5.3. The pre-sale management

Since Loccioni realizes high-tech solutions tailored to its customers, before the order confirmation it is fundamental that the company defines accurately which are the needs of the customer and which is the best solution to meet them. This is not an easy operation, since every project is customized and it has never been realized before, so it requires skilled people that are able to convert the project's specifications into needed resources to define the cost of a project.

In Loccioni there is a devoted team of project engineers that is specialized in this activity and has gained the appropriate experience to convert an idea into a project and turn the needed resources into costs.

Figure 3.2 – Pre-sale management process



Source – Designed by the author

The whole process starts with the identification of a customer problem (input) and this phase has not a specific responsible since it is usually carried out by those that have recurring contacts with the customers (team service and PM). Once all the necessary information are available, the responsible of the business unit analyzes the problem and the customer, to define if the organization is able to execute the project and the customer is coherent with the Loccioni strategy and then s/he appoints the project engineer that will be responsible of the technical definition of the project and the cost estimate (not necessarily s/he will be also the project engineer that will be responsible of the project execution). Meanwhile, the sales responsible evaluate the customer to define his reliability from a financial perspective and then appoints the person that will be responsible of the relationship with that customer and of the negotiation of the contract.

Once the analysis of the customer has been completed, the project engineer will start with the technical description of the project and the costs estimate supported

by *GestOff* (look at figure 3.3 on the following page; some information has been hidden to respect the privacy of the company).

This tool, developed by Loccioni approximately two years ago represents an important support to the project engineer that must prepare the technical description and the estimate costs of a new project, since it allows him/her to refer to a database of the previous projects already executed and to view the actual costs divided by activities realized and items used²². This information is fundamental for the project engineer that, putting together the gained experience and the actual costs of previous project, can reliably estimate the amount of resources needed.

²² Even if each project is completely tailored to customer's requirements, some of the activities required to the project realization have been standardized and recur in many projects.

Figure 3.3 – GestOff: Loccioni’s offers management tool



Source – Loccioni’s tools

Of course, to carry out this activity, the project engineer requires the support of the responsible of the functions that will be involved in the realization of the project, that support the pre-sale management by estimating the hours needed to perform their tasks. The collaboration with the functions' responsible is fundamental to realize an accurate technical definition of the project, in order to submit to the customer a clear project definition that meet his needs.

Once the project engineer has completed the design of the project, s/he sends the cost estimate of the project to the sale responsible, that will add to the cost the commercial margin and will define all the provisions in the contract (terms of payments, shipment, etc.). In this phase it is possible that the client requires some technical modifications that must be managed by the project engineer that will record them on GestOff.

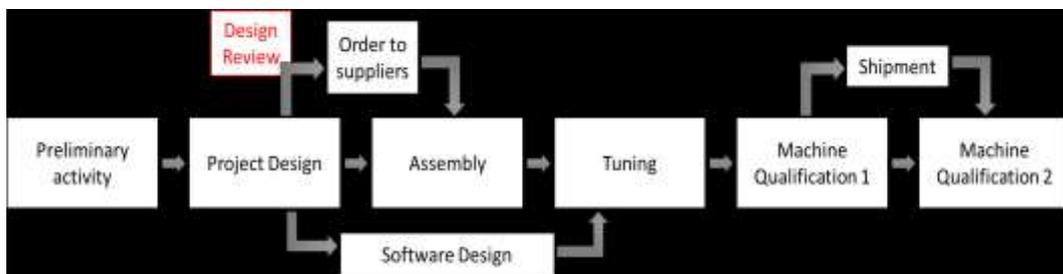
Only when the technical features of the project have been confirmed, the sale responsible negotiate with the purchasing responsible of the client the terms of the contract (price, payment conditions, delivery date, shipment, etc.) to convert the offer into an official order.

3.5.4. The project execution management

The project execution can only start once the order is confirmed, due to the high value of the raw materials that the company must pay in advance to realize the project.

This stage of the project management refers to the core business activities of the company and consists in many phases that can be considered standardized for what concerns procedures, but their duration varies according to the customer and the complexity of the project²³ (look at Figure 3.4).

Figure 3.4 – Project execution management phases



Source – Designed by the author

At this stage of the project the organization has appointed a project manager that will be responsible of the project in terms of time, costs and quality.

²³ A simple project (200/300K) lasts around 7 months while more complex projects can last up to 15 months.

The starting point of project management is to export the costs estimate defined in the previous stage on GestOff into the *Scheda Commessa*, that is a useful tool for project management, design by Loccioni, in which the project manager will have the project budget and the actual costs divided by cost centers and that will support the monitoring of the project performance (Look at figure 3.5).

Since the project manager is evaluated on the respect of the three parameters above-mentioned, s/he should check the costs estimate made by the project engineer during the definition of the offer and s/he could decide, if required, to modify the previous budget with the updated cost estimates. Once the project manager has approved the project budget, that cannot longer be modified, and has assembled the project team, s/he will meet the client to share with him/her the project planning, to define the main features of the project like the machine layout and the main technical characteristics.

After this step, the organization proceeds with the design of the machine, during which the focus is on the details of the machine and each function will contribute for what concerns its activity. The design phase, during which the project manager has recurring meeting with the customer to define all details of the machine, ends with the *design review*, that is an important milestone of the process in which the customer confirms the design. This is a binding moment for the project, since until the client accepts the project design, the company cannot proceed with the orders of raw materials needed for the realization of the machine²⁴. To go on with the project execution, the organization must wait for the delivery of materials, that usually lasts up to two months. In the meanwhile, the *software development* function, after having contributed to the definition of the main features of the

²⁴ The company will pay in advance required materials only when the customer confirms the design, due to the weight of materials on the total cost of a project (70/80% of the total costs).

machine, has started to design the software, that is the key element that makes the machine work, in order to be ready when the machine will go live.

Once the machine has been assembled, the objective is to set it in order to make it function as required by the customer, so the first check refers to the hardware and verifies that the machine has been assembled correctly and everything works. If the first check is positive, the project team must test the machine, in order to verify that the output is accurate and coherent with the customer requirements. If the software check has been approved, the project manager will contact the customer and invite him/her for the *Machine Qualification 1* (MQ1) to test the machine and verify the coherence with his/her specifications. If also the client approves the quality of the machine, it is possible to organize the shipment to the customer plant²⁵. Once the machine has been delivered to the customer plant, the project team will go there for the *Machine Qualification 2* (MQ2). At this stage, the project team and the customer will repeat the same procedures made during the MQ1 in order to verify the functioning of the machine and ensure the quality requested by the customer. If the check is positive, the client will sign the *Acceptance Letter*, that is a formal

²⁵ During the MQ1 it is possible that the customer does not approve the machine or that s/he requires additional modification. In these cases there are two alternatives:

- *The customer accepts the machine* even if it is not perfect and there is something to fix or improve. Usually this is the best solution if problems are not very complex and the team can fix them easily;
- *The customer does not accept the machine*. In this case the project team must solve the problems and the customer will come again for the MQ1 before approving the shipment to his/her plant.

document that confirms the closing of the order and the beginning of the warranty period.

During the execution of the project, the PM is responsible of the work progress status and the success (or unsuccess) of the project and is responsible of the relationship with the customer and in addition to all the activities described above, the project manager is also considered *Contract Manager*, since s/he will be responsible of preparing new costs estimate for potential improvements required by the customer.

3.5.5. The after-sale management

The after-sale support to the clients represents an important share of the business for the company, since it guarantees profits for the following years and especially it is fundamental to nurture the partnership with customers.

The formalization of the *service* dates back to 1988, when Loccioni felt the need to guarantee the functioning of its machines for a long time. Initially the customer care was organized by Business Units, where each one had its own service team.

This organization started to change since 2001, when all the service teams had been grouped in the same plant in a unique business unit and the structure of the team improved with the increase of the number of technicians. This situation was positive since it facilitated the exchange of knowledge between colleagues but, since the

service business unit had its own organization and its own budget, it was also source of discord and competition between the service team and all other business units. For this reason, due to the problems that arose related to the lack of communication between the business unit and the service, after a period of skills improvement, in 2011, the customer care competence went back in the business units with the aim to support the organization²⁶.

Nowadays, the customer care function has a well-defined organization, with the service team internalized in each business unit, except for the spare parts management, that has been kept separate and unique for all the business units. The customer care function, in addition to be responsible of the ordinary and extraordinary maintenance, modifications and tooling, coordinates the activity of the international branches to guarantee assistance to all customers and to minimize costs. Notwithstanding the service has a crucial role for the business of the company, it is not easy to identify a defined set of activities for the management of this procedure, since the method varies according to the business unit and to the customer's needs and requirements.

The first variable, that changes according to the customer, the business unit and the type of service, is the moment in which the organization prepares and presents the

²⁶ The decentralization of the service function within the business lines has improved the communication between the service team and the project team, that was a weakness of the organizational model but at the same time has lead to the loss of the method, since each business unit adopted a procedure that was different from that used by the others.

offer for the after-sale service. The best hypothesis consists in the moving up of this phase to the pre-sale process of the machine, with the objective to sell jointly the machine and the service but usually this is not possible since the responsible of the purchase of the machine has not also the budget for the purchase of the service and for this reason this step must be postponed.

Once the customer signs the Acceptance Letter, the project can be closed and invoiced and the company must provide the assistance to the customer to ensure the correct functioning of the machine, in addition to the warranty period to the customer (that may vary from the first 12 to 24 months). By the way, the boundary among the project execution and the service is not clear, since, especially at the beginning of the customer care period, the client is used to interact with the project manager that was responsible of the realization of the machine and that, for this reason, tends to support the customer without turning to the customer service team and moreover, the support of the project manager, that has gained a great knowledge of the machine, is required to support the customer care team to plan effective activities to support the customer properly²⁷.

The role of the service team is to manage the relationship with customers after the sale of the machine, being the touchpoint between the organization and the client.

²⁷ The transition of responsibility from the project team to the service team depends on the customer, since clients with a strong loyalty and a great relationship already know the Loccioni's organization and appreciate the presence of an international customer care team that will support them during the whole machine cycle life. In these cases, the boundary is well defined and the customer care activities are under the responsibility of the respective team.

This means that once the warranty period starts, the team of customer care is responsible to help the customer use the machine, providing assistance whenever necessary; this organizational model channels all customers' requests to the team that then coordinates the functions activities (software, mechanical, spare parts, etc.) to meet the customers' needs.

The management of spare parts is carried out differently from the management of the other service activities. The current organization consists in another team that is responsible of the orders of spare parts for all the business units (with the offers management that is still under the responsibility of the service team of each BU). This model has led to numerous advantages for the organization in terms of improvement of spare parts management due to the fact that many elementary components are used by more than one business unit. Firstly, being a unique and independent function has improved the alignment of prices at which the same item is sold by the different business units and the centralized management of orders to suppliers has empowered the organization concerning the price negotiation with suppliers. The centralization of the management of spare parts has become necessary also because the service team was mainly focused on the more complex activities like the ordinary and extraordinary maintenance and modification to the machines; the change in the organization has improved the order management, reducing the delivery time from 39 to 21 days.

3.6. THE PLANNING AND MANAGEMENT CONTROL IN LOCCIONI

3.6.1. The history of the planning and management control in Loccioni

The introduction of the planning and management control system in Loccioni dates back to mid-eighties. The entrepreneur decided to implement it in order to get more detailed data with a different timing with respect to those provided by the accountant, that provided information according to the fiscal requirements.

The implementation of the planning and management control system began with the development of a system of cost accounting aimed to measure the core business of the organization: the projects. Once the measurement of the profitability of projects had become a strong competence of the organization, the implementation process moved to the development of a profit and loss account that measured the company's performance. This step represents a crucial moment since it required the entrepreneur to define a method that was coherent with the organizational structure model and led to the adoption of a matrix performance measurement system, with a focus on both the business units (vertical perspective) and on the competencies (horizontal perspective).

Until the nineties the focus was only on the control and the evaluation of performances and only around the late nineties the organization felt the need of a strategic planning system. The first step has been the implementation of the annual

budget followed by the introduction of a long-term strategy planning. From the early twenties, the main milestones in the implementation process of the planning and management control system have been:

- The introduction of a consolidated financial statement that allows to implement a planning and control system in terms of Loccioni Group (strategic choice due to the establishment of the international branches);
- The implementation of the financial planning, due to the necessity to plan and monitor accurately inflows and outflows;
- The latest innovation consists in the implementation of a planning and control systems of the intangibles assets. This is an interesting aspect since Loccioni invests its profit largely in technologies, people and territory that are investments with a qualitative return rather than quantitative.

The aim of the organization is to train those who internally are called the “*economists*” that is to say people belonging the planning and management control function which is adapted to the matrix organization in order to support the business in each of its dimensions.

The matrix approach of the *economists* leads to the individuation of two areas of responsibility. The main activities refer to the core business of the company and consist in supporting the business unit responsible with a focus on all the activities of the business (marketing, production, R&D etc.). This organizational model has led to assign at least an *economist* to each business unit with a vertical approach, in

order to support the whole team in all the activities and to develop cross competencies. In addition to the activities related to the core business, each *economist* is involved in other activities that it is possible to define “horizontal” since they are more focused on competencies and consist in carrying out other projects to support the organization regarding different areas (the development of the international planning and control system, the implementation of tools that automate processes, the improvement of purchase management, etc.).

To support the activities of the planning and management control function, Loccioni has developed a series of tools, with the support of the IT function, designed to improve the effectiveness and the efficiency of processes.

The cost accounting system, as the planning and management control function, has been adapted to the matrix organizational model and for this reason it is possible to divide costs and revenues by business unit (vertical approach) and by competence (horizontal approach). This is the main framework of the cost accounting system that is based on the projects; each project has a distinctive code that allows to allocate costs (materials, manpower, outsources, etc.) and revenues related to it. Thanks to the level of detail of the analysis, it is then possible to group projects according to the scope of the analysis (with respect to the customer, the business unit, the plant, the geographical area etc.).

3.6.2. The support of the planning and management control to the organization

In a company producing to order the support of the planning and management control function is fundamental for the success of the business since it aims to the monitoring of processes with the objective to ensure effectiveness and efficiency to all the activities carried out by the organization. In a company as Loccioni, where the core business consists in the supply of high-tech and tailored solutions and the majority of the employees has a technical background, the role of the *economists* is crucial.

However the support that the planning and management control function offers to the organization is wide, since it goes from the strategy definition to the monitoring of projects with a focus on both quantitative (economic margins, financial performance, etc.) and qualitative (coherence of clients with the company's vision, etc.) aspects.

The strategy definition, that is made every three years, is carried out by the entrepreneur and the top management and consists in the definition of the guidelines and the consequent internal organization, according to the marketing analysis (future trends of business areas and customers). The support that the planning and management control function offers to this activity is mainly numerical, since it consists in providing and analyzing historical data regarding business areas and clients. In addition to the long-term budget, every year the organization draws up

the annual budget, that starts with the estimate of the sales amount and the concerning margins for the next period and then focuses on the amount that the production responsible estimates to be able to execute in the same period.

The *economists* have a key role in the implementation of the activities planned during the yearly budget definition, since they have a wider vision of the company's objectives with respect to the sale responsible and the project managers that are mainly focused on their projects and need to be guided and supported to ensure coherence between the company's objectives and the projects performances. The support of the management control to the core business, since it is oriented to all the activities carried out in a business unit, can be divided according to the three stages of project management identified in the previous paragraph.

3.6.3. The support to the pre-sale management

As far as the pre-sale management concerned, the support that the management control function can provide to the organization is limited, since this stage requires mainly technical skills to develop an offer coherent with the activities needed to realize the object of the project, but very important to ensure the expected performance of the company. The support that the *economist* provides to the organization at this stage can be divided into a strategic support and an operational one. Regarding the former, the aim of the planning and management control

function refers to the analysis of the coherence of the potential customer with the company's vision (to work with the best in the world) and of the commercial margin of the offer with the target margin of the business unit .

From the operational point of view, the support of the *economist* aims to support and monitor the definition of the terms of the contract (shipment, terms of payments etc.), since sometimes it can happens that the sale responsible, since s/he is evaluated on the volume that he sell in the period, offers conditions that are attractive for the customer but unfavorable for the company.

Once the pre-sale process described in the previous paragraph has been completed, the official opening of the project (it means that from that moment on it is possible to allocate costs and revenues to a project) is under the responsibility of the *economist* that will make sure that the customer has officially confirmed the order. This represents an important responsibility, since project managers tend to start working on a project even if it has not been confirmed by the client, to get a head start with the activities but this represents a risk for the company since if the customer does not confirms the order, the costs already sustained will become indirect costs for the organization.

3.6.4. The support to the project execution management

The stage during which the support of the planning and management control function is stronger and regular is the project execution, where the *economist* works closely with the project managers to implement the feedforward mechanism and monitor the work progress status of projects with the aim to identify potential variances between the actual and the target margin.

As already said above, once the customer confirms the order, the project manager should verify the budget made by the project engineer during the previous phase and if required modify and correct potential errors. The collaboration between the project manager and the *economist* begins soon, since, in addition to the revision of the budget, that then cannot be modified anymore and represents a guideline for the project activities, to the project manager is requested to plan the financial flows related to his/her project. This activity is carried out by the PM and the *economist* jointly since the former has a deeper knowledge regarding the project dynamics, while the latter has a general perception of all the projects that the company is realizing in a certain moment. The information that the *economists* gather from all the projects, lead to the definition of the financial exposure in the short run of the company and support the definition of potential financial operations to carry out to take advantage of a positive situation or to remedy to potential deficits.

Once these preliminary activities have been carried out, the project team will start working to realize the project. At this stage, the collaboration among project manager and *economist* is monthly and its objective is to monitor the work progress status to identify potential variances between the actual and the target and their sources, in order to define corrective action to fix the problem.

The organization of this activity has slightly changed since before the estimate to complete of a project was determined by the project manager and the *economist* together, while nowadays, due to the support provided by the tools available, this is only a responsibility of the project manager that periodically will estimate the activities to carry out (and the relative costs) to realize the project. The role of the *economist* in this case is to determine the actual costs of a project and analyze the total of estimate to complete and the actual costs of a project, in order to determine the expected margin at closure. This perspective, due to the high level of detail of information provided by the “Scheda Commessa” that splits costs by cost centers (where each one has its own budget), allows to identify accurately the source of variances that could occur. The project manager that has a clear idea of the activities carried out, should motivate the identified variances and together with the

economist, they will try to define some corrective actions to improve the performance of the project²⁸.

During the monthly check, the project manager is also required to determine the financial flow related to the estimate to complete, in order to have an accurate prediction of future outflows related to activities and materials and of future inflows related to the closure of the project and the consequent invoicing.

In addition to the monitoring of project costs, the support of the planning and management control function to the project management during the realization process regards also the monitoring of the respect of the delivery date. This control has led to an improvement of the respect of this parameter since it considers all the variables that affect the delivery date of a project and, if the delay is due to the customer (additional request, the plant is not ready to receive the machine, etc.), the controller updates the delivery date in order to consider the actual delay starting from the new expected delivery date.

²⁸ If for example the reason of the over budget is related to an additional request of the customer, a potential corrective action should be to ask the customer for a new order for the variation, in order to cover unexpected costs.

3.6.5. The support to the after-sale management

The support of the planning and management control function to the after-sale management can be substantially considered similar to the support that the *economists* provide to the project execution management.

The difference is that, even if each project is tailored to the customer requirements, it is possible to consider standardized the procedure of monitoring of project, while for the after-sale management there are many different activities that present a different complexity and require different monitoring approaches.

As far as the most elementary activities concerned, like extraordinary maintenance and spare parts, due to the high number of project and their small size it is not needed a well-structured budget since to support the offer definition it is just necessary to know the materials and labor costs. Even if this kind of projects does not require a constant collaboration between *economists* and project manager, the formers carry out the monitoring activity independently and the activity of control consists in the comparison between the acquisition margin and the actual margin at the end of the project; only if the actual performance is not coherent with the expected one, the *economist* will consult the project manager and together they will try to identify the source of the variance.

As far as the more complex projects (like modifications, contracts and tooling) concerned, their monitoring procedure is more structured since they consist in

activities that can be easily planned and defined. In these cases the control process is the same of the realization projects, with a structured budget phase on GestOff, the confirm or modification of the budget made by the project manager and the monthly monitoring carried out by the *economist*, that elaborates and analyzes the actual costs of the project) and by the project manager, that estimates the future costs that the company will bear until the end of the project. These two points of view, jointly, provide an estimate of the future margin at the end of the project and allows to know in advance if there are some variances and so, if some corrective actions are needed.

Concerning the after-sale management, there is another aspect that must be monitored: the warranty. The warranty period begins once the customer signs the Final Acceptance Letter and for this reason the project manager should be sure that all the activities related to the realization of the project has been completed²⁹. The organization has set the general objective to not go beyond the 2% of the value of the machine and for this reason the control that the *economist* carries out on these project consists in a periodically check the amount of actual costs and alert the project manager when the actual amount is close to the target amount of costs.

²⁹ Sometimes the customer is in a hurry to start using the machine and signs the acceptance letter even if there are some activities still to carry out. This has negative consequences for the company since the costs related to the missing activities will be allocated to the warranty project rather than to the machine project, changing the final margins.

3.6.6. Strengths, weaknesses and potential improvements of the Loccioni control system

The case study research conducted in this chapter provides an interesting example of the support that the management control offers to the organizations producing to order.

The Loccioni company has developed a well-structured matrix organization that presents two advantages. The first consists in the organization by business units, that guarantees a risk diversification and a business growth. The second refers to the organization by competencies according to the processes related to the supply and the maintenance of the machines, that guarantees an adequate resources allocation avoiding problems related to the lack of resources and promotes the sharing of knowledge and competencies.

The interesting feature of the organizational structure model adopted by Loccioni is that all processes have been conformed to the matrix organization so that each business line has its own project management team that, in turn, is organized in three distinct teams that are responsible of the three steps of the project/machine cycle life: pre-sale management, project execution management and after-sale management. This model reflects the vision of the company that aims to build a partnership with its customers rather than to sell them a machine or a service, and the specialization of project managers by business unit is a strength to get this

objective since the customer is used to address always to the same person, creating a strong relationship based on a mutual trust.

From a project management perspective, it can be inferred that the company has developed a system that best fits the business model and guarantees an effective management of processes. This is due, firstly, to the tools that Loccioni has developed thanks to the expertise of the IT team that is able to provide sophisticated tools that are tailored to the core business requirements and, secondly, to the high flexibility of procedures that are highly adaptable to the characteristics of the projects and to the requirements of the customers.

As for the project management, also the management control function has been adapted to the matrix organization and this allows to potentially provide a complete support to the project management. The peculiarity of this model consists in the choice of considering the management accountant as an *economist* that is specialized by business line rather than by functions. This organizational model improves the competencies and the knowledge of the management accountant, that is considered as a close collaborator of the responsible of the business line, being responsible of the monitoring of all the processes related to a business unit.

The management control system that Loccioni has developed through the years is a complex system that guarantees the support to the whole process of management of projects.

The model is based on a strong *feedforward* approach that, thanks to the available tools that facilitate the control process, monitors the project performance with the aim to identify on time potential inefficiencies in order to define corrective actions. From an operational point of view the *economists* constantly collaborate with the project managers to get the expected results, especially focusing on the achievement of cost objectives, and the support that the management control function provides to the organization is tangible at all the stages of project management, with a more accurate procedure for the project execution phase.

So, the main challenge of an *economist* within the Loccioni organization, in terms of support to the project management, is related to the *economic education* of the collaborators, since the project management team is largely composed by engineers that have the appropriate technical skills according to the complexity of the projects. Despite this feature represents a strength, due to the realization of high-tech solutions that the company realizes, it represents a limitation for the organization, since project managers usually tend to focus mainly on the technical aspect of a project. For this reason, it is fundamental that the *economists* and the project managers work side by side, not only to ensure a complete analysis of the project performance, but also to share knowledge and attitude to the economic and financial aspect of a project.

From the analysis it emerges that the success of this collaboration depends on the attitude of the project managers to recognize the support provided by the

management control function as a value added activity, and on the *economists* time availability, that sometimes are too busy with the execution of many operative activities that restricts the potential support to the business line.

Concerning the opinion that the project managers have about the support provided by the management control function, it is perceived as a quantitative support, limited to provide data whenever necessary without actually contributing to the improvement of processes; for this reason it is fundamental that the *economist* is more interested in understanding the meaning of data that s/he elaborates, developing a general technical knowledge about the solution that Loccioni realizes, trying to provide an effective support also to the decision making process that would be more appreciated by the project managers.

As far as the time availability concerned, this problem could depend on the low number of management accountant with respect to the dimension of the business, that is source of overworked *economists*. To solve this issue, Loccioni is trying to increase the number of *economists* within the organization and is working on the automation of operative activities through the implementation of a business intelligence system that automates the data collection process and allows the *economist* to invest more time on the implementation and the monitoring of strategies at level of business unit.

CONCLUSION

Companies producing to order are characterized by a more complex production model with respect to those producing to stock and the main difference refers to the customization of the production, that characterizes the formers, according to the customer's specification that makes each project different from the others. This production model requires an organizational structure with a double perspective: the first, internal, that is based on the resources that a company has available to carry out the required activities, and the second, external, focused on the output to realize in order to ensure a correct allocation of resources.

The key element of a company producing to order is the *project* and the whole organization must be adapted to optimize the performance of the processes needed for its execution. The set of activities and procedures needed to plan and execute a project requires an organized project management system, that tries to formalize a systematic process for the realization of projects and the achievement of expected results. The project manager is the responsible of the success of a project and s/he is evaluated on the respect of time, costs and quality.

Due to the complexity of projects and their duration, to ensure the respect of these three parameters becomes fundamental that within the organization there is management control function that supports the project management to monitor the work progress status of the projects with a *feedforward* approach.

This kind of approach is fundamental for a company producing to order since it allows to monitor projects “work in progress” with the aim to identify on time potential inefficiencies and variances on the expected result and to implement corrective action to improve the project performance and ensure coherence between the objective and the result.

The support that a management accountant provides to the project managers can be analyzed from two different and complementary points of view.

From an operational perspective, the collaboration between the management control function and the project management function can be divided into three different moments: during the initial phase the management accountant supports the project manager in the correct estimate of costs for the definition of the price of the project; during the project execution s/he contributes to the monitoring of the project progress status in order to highlight potential process inefficiencies; at the end of the project s/he analyzes the performance of a project, identifying the inefficiencies in order to improve procedures during the next projects. What emerges from the analysis of the Loccioni case study is that the definition of project costs estimate is actually under the responsibility of the project manager since it is a process that requires technical skills for the determination of activities needed, so the support of the management accountant is limited to the definition of the terms of the contract to guarantee coherence between the condition offered to the client and the company’s objectives. The activity for which the support provided by the

management accountant is most accurate and effective refers to the monitoring of the project progress status, that requires that the management accountant collaborates with the project manager since the former elaborates the actual costs at a certain moment and the latter can estimate the cost at completion, having the control of the project execution. However, this process is facilitated by the IT function, that supported by the management control function, provides effective tools that allow to automate the data collection and elaboration.

The other point of view regards the role of the management accountant as an “*educator*” (Brunetti, 1992). Even if, nowadays, the automation of processes is leading the project managers to carry out automatically the data collection and elaboration for the monitoring of the project progress status, the role of the management accountant within the organization producing to order cannot be replaced for several reasons. Firstly, especially in those company like Loccioni where the core business is highly technical, the complexity of the projects requires the project managers to have also technical skills and this could lead them to focus mainly on the technical features of the projects rather than also on the economic performance of the projects. In this kind of framework, the challenge for the management accountant consists in the spreading of the economic culture among the project managers, trying to impart them the importance and the effectiveness of the management control system.

The second aspect that makes crucial the presence of the management control function inside the organization refers to the focus that project managers have mainly on their project rather than on the company's business. Since the management accountant contributes also to the definition of the budget of the company and has a wider vision on the company's objectives with respect to the project managers, s/he fulfils the function of integrator between the detailed perspective of the single project and the wider perspective of the general performance of the company, with the objective to ensure coherence between the expected and actual margin of a project and the expected and actual margin of the company.

However, the role of the management accountant within the companies continues to evolve according to the technological advances that are making processes even more automated and are reducing the operational support that the management accountant could provide to the organization. In this kind of context, the management control function has the possibility to improve the quality and the effectiveness of its support to the organization and to get the chance to do it, the improvement should follow two different paths.

Firstly, it is fundamental that the management accountants are inquiring and that do not limit their contribution to the data collection and elaboration, trying to make sense of information that s/he provides to his/her collaborators; to promote this approach companies should implement the organizational structure in order to put

the management accountants strictly in contact with the managers and involve them in all the dynamics of the business to increase their general managerial knowledge. On the other hand, to improve the support that the management control function provides to the organization, it is important to share an economic culture and knowledge among workers in order to let them appreciate more the contribution of the management accountant.

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