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The sales planning in the fashion industry

Il planning delle vendite nel settore moda

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INTRODUCTION

The theme that will be discussed in this paper is the sales planning that is based on the forecast of market demand.

Nowadays, the importance of being able to predict market demand empirically, that is with mathematical models, is increasingly present in companies; despite this, many do not exploit these models because of their complexity. The route that will be presented, starts from a brief introduction of what is the management control and then move on to how to develop a sales planning and then get to the drafting of the annual budget.

The analysis will be a bit more in-depth and will help us to better understand the value of a planning and a forecast. In the second part of the journey, will be analyzed what are the most used models for the forecast of the future market demand, we will analyze the qualitative methods, mostly based on subjective data and after that we will go into the detail of quantitative methods; these methods are very important to be able to develop a forecast of market demand that is as accurate and reliable as possible.

Finally, a sales planning project will be presented which I developed together with the consulting company "K.Group" thanks to the use of the business intelligence software "Board"; the presentation of the project will help to understand the theoretical part previously analyzed. The idea behind this elaboration starts from a working relationship in a company like K.Group that every day develops models of planning, budgeting and forecast for its customers, it is thanks to them that I wanted to analyze these topics better and more in detail.

INTRODUCTION (ITA)

Il tema che verrà trattato in questo elaborato è il planning delle vendite che si basa sul forecast della domanda di mercato.

Il percoso che si presenterà, parte da una breve introduzione di quello che è il controllo di gestione per passare poi subito a come sviluppare un planning delle vendite ed arrivare quindi alla stesura del budget annuale.

Per quanto riguarda il budget, l'analisi sarà un po' più approfondita e ci aiuterà a compredere meglio il valore di un planning e di un forecast.

Nella seconda parte del porcorso invece, verranno analizzati quelli che sono i modelli principali utilizzati per il forecast della domanda di mercato futura, analizzeremo i metodi qualitativi, basati su dati per lo più soggettivi dopo di che andremo nel dettaglio dei metodi quantitativi; questi metodi sono molto importanti per poter sviluppare un forecast della domanda di mercato che sia quanto più preciso ed affidabile possibile.

Per finire, sarà presentato un progetto di planning delle vendite che ho sviluppato insieme all'azienda di consulenza "K.Group" grazie all' utilizzo del software di business intelligence "Board"; la presentazione del progetto aiuterà alla comprensione della parte teorica precedentemente analizzata.

L' idea alla base di questo elaborato parte da un rapporto di lavoro in un'azienda come K.Group che tutti i giorni elabora modelli di planning, budgeting e forecast per i propri clienti, è proprio grazie a loro che ho voluto analizzare meglio e più nel dettaglio questi argomenti.

L' obbietivo finale è quello di portare ad una maggiore consapevolezza della materia del controllo di gestione e di tutte le sue sfaccettature.

CHAPTER 0: "WHAT IS MANAGEMENT CONTROL"

0.1: Management control: concept and characteristics

Management control is a fundamental operating mechanism in all companies.

It consists in measuring internal performance and taking responsibility according to parameters often linked to the allocation of monetary incentives. The usefulness of management control is in its potential to stimulate individual and organizational behavior in line with the pursuit of business objectives. The management control also allows the dissemination within the economic unit of the culture of results and economic language, essential elements of the cognitive baggage of any organization that wants to deal with the current logic of the market.

The operating mechanism in question should not be seen as a set of accounting techniques, but as an institutionalized business practice, able to represent an important resource for the transfer of values in time and space. These systems are characterized by three central elements:

-       *Centers of responsibility: they consist* of the different types of organizational units to which are assigned the responsibilities for the economic and financial results achieved within the company.

-       *The process: in which the* operational part of the control system is articulated, which includes the prior identification of the annual objectives in line with the long-term ones, the preparation of the budget, its refinement, and then move to its negotiation and review, up to the verification of the intermediate and final results, and then conclude with the feedback and implementation of the initiatives that follows from the process.

-       *The technical-accounting support structure:* it consists of performance reporting tools and reporting and analysis models which, as a whole, constitute management accounting. These include the budget, performance indicators, analytical accounting, reporting schemes, analysis of deviations and formal mechanisms linking the achieved results to positive awards or negative individual .

The culture of results

The growing need to pay more attention to economic and financial outcomes is now also crucial for smaller companies. This focus on results has only spread in our country during the last 30 years.

This does not mean that companies previously were not aware about the importance of the economic outcomes and financial ones, but the emphasis placed on these aspects was undeniably less than what is required today of the continuous evolution of the market and the constant growth of competitors. Even in the best-managed companies, in fact, it was not the economic-financial results or the creation of value for the shareholder that ensured success.

The careers of the controllers were not always based on merit, sometimes the performance of a controller could be compromised by the performance of the other members of the company, the internal measurements were not very reliable, the individual functions communicated little to each other, the attention to costs appeared in part and the needs of the customer were not always considered among the management priorities. These observations do not mean that Italian companies did not oversee the technical processes that characterized them. The secret of the success of our enterprises, and of the smaller ones, resided, and still resides, in the very domain of this function. In recent years, however, competition has widened considerably and profitability margins have been reduced significantly for all companies that are committed to internationalization in particular. (nota) For the larger ones, the key stakeholders have also changed, as actual and potential shareholders have taken a more central role than in the past.

The focus on economic and financial management and shareholders has increased significantly. Previously, this management profile was not considered to be as central unless difficulties arose in meeting debt deadlines. This behavior was stimulated by the development methods typical of small and medium-sized enterprises in our country, which have always based their growth on loan capital, too often short-term, rather than on venture capital.

The practice of multi reliance, or the establishment of relationships with multiple credit institutions, dominated. For a long time this situation has been appreciated both by the banks, which thus share their risks on multiple contractors and also by companies , which

obtained resources that were otherwise unavailable, without taking proper account of the consequences resulting from it. The situation described deteriorated as soon as the entrepreneur was no longer able to successfully juggle the dynamic asymmetric flows of income and expenses. This inadequacy has taken on such an enormous scale that the introduction of results orientation is now an essential and at the same time very difficult objective for many economic bodies to pursue.

Monitoring and orientation toward the results

A more results-oriented approach means that business leaders focus more on creating value for the holders of share capital, and that the ethically correct pursuit of the levels of profitability and liquidity promised to investors and lenders, become the main task assigned to the heads of all levels.

To achieve this goal, it is essential that the priorities considered crucial for business success become the own of all employees, from the lowest grade up to the highest, there is a high degree of alignment between the strategies of the enterprise as a whole, the behavior of individuals and within the economic organism, a unique and shared economic-financial language is used to plan, decide and evaluate. This is not achieved simply by stating the intention to introduce cost analysis or management reporting in the company. Also because such instruments, often, are present in the enterprises by now from decades. However, it is necessary to move from information to action, from production to the use of analysis in terms of results, from a style often paternalistic in the allocation of objectives to a more involved and in-depth analysis of the company performance. Having managerial accounting is not sufficient to ensure that the information it produces is used for decision-making and operational purposes. For this to happen, the internal players must have a system of values that gives priority to the economic and financial implications of all the decisions taken and all the initiatives put in place. It is necessary to affirm the so-called culture of results, which forms the effectiveness of management control and at the same time is conditioned by it. Without them, control often remains a purely symbolic or formal mechanism; the consideration of control practices therefore strengthens the culture of results and allows for their definitive affirmation.

0.1.2: The new management control (andrebbe potenziato anche con aspetti legati alla multidimensionalità, alla sostenibilità ecc.)

In a context characterized by a culture of results, each manager considers it is essential to have not only well-timed and consistent information about their performance but also professional analysis and advice to improve each time. The activity of the control operators is therefore characterized by much more important moments than the production of pure reports; If properly retrained and trained, these subjects can become valuable internal consultants, unique for the connection between the phases of strategic approach and those more strictly operational and implementing.

The affirmation of the focus on results, especially if combined with the trend in the adoption of increasingly articulated organizational structures (specialized divisions for specific markets and/or operating and holding sectors with the task of coordinating and integrating) requires that the management control function also adapt to this evolution.

To adequately support the most stringent information requirements of the management, the rules according to which this office carries out its activities should be amended and also the organizational position assigned and the known importance of the company management to the control activities are usually increased in a significant way. Moreover emerges, the need for the controller, that can carry out its work properly, away from the rare attempts of individual managers, to see relevant results consistent with their wishes, rather than with the economic phenomena actually manifested. The "local" controller must strongly and convincingly support the operating manager but cannot become co-responsible in terms of synthesis results nor be hierarchically subordinate. For these reasons, although often functionally part of the "local" management team, such an analyst is usually considered dependent, from a hierarchical point of view, of the central control function, the autonomy necessary to refer any matter directly to it or to the governing bodies.

0.1.3: Key Performance indicators

Defeating the idea about indicators

It is clear that management control also involves factors and variables other than those more strictly technical accounting. We must therefore go beyond the myth of indicators, all too often naively considering the means that alone are able to make the necessary qualitative leap in the effectiveness and efficiency of business management.

Identifying and detecting analytical quantities and synthesis (aspect of the material size) that may be more significant is certainly for the best use of resources, having convincing measures is not enough, however, to influence individual and organizational behavior in a manner consistent with the achievement of business objectives, unique, and true purpose of management control. It is also necessary to intervene on the immaterial dimension, finding the best solutions to the typical issues of this profile mentioned above, and induce a change in the main factor that conditions it, namely the internal culture, with a view to a more results-oriented approach. Working on a profile as intimate as that of the internal value system is a very challenging and difficult task, which requires a strong commitment by the top, a great deal of attention to staff training and a clear understanding of both the underlying objectives assigned to the economic unit and the existing relationship with stakeholders. Over time, the implementation of management control tools and processes also contributes to the strengthening of the culture of results, stimulating interesting forms of organizational learning.

In summary, to understand the effects of control on behavior and decision-making and operational processes, attention should be paid not only to the material size of the mechanism in question but also to its intangible size and factors, internal and external, which affect these two profiles. Among these factors, particular emphasis should be placed on cultural, social, and institutional aspects and issues. Only by following this approach can one appreciate the reasons why the same technical-operational solution is not effective in all situations, why the function exercised by this mechanism does not always coincide with that attributable by top management and which are the best control solutions in the specific business context of reference.

It has already been pointed out that the concentration on results implies the assignment of particular importance to internal measurements. To ensure that they are reliable and that managers behave in the way desired by business leaders, performance indicators must have the following qualities:

- timeliness of the calculation.

- objectivity in their assessment (two different subjects should detect values of the indicator almost equal)

- easy to understand.

- consistency with the objectives of the holding.

- accuracy in the measurement of the object of investigation (quality satisfied when the result of the analysis is constituted by a number that expresses a good approximation of the phenomenon represented)

It has already been pointed out that the importance that management control assigns to performance indicators can stimulate managers to interfere on the data that express the results achieved. In order to prevent this phenomenon, the top management must pay close attention to the issue of "data integrity", in the sense of respecting the rules and procedures for obtaining, calculating, communicating and analyzing them. The data, in fact, must always respect the underlying economic processes and values. This concerns when companies are listed on the stock exchange. The financial market must have no doubts in this sense, as the most important asset for any company is its credibility in the eyes of shareholders, which is based primarily on the numbers that come from internal surveys.

0.1.4 The different dimensions of management control

There is a close link between management behavior and individual behavior, the past has reason to be to the extent that it can influence the latter. It is clear that conditioning behavior is not easy, it also implies the reference to aspects other than purely technical-accounting, including those of a cultural nature. To take account of these profiles, it may be useful to increase the traditional perspectives of analysis and to introduce the concepts of material size and immaterial dimension of control.

Material dimension

The main focus of those who work in the field of management control are the centers of responsibility, control processes and managerial accounting. These mechanisms are only one part of the management control system: the "material" dimension. This, in turn, can be distinguished into:

1. *Static component,* consisting of the technical support structure and the responsibility map;

2. *Dynamic component*, that is, the process by which control becomes operational.

This dimension can be named as "material" because it is characterized by procedures and formal documents, such as manuals, reports, service orders, internal notes, organizational charts, easily found in the company. Even if they are correctly defined, the technical-accounting tools unfortunately manage to guarantee only the production of data and information useful to monitor and support the business activities. The fact that these data exist certainly does not ensure the effective use of them within the operational and decision-making processes, much less is a sufficient stimulus to more effective and efficient behaviors.

Intangible dimension

The intangible attribute is due to the fact that the elements that compose it dimension are not usually formally explained in documents or internal regulations;

These elements are:

1) The role assigned to the control from the business summits, is constituted from the function that they effectively attribute to the management control, to notice that such role does not always coincide with that that that comes formally announced to the various internal actors to the stakeholder, Usually, it consists of the pursuit of higher conditions of efficiency and effectiveness. In many cases, beyond the formal statements, there is a purely symbolic interest in the subject of control, with limited impact on organizational and individual behavior. This attitude is caused by the prevalence of fears that often arise in the top management at the time when you want to carry out an effective management control activity.

Announce the implementation of strict control methodologies, making explicit reference to principles of labels well-known, such as "value creation, activity-based management", incentive on results, EVA, allows to show external analysts and stakeholders in general that the company uses a modern management equipment and keeps the interests of the owners at heart. Showing such attention can be very useful to the business leaders to consolidate their legitimacy, to maintain good relations with stakeholders and, ultimately, not to lose their power. In other words, management control is one of the most effective means of achieving the desired degree of isomorphism in relation to the reference environment, that is, the structural and procedural alignment with what is considered desirable by the actors with whom the company interfaces.

2) Within the immaterial dimension, the modes used in the management of control must also be included, that is, with a play on words, the modes of management control management. The definition and the implementation of such operating mechanism, in fact, demand to the business summits to face multiple issues, organizational and operating (such as the management control style adopted, the organization of the control functions, the positioning in the corporate organization chart, the power assigned to the controller etc).

The effective role of control

The role assigned to the management control and the modalities followed in its management (elements of the immaterial dimension) strongly influence the ability of this mechanism to stimulate individual and organizational behavior. There are, in fact, cases of companies that have systems not too fine to represent internal performance (aspect inherent to the material size) manage to attract a strong attention to the results, making clear the emphasis on the control and operational solutions adopted (immaterial dimension). The configuration assumed by the immaterial dimension affects not only the behaviour but also the model in which the material dimension of the control is structured, and in particular the control process. The analytical nature of the budget structure and the rigour followed in preparing this document, for example, depend on the role assigned to management control by business leaders. The material dimension, in

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turn, inevitably conditions the immaterial one. The way in which the responsibility map is drawn, for example, constrains the function that the vertices can assign to the control, just as it is useless to pursue a strict control if the directional accounting produces unreliable information. The immaterial dimension is also strongly influenced by an articulated and heterogeneous series of factors inside and outside the company, mentioned in the table. Among them, intangible aspects, which are difficult to monitor and modify, should be given an important role. It refers to the institutional profiles that characterize the single economic unit and the context of reference, the cultural and social characteristics of the human patrimony present in the company and in the territory where it operates, as well as the way business leaders want or must manage relationships with stakeholders.

INTERNAL FACTORS Culture, Institutions, Stakeholders, Resources, The distribution of the decisional power, Technology, Strategy, Corporate governance system etc..

EXTERNAL FACTOR Sector, Financial Market, Culture and Competitors

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(source: personal elaboration)

0.1.4.1: The advantages and disadvantages of management control

Now we can consider more closely what are the advantages and disadvantages that may arise from the performance of control activities:

A)	*Advantages*

It has been repeatedly highlighted that management control has interesting potential in influencing behaviors within the company. In concrete terms, the possible benefits include, in addition to the contribution and the affirmation of the culture of results of which we have dealt, the following points:

- Better communication of business priorities and any changes in strategic and operational trajectories.
- The production of stimuli to the pursuit of business objectives and the best use of resources.
- More effective vertical and horizontal coordination of business activities.

- The recognition of the performance of individuals, and therefore, the stimulus to greater individual employment

- The opportunity to appreciate and value the contributions of individual operators

- The strengthening of internal meritocracy

- The individual and team learning deriving from the same participation in the control processes, and in particular to that of budgeting. (This presence implies and stimulates, in fact, a better knowledge of business strategies and business model, the expected objectives, the organizational structure, individual responsibilities, internal processes, market behavior and competitors)

- The incentive to define more reliable accounting data.

- A certain orientation to the short term that in the right measure can be healthy for the fate of the company.

B) *Disadvantages*

In contrast to the positive results, the distortions that can be generated by the management control, especially when this mechanism is managed in an inadequate way (from the aspect of the immaterial dimension) include the following undesirable outcomes.

- An excessive orientation to the short term, induced from the pressure to improve the annual outcomes of own initiatives, to the detriment of the results of medium - long term, the so-called managerial myopia. It refers to the implementation of inappropriate operational behavior with the pursuit of the company's underlying objectives, such as the reduction of discretionary costs (for example promotion and training), as they have effects only in more distant times.

- The stimulus to use accounting workarounds that allow to show results more in line with those assigned, but without creating any economic value against them.

- The induction of excessive levels of stress and internal competition.

- The reduction of group spirit (there are some teamwork KPIs that must be considered)

- The lower awareness of the peculiarities of their internal processes and their strengths, due to the excessive emphasis given at the time of the conversion of business activities into numbers.

It is not enough, therefore, the intention of the summits to equip themselves with well-thought-out control instruments for the company to report precious benefits, just as it is naïve to think that as an effect of the control manifests only useful behaviors to the pursuit of the long-term objectives term.

0.1.5: The stages of the control process

The control process is the very essence of the management control. It is through the development of the phases in which the process is articulated that the control of management realizes its main objectives that consist in placing the management of enterprise in conditions to develop the decisional activity respecting the proposition of effectiveness and of efficiency and motivate corporate entities to pursue the objectives set "(Bergamin Barbato M., 1992).

Mistakes in the definition and implementation of the control process can be translate in the failure of the management control itself.

Talking about the control process means referring to:

1) The phases in which it is articulated, that is the programming, the preparation of the budget, the recording of the results and the appraisal of the performances reached from the company in its entirety and from the single responsible.

2) "The style of control adopted by the management to encourage the individual organizational units and implement behaviors in line with corporate purposes" (Brusa, 2000).

3) The conditions which determine its effectiveness, or the criteria to be followed in its design and execution.

4) The subjects involved in the different phases in which it is articulated.

5) The benefits introduced in the company since its implementation.

We cannot talk about an effective control process if this is not perfectly connected with the strategic planning process, that is, with the process by which the company mission, the fundamental objectives of the organization are defined, and the strategies necessary for their achievement are identified (Kennet A Merchant-2001).

The monitoring process involves the following key steps:

- Programming.

- Preparation of the budget.

- Measurement of the reporting.

- Evaluation of the results achieved.

Such phases can also influence each other. The control process, even if articulated in different operating phases with its own aims and modalities of implementation, It must be considered in a unitary way as the effectiveness of it, depends on the coherence and the compatibility of the single moments that compose it" (Bocchinou. 1994).

The links between the various stages of the control process are relevant:

- The budget objectives must be defined in line with the action plans identified in the programming and with the available resources, present and future, within the company. Only in this way can the results achieved by the owners of the individual organizational units enable them to fulfil their business objectives.

- The evaluation of the performances of the business managers must be carried out through the activation of the feedback process and it is the result between the reached results and those previewed. For this purpose, the criteria used for the measurement must be the same as those adopted in the definition of the budget targets. Otherwise, the information resulting from those activities would be unreliable and material.

- The information obtained through the recognition and evaluation of the intermediate and final results achieved, as well as building the basis for the planning of future business, may reveal inconsistencies in the behavior of managers or errors in the programming activity carried out.

The planning

Planning is the process by which the action planned to be implemented in the most recent years and the resources required for their implementation are identified.

The definition of the plans allows to transform the strategies assigned to the company as a whole in a series of activities focused within the organization. These coordinated activities allow the implementation of the strategies and the achievement of the

objectives assigned to each unit. Different plans can be focused on a specific functional area, cover multiple areas or refer to the company as a whole. In order to enable the achievement of the corporate mission, the plans must be in line with what is established in the strategic planning and their definition must provide for the involvement not only of business leaders but also of managers responsible for individual areas. It is through this phase, in fact, that the strategic objectives are spread within the organizational structure. Based on these strategic objectives and strategies identified in the strategic planning, action programs are defined, with a more operational content and referring to a shorter period.

Through the process of defining the plan, the top management communicate to lower level managers what are the priorities of the company and at the same time the latter transmit to their superiors important information that only those who are close to the problems operating may possess, in terms of business opportunities, operational threats and future financial needs.

The planning process shall begin with an assessment of the state of implementation of the ongoing plans.

This analysis must reveal any deviations from what was expected, as well as the causes that determined them. On the basis of these evaluations, it is decided whether or not to insist on these kind of plans or to amend or suspend them. Once the concepts considered to be of interest for the implementation of the strategies determined in the strategic planning have been identified, an analysis of their expediency and opportunities will be carried out, assessing their impact in economic terms-financial management and their consistency with the real potential of the company, in terms of human, technological and material resources. The identification of the plans to be implemented also includes consideration of more subjective aspects, such as, for example, the ability of individual managers to make their needs prevail over those presented by others.

It is at this stage, in fact, that managers compete in order to be assigned as much resources as possible. Planning is also an important time for verifying the validity of the strategic decision. In the process of translating strategies into action plans, difficulties may arise in adapting due to possible inconsistencies between strategic objectives and the actual capacity of the organizational structure. This, together with further

information on the characteristics of the company and its strengths and weaknesses, may lead to a revision of the strategic plan (see Merchant K.A 2001).

The preparation of the budget

The preparation of the budget is substantiated in the short-term financial planning. It is the final stage of the planning process and plays a crucial role in the control process. It is with the drafting of sectoral budgets and through their consolidation that:

- The basis for the recognition and assessment of the results achieved shall be defined. (Careful preparation of the budget forms the basis for the proper functioning of the control process. In fact, the benefits introduced by its correct definition are relevant);
- The analysis and approval of the different sector's budget allows management to verify the appropriateness of the objectives contained in them and, indirectly, to carry out a preventive control on the actions of the managers, before they begin. "The control activity takes the form of an assessment of the consistency of the budget objectives with what is foreseen in the strategic planning and programming and then in the verification of the capabilities of the objectives set out in the Strategic Plan" (Brusa 2000).
- The corporate purposes are communicated within the organizational structure and translated into operational terms by assigning the objectives to the heads of the individual centers of responsibility.
- The articulation of budget targets over time periods of several years allows for mid-term reviews and timely corrective actions if the relevant results are not consistent with what is planned.
- The objectives described in the various sectoral budgets shall be defined in such a way as to ensure coordination of the different activities carried out within the organizational structure.
- The involvement of managers in the definition of budget objectives allows to increase their motivation and to acquire valuable information that only those who are close to operational problems can possess.
- The decisions taken during strategic planning and programming are improved.

- An effective budget preparation process is the basis for a valid and reliable evaluation of the results achieved by the company as a whole and by the owners of the individual centers of responsibility.
- The company budget, to be effective, must be drawn up in line with the mission and strategies defined in the strategic planning process, as well as the action plans identified by the planning and must result from the consolidation of the partial budgets containing the objectives relating to the individual centers of responsibility in which the organizational structure is structured.

The company budget, referring to a solar year, must be operational from January 1 of each year. Since many activities must be carried out to reach its definition, the preparation of the budget must begin at least four months before the end of the financial year.(only for who perform the budgeting process for the solar year).

In the first days of September, the Top Management must communicate to the individual centers of corporate responsibility the guidelines that the latter must follow in defining the budgets related to the organizational units directed by them.

- By the end of September, the sales manager must submit a first forecast of the sales volume that can be achieved in the next administrative period. After this communication, meetings must be organized between the heads of the various organizational units and the management of the company in order to verify the compatibility of the expected volumes with the capabilities of the company in terms of present and future resources and the consistency of the first forecast carried out with the aims that the organization intends to achieve. On the basis of the information obtained during that meeting, the need to revise the sales volumes initially envisaged may arise.
- By the end of October, individual center managers must submit to the management a first version of the sectoral budgets for which they are responsible. With this communication, a further phase of negotiation of the objectives begins, which must lead to the drafting of the final budgets. The audit carried out by the management must ensure, inter alia, the coordination of the activities carried out in the various organizational areas. By that date, the preliminary statement for the current year must also be available.

- By the end of November, sectoral budgets and the final company budget must be drawn up and approved. The objectives contained in it may be different from those initially envisaged, as the result of further comparisons between management and individual managers and based on the results for the current year, as explained in the preliminary statement.

- Within the first half of December the management must communicate to the heads of the single organizational units the objectives on the base of which the same ones will be entrusted in the next administrative period

   (Aloi F., Aloi A., 2002; 43-54).

The Measurement and Reporting

Measurement and Reporting are the set of activities through which the results are collected, measured and reported. From the moment that this phase constitutes the base for the review of the performances achieved from the company in its entirety, from the single centers of responsibility and from their managers, it is a process that must be carried out with much attention. Incorrect measurements may affect the significance of the assessments made and the validity of future planning.

The measurement may relate to: Final and Intermediate results.

In general, both measurements are carried out at the company. The assessment of the managment of the individual centers of responsibility, aimed at awarding prizes and punishments, requires the measurement of the results. At the same time, the measurement of interim results makes it possible to ascertain in a timely manner any inconsistencies in management and to implement appropriate corrective actions. To assess the results effectively, the measurement must be carried out only on those aspects which are judged as relevant to the company's success (Zerrili A., 1994).

Particular attention shall also be paid to the method and unit of measurement used for the measurement. To allow the activation of the feedback mechanism and thus the comparison between what has been achieved and planned, the results achieved must be measured using the same criteria as those used when allocating budget targets. Once detected, the results are collected and commented in special control reports and transmitted to the different business stakeholders.

From the different moment in which the information are, that such subjects need, usually in the company, more control reports are drawn up. The nature and detail of the data contained in them depend on the purposes which the various recipients intend to achieve by their use. The importance of the items surveyed does not depend on their value, but on their nature. Some data, even if with relative amount, can be particularly relevant in relation to the completed activity or can report situations that need special attention. The control reports also describe the deviations that occurred in the results achieved compared to what was planned, as well as the first considerations about the causes that determined them. Control reports are often accompanied by information reports that contain information that is out of the box, generated within the organization, or related to the external environment.

The period of measurement and reporting depends on the phenomenon being analyzed and in particular on the variability of the factors considered relevant for the monitoring of its performance. It must be neither too long nor too short. Too long times can prevent management to intervene promptly, if necessary, on the phenomena observed, on the other hand too short times, under the month, can compromise the significance of the measurements made. The need to lead the business management and to promptly remove obstacles to its effective development requires measurements to be carried out periodically, even during the year. In companies where the culture of control has reached a certain degree of maturity within the first ten days of each month, the results of the previous month are collected and communicated to interested parties. (Aloi F., Aloi A., 2002)

The presence of an effective detection and reporting system, even over several years, influences the behavior of managers. These, in fact, aware of the periodic measurement of their performance are stimulated to do the best possible to achieve the objectives assigned to them.

At the same time the periodic survey of the results and the communication of these to the subjects engaged in their attainment elevates the cultural level present in the company, generating, through the understanding of the errors committed, a process of continuous improvement.

Evaluation of the results achieved

The evaluation is the final stage of the monitoring process. It begins with the analysis of the results highlighted and described in the formal control reports. This information, which is mainly of a quantitative nature, is supplemented by personal observations by the immediate superior who, occasional or periodic visits and informal communications received from the auditees, may better understand the causes that led to the relevant results. The assessment shall be carried out by comparing the planned and the achieved results. This analysis, which is the essence of the feedback mechanism, makes it possible to analyze the causes that led to any deviations from what was planned, to assess the efficiency and effectiveness of the activities carried out, as well as the merits and faults of the initiatives undertaken.

The evaluation shall include an analysis of the degree of implementation of the programs defined in the programming, an evaluation of the results achieved by the individual centers of responsibility and of the performance achieved by their managers. Results different from those desired may be due to the inadequacy of the behaviors assumed by the managers and therefore attributable to their responsibility, both to budget objectives defined in an inadequate manner with the established strategic. In the evaluation of the results, not only the analysis of the causes that led to negative deviations is important, but also the reasons that generated positive variances. Consideration of the latter can provide valuable information for the planning of future activity.

In addition to feedback, there are other methods for evaluating results. The results achieved in a given period may be compared with those achieved in previous time intervals.

It should be noted, however, that this type of control, while highlighting the trend in performance over time, is not sufficient to assess the performance achieved by individual business managers. From one period to another, in fact, the change of some internal or external considerations to the company can make the comparison between the results achieved in the two periods of analysis unreliable. At the same time, comparison with past performance may not stimulate performance improvement, particularly when performance is not satisfactory. (Welsch GA., 1998).

The evaluation is relevant not only at the end of the year, but also during the year, assessing short-term results allows corrective actions to be taken if the trend is not consistent with what is expected.

The corrective actions may take the form of the following activities:

- Change of working method followed by managers.
- Modification of the plans or objectives defined in the planning in order to avoid any recurrence of distortions in the future or to improve the results achieved in any event.

The effectiveness of corrective action is directly related to:

- The accuracy and precision with which the intermediate results achieved have been recorded-
- The attention with which they have been analyzed the causes that have determined eventual deviations from previewed.
- The timing with which corrective action is applied.

As it is used to remedy an emergency situation, any delay in its implementation may lead to its uselessness or even to a deterioration in the results achieved.

"In order to allow for the correction of the interim results achieved, special attention should also be paid to monitoring the actual implementation by the stakeholders concerned by the planned corrective action, and the effects of these products in the periods following its application" (Zerilli A., 1994; 134-136).

The evaluation of the results allows to stimulate the business managers to put in action the wished behaviors from the organization. It is the basis of the considerations arising from the assessment that rewards are granted or penalties applied to the managers of centers of responsibility. For the purposes of the explanatory statement, the time elapsed between the end of the period to be monitored and the communication of the evaluations carried out on the results achieved by the

stakeholders. Excessive delays may affect the credibility of the control carried out and may render ineffective any corrective actions envisaged.

The Table summarizes the various stages of the control process:

PLANNING	BUDGETING	REPORTING	ASSESSMENT
DEFINTION OF: -Operative Programs -Resources	Assigning objectives to area managers	Detection and communication of results achieved	ASSESSMENT OF: -Degree of implementation of programmes -Results achieved by the areas -Performance of managers
(Planning: 3 to 5 years)	(Planning: short term)		

(Source: personal elaboration)

CHAPTER 1: "STRATEGIC PLANNING AND THE BUDGET"

As part of the control process, planning takes the function of directing the management of any economic unit towards the objectives to be pursued in the medium-long term with the aim of achieving the relative competitive advantage position in the target markets in which it lives and operates. This function is particularly important for those companies that operate in very dynamic scenarios and in sectors subject to technological innovations in constant evolution. The doctrine holds that "planning is the conscious determination of the course of the actions preordained to the achievement of the objectives". "Planning therefore means deciding" (*Koontz, 1958*).

At the beginning of the decision there is the mission, from which any company draws the social legitimacy of its action, an essential condition for survival and development over time. Economic activity cannot be planned without knowing the current and future dynamics of the reference environment in its cultural, social, political, economic, and technological features. It follows that internal and external changes to the company perimeter cannot be separated from the full awareness of who we are and where we operate or intend to act. It's from here, that the idea is embodied in objectives set in line with the mission, the decisions and the actions to be taken, the effects that will change the situation within the firm and therefore in the reference environment. In other words, changes in the economic and business scenarios cannot lead to changes in the strategic orientations of its economic actors, but the behaviors adopted to pursue the deliberate strategies can contribute, particularly in the context of large companies or groups of companies, to make the markets in which they operate more changeable. The possibility of managing the processes of change within the economic unit, so that its becoming correlates harmoniously with that of the reference environment, depends on the effectiveness of the function of control and, in particular by the instruments adopted for carrying out that activity. Among the instruments that allow to carry out the function of control are those of planning, which allow to perform a monitoring of antecedent type. The planning assumes strategic value from the moment in which it is carried out considering

the close correlation that exists between the company and the external environment which it arises. This conceptual approach justifies attributing the primary objective of determining controlled changes in the baseline to the strategic planning.

The strategy, in fact, is never definitive, but it is an instrument that can be constantly improved. It cannot be foreshadowed and rigidly defined at the original moment of setting and starting. On the contrary, it must be regularly reviewed and updated to adapt progressively to the systematic evolution of the business situation and changes in ideas and objectives.

After the implementation of the last phase of the strategic planning process, strategic control must come into play, as an integrated procedure of this process, with the aim of verifying the validity of the strategic behavior implemented in comparison with what was established in the planning, and with the aim of increase the effectiveness of the strategic decision-making process. In line with this, also the construction of the strategic plan comes to be a continuous work that, in the case of the creation of a new business initiative within a new existing business reality, it exploits, enhances the strategic-forward skills and capabilities previously developed , going to integrate with the planning and programming processes already in progress.

1.1: Focus on the Strategic planning

In order to understand the role of "strategic planning" in the management of corporate change, it is appropriate to clarify the meaning of this expression, going deeper to the description of the relative implementation process.

The concept of strategy is defined as "the general scheme that allows the use of resources to be finalized to the determination of an advantageous position" (Grant*, 1994).* The company strategy is based on three fundamental elements such as: *the* objectives (set by the board of directors), internal resources (human and intangible) and the external environment (the market in business competition) also foreshadowed by strategies and opponents. Even if the strategic approach is a mainly characteristic of the culture of large companies, operating in very competitive market conditions, it is considered as the

advantageous position referred to in the definition proposed by Grant should pervade the behavior of any economic unit, directing it towards the achievement of entrepreneurial excellence. It is this kind of orientation that should induce the different economic realities to identify the business areas in which create value for stakeholders and pursue, in this way, the institutional purpose, ensuring its survival and development over time. The need to keep the organization in dynamic balance with the constantly changing environment makes it appropriate to strategically plan the business management. In theory, planning is strategic when it involves the analysis of company-environment relations in order to identify the actions to be chased in line with your mission. Therefore, it may not necessarily be associated with a long-term perspective: in fact, if the company context are structurally modifiable with short interventions, it would assume a character of the same kind (Liberator, 1972). The strategic orientation of the company management implies the implementation of the planning process that, assumes a *well*-defined *mission, it is substantiated in the following phases:*

·   Definition of strategic objectives or the ultimate objectives that the company

     sets in terms of growth, development and image.

·   Analysis of the starting situation allowing to identify the strengths and weaknesses of the economic unit of reference, as well as the opportunities and threats coming from the environment in which it operates. It also makes it possible to identify the skills to be developed in the areas considered critical to achieving the desired competitive advantage.

1.1.1: Differences between Business Plan and Industrial Plan

The *Business Plan* is a process and a document through which a business idea based on intuition (business idea) is formalized in an organic, systematic and organizational way.

It is, in other words, an investigation, conducted in advance, aimed at clarifying, motivating and fully highlighting all the contents, (strategic, organizational, operational, legal, economic, financial and patrimonial) characteristics, problems and values of a new business project, in order to analyze them, identify any

critical points, enhance the potential of the market and assess all possible impacts from a qualitative point of view, establishing the concrete feasibility of the initiative, its economic opportunity and its financial compatibility.

The Business Plan qualifies as an overall planning tool; the Business Plan is an ad hoc study carried out during the analysis of a new business initiative and can serve both in view of a project that involves the creation and subsequent development of a new company (birth of the company) both to support the realization of a specific investment linked to a project of expansion or diversification within a company already started (growth of the company). It may therefore refer to comprehensive business initiatives (setting up a business, acquiring other businesses or branches, joint venture agreements, etc.) and individual initiatives such as the launch of a new product/service, launch of a new sales network, creation of new businesses etc. Obviously, in the previous cases there are extremely different problems. The fact remains, however, that Business Plan is a key management tool for all companies, whether they are in the start-up phase or are growing rapidly and have reached a more advanced level of development. Sometimes the term Business Plan is used to indicate also the process and the document aimed at setting, describe, periodically update and monitor the development of possible strategies for the development of an entire existing business or specific business areas, for example, in the case of recovery plans or corporate restructuring, expansion of the current activity, listing on the stock exchange etc. However, it is more appropriate to speak in these cases of Budget.

The Business Plan and the Industrial Plan share the logic of strategic planning and business planning at their base. For this reason, the structure, the contents and the drafting processes of these documents have many common features, in some cases even coincident.

STRATEGIC PLAN
Process through which they
are described, realized and
summarized
- Business idea
- Competitive analysis
- Resources
- Investments
- Expected results

BUSINESS PLAN

Related to a new "Business
venture" such as a new opening
or something like that

INDUSTRIAL PLAN

Related to an existing "Business"
such as recovery or expansion
plans

(Source: personal elaboration)

Nevertheless, the diversity of their subject matter (prospects for the development
of a new business initiative in the case of Business Planning and a whole company
already established or a specific business area in that of the Industrial Planning),
and it leads to some differences. If, for example, a large amount of space is
devoted to the Industrial Planning process to describe the company, the
operational strategic approach and the eventual need or convenience of its
renewal resulting from the threats/opportunities of the competitive environment
and/or comparison with the strengths and weaknesses of competitors
(benchmarking). On the other hand, in the context of Business Planning, this
exhibition covers a smaller, if not absent, area, as in the case of new business
creation projects for which there is no historical basis to refer. On the other hand,

the business plan, compared to the industrial plan, gives greater weight to the description of the economic and financial situation of the individuals involved in the project and to the enhancement of their managerial and relational skills. But in the case of the industrial plan, there is a general tendency to give greater importance to the internal purposes of it (defining, updating, reviewing and monitoring business development strategies), for the Business Plan, the emphasis is on table, Unfortunately, only in view of the external functions of this document, by virtue of its being instrumental in obtaining financial resources to support the new entrepreneurial initiative. Finally, the inevitable differences will arise when the economic, financial and capital forecasts are drawn up. Whereas, in the case of the Industrial Plan, historical data (standard costs etc) and some experience and knowledge of the market can be used, in the Business Plan they must be based exclusively on conjectural data and information collected from outside and using more or less defined criteria and methods.

1.1.2: The Need to draft a Strategic Plan

The development of a BP that assists the stage of birth and subsequent growth of a new business idea has become an activity from which no entrepreneur (large or small, actual or aspiring) can disregard: regardless of the amount of resources he intends to invest, employing it "blindly" is a risk not to be taken.

The structured and formalized planning of the own business, therefore, does not constitute a luxury, or an useless waste of time, but a requirement. It is functional also in the case of small and very small entrepreneurial activities. The reflections carried out so far highlight, in fact, that the Strategic Plan contrary to what is often thought, is a management tool whose importance and need is also evident for smaller initiatives. Based on this awareness, there has been a growing interest in this document in recent years and the technical literature has been enriched with new texts on the subject. The Business Plan and the Industrial Plan are terms

used to date, in the most disparate occasions managing tools increasingly popular and known.

In fact, such dissemination is mainly a consequence of the fact that the drafting and presentation of the Strategic Plan is becoming one of the essential requirements for being financed by financial intermediaries and/or through European programs, national, regional and provincial facilitated finance. In fact, the subordination of the granting of aid and/or facilities to a positive assessment of the validity of the project to be supported based on the Strategic Plan is one of the main innovations concerning the forms of public intervention in support of enterprises. Up to now, almost all the initiatives in support of both public and private companies, provide a prior judgment on the basis of the Strategic Plan and the criteria for its evaluation are from time to time made narrower. This is a consequence of the above-mentioned and increasingly importance of this business planning tool: it is no longer a formality to be fulfilled in order to obtain aid, a mere technicality, but rather an irreplaceable means of training an entrepreneurial spirit, or the right way to confront a new initiative, thus increasing the possibility of survival.

The feeling, therefore, is that it is increasing awareness of the potential of the Strategic Plan. However, there is still no widespread knowledge of this tool and not many people are able to prepare a "good" Strategic Plan.

1.1.3: The functions of the strategic plan

At this point, two macro-purposes emerge, which can be assigned to the Strategic Plan:

· *Internal purposes:* define and disseminate objectives and challenges for the future within the company.

· *External purposes:* communicate the same objectives to the outside world (financial community, customers and business partners, stakeholders in general).

In the first case, emphasis is placed on the Strategic Plan as a tool for analysis, planning, control, understanding and learning; in the second as an information

and communication tool. Actually, since the Strategic Plan was mainly issued in response to explicit requests from the Public Administration, Investors and Credit institutions for the granting of financial resources to invest in the new initiative, greater importance has always been given to the second order of objectives of the Strategic Plan. In effect, the Strategic Plan is a tool that serves primarily to those who compile it to fully understand and strengthen their business plan. On the other hand, an idea in which risk their financial resources and energy, in addition to those of their investors or financiers, must convince those who offer it even before those who have to submit it to trial. The two macro-objectives just outlined are divided into multiple sub-objectives, corresponding to the different advantages deriving from the work of drafting and the use of a correct business plan.

INTERNAL

INTERNAL PURPOSES

- Systematize the insights
- Arrive at a better analysis and evaluation of the business idea
- Plot the route to be taken
- Reducing uncertainty and limiting entrepreneurial risk
- Allow an objective assessment of the coherence and feasibility of Iniz
- Providing a Benchmark
- Stimulating internal learning and deepening processes
- To encourage the involvement, greater motivation and better participation of all the dreams that will contribute to the initiative

EXTERNAL PURPOSES

- Facilitate the presentation outside the project and give rise to a first verification of interest
- Support requests for financing, the granting of special support and/or facilities or the obtaining of environmental and quality certifications
- Get the membership of any partners and promote new business relationships

EXTERNAL

(Source: personal elaboration)

1.1.4: The contents of the Strategic Plan (troppo sintetico almeno dovresti commentare l'immagine inserita)

It is good to specify that in this regard it is not possible to propose a standard model. This is because the Plan can take on different contents and a specific connotation.

The Strategic Plan consists of two complementary parts:

· Descriptive, where all the fundamental aspects that distinguish the entrepreneurial project are considered and illustrated.

· Analytical-numerical, in which, through economic-financial projections, aims to identify the expected results of the initiative, as well as the impact that it may have on the company structure, if the project concerns an existing company.

The Strategic Plan must aim to ensure a reasonable trade-off between relevant information and adequate quantitative support. In many cases, however, there is a tendency to give greater importance to the quantitative part of the Strategic Plan, making the mistake of composing a purely accounting Plan, that is based almost exclusively on the economic-financial part, where the only interest is for the profit neglecting the knowledge of the market and the know-how entrepreneurial.

The general structure presented in the Table is only a basis from which everyone must then carve out the best "personal" solution, correcting it , simplifying and/ or integrating it according to the characteristics and peculiarities of the specific case.

(Source:https://onstrategyhq.com)

1.2: Main features of the budget

The current socio-economic scenario is characterized by a high degree of dynamism and complexity: technology, consumer preferences, reference standards, competition on supply channels and outbound markets, are just some of the factors that need to be constantly kept under control as they are constantly evolving. This variability of the context conditions is accompanied by an increasingly difficult management of the resources available for each firm, which are not only progressively scarcer, but they are also characterized by an increasing complexity associated with their proper and efficient management. In response to these needs, business analysts have over time developed a set of tools and procedures to plan the actions to be taken, to make the best use of available business resources, to detect the results achieved and compare them with those estimated to see if there were any deviations.

In this context, a particularly important role is played by an administrative-accounting document known as the budget.

The budget, in particular, takes the form of an accounting-administrative document that, with reference to a short-term vision, usually a year, has as a cognitive purpose the translation in quantitative terms, monetary data contained in the medium to long-term business plan. In the quantification of the objectives the budgeting procedure foresees the use of standard costs, that is precalculated costs referring to productive situations and conditions and definable "typical"; Consequently, emerges that data from the system of physical yields relating to the foreseeable development of production conditions must be available. Those data will be used with the aim of determining costs, to trace the link with the formal planning system, that is with the information system adopted by the company in the definition of the objectives and in the setting of the managerial policies. They are considered optimal by the company management in relation to fundamental factors, such as the combination of products/markets/technologies, competitive positioning on the market, etc.

The budget stimulates the focus of business decision makers towards a future time prospect, even if it is short-term, requires at the same time a strong link with general accounting (relative to the company's objectives of a final nature) both with analytical accounting (relative to the particular business objectives, relating to individual business areas).

At this point it is time to highlight the main features and the process of preparing the budget. In particular, the main qualities of the instrument and its main functions.

The functions of the budget:

Considered within the framework of the technical-accounting instruments of management control, the budget occupies a well-defined position, assuming a plurality of functions complementary to those carried out by other information tools. In this sense, the variety of functions that the budget can satisfy is undoubtedly a considerable advantage associated with its use in the company. The budget instrument performs a plurality of functions within an organization.

(Source: personal elaboration)

1.2.1: Coordination of company groups

The budgeting system allows the ex-ante coordination of the various corporate groups. The formulation of the budget emerges from a long process of negotiation and refinement of the proposals contained in it. A participation from all the involved subjects, consequently, turns out necessary not only during its redaction but, above all, to its successive performance. It is characterized by the necessity to coordinate in advance the various corporate organs regarding the moment in which they will begin to act. Moreover, another essential element is the aim to find possible problematic or errors of planning that the company, as a whole, and the various area managers, individually, may have to face in the near future.

1.2.2: Development and balancing of economic & financial parameters

The budget provides the economic and financial parameters essential for comparison with the results achieved and for the conduction of the subsequent analysis of variances. The comparison between the objectives pursued and the results achieved, with the consequent evidence of relative deviations and the implementation of corrective actions, constitutes the essence of the feedback mechanism at the basis of the management control. The budget, in this sense, is characterized as a real formalized statement of what are the economic and financial objectives to be achieved in the following year, allows to carry out the above-mentioned verification process. This comparison, and the associated identification of variances, in fact, not only makes it possible to exercise a much-needed control over the use of resources and the actions implemented, but also the identification of those areas that can be defined as more critical in relation to the gap between the objectives pursued and the results achieved. The areas thus highlighted, in the absence, could be characterized by dysfunctions and inefficient processes of use of company resources for which their identification is an essential prerequisite for a timely rationalization of the company. The quantification of the objectives and the explication of the levers and the means with which to reach them is fundamental, moreover, for the purpose of the communication of the business plans to the managers of the various centers of

responsibility. Through the budget, in the end, all the quantitative information relating to the limits and constraints, to the organizational action of the various centers of responsibility are clearly highlighted.

1.2.3: Vision and guidance for managers

The budget is a guide and orientation of the actions of top management and managers at various levels of the company structure. Through the budget, in fact, once verified its compatibility with the objectives contained and enunciated by the strategic plan, every manager receives a determined goal to reach, with the specification of the available resources. In this way, the actions of the individuals are directed to the accomplishment of the mentioned aims, applying, therefore, the function of guide and orientation of the budgeting process itself. As noted above, however, the allocation of objectives and the specification of available resources should only take place when the consistency of the budget with the strategic plan and its objectives has been verified, and after having checked the feasibility of the plan in the light of the short-term constraints that may exist.

1.2.4: Coordination of the manager's actions

One of the main objectives of the budget is to coordinate the diverse range of company resources of company resources in the pursuit of particular goals, which must be complementary and compatible at the global level of the economic organism. In this way, a satisfactory balance is achieved between the different parts of the company, so that the planned specific and overall results can be achieved together.

1.2.5: Manager's motivation

The budget tool must motivate managers, in the direction of an overall better performance and aimed at achieving shared objectives at the company level excluding, where possible, internal competition between them. The process of formulating the budget should therefore be characterized by its participatory nature, that is, by the sharing of common objectives between all stakeholders. In

this context, the participation of those responsible in the process of formulating the budget should contribute not only to making explicit the objectives assigned to each responsible person, also loves to encourage their active involvement through a collaborative and non-taxable process.

1.2.6: Relations between business areas:

The budget is particularly useful not only in order to inform managers about the problems of the individual activities carried out within the respective center of responsibility, and about the interdependencies of their unit like the other centers, but it is also characterized as a suitable tool to spread within the company a more general and extensive knowledge of the peculiarity, relationships and ties that distinguish and connect the individual centers of responsibility or other functional areas of the company.

The composition of the company budget

In its final form, at the company level, the budget takes the form of a budget, or translates the management programs related to the subsequent administrative period in prospectuses formalized in economic, financial and capital terms. At the end, you can recall how the company budget is constituted through the joint consideration of multiple prospects:

a.   economic budget (estimated income statement).

b.   financial budget (statement of anticipated cash flows).

c.   balance sheet (balance sheet estimate).

1.2.7: Budgeting process

The process of formulating the budget usually requires some preconditions for its completion, beyond its essential moment, the aggregation and consolidation of individual budgets in the global document of the company.

The characteristics of this process are as follows:

1. It is necessary to start from the general objectives of the plan, in which the budget represents the translations in economic-financial and operational terms of the first year. The starting point for the budget formulation process in this respect is the objectives, strategies and plans formalized in the strategic plan. The budget is only the first year of the plan.

2. The budget must be prepared by the beginning of the year to which it relates. Since business planning processes can vary considerably, both in their duration and in their timing, the steps of the process of drafting the budget must be carefully planned.

3. The budget formation process should actively involve many corporate bodies. Participation allows not only a common formulation of the company budget, but above all, the accent placed by the individual managers on the peculiarities deemed relevant for this process, through the individual contribution of all and with the identification of the business levers on which you can refer and affect. Consequently, while it is preferable that the programs proposed by the managers of the centers of responsibility should be independent of each other, they should also be consistent with the general objectives.

4. The process of budget formulation takes place through the conclusion of different phases that are logically assumed and, in any case, interface in an iterative way. In this sense, the budget can be subject to numerous revisions and modifications before its final version.

The graphical representation in the following chart intends to show the main phases of the formation.

(Source: personal elaboration)

The examination of the table shows at least two aspects:
- the scheme highlights the economic and financial component of the budget formulation process.
- the functional areas or centers of responsibility at the base of the company's organization are clearly underlined, that is, the commercial area, the technical-productive area, the other areas.

In fact, if the operational aspect of the budget is essential for identifying, in quantitative-monetary terms, the objectives to be achieved and the related means and operations to be used and carried out to achieve, the consequent

attribution of responsibility turns out in its turn indispensable for the correct orientation and motivation of the business managers. In this way it will be possible to direct all the efforts of the individuals towards mutual cooperation and also the pursuit of the ends assigned to them, possibly also through the control of the actions put in place. In referring to the process of drafting the budget thus identified, it could also group the individual particular budgets into three basic subsystems, as indicated below:

1. *Operative b*udget, corresponding to the areas whose organization is typically part of the management characteristic of the company, namely: commercial, productive, administrative, research and development. These budgets, which have as a prerequisite the economic-income feasibility, find aggregation in a possible budget of the operating costs characteristic or, like other cost items, in the budget of the income statement.

2. *Investment b*udget, which must be linked to a technical, or structural feasibility study.

3. *Financial b*udget, consisting of at least two particular budgets: treasury budget (or cash) and the statement of sources and uses. They could be supplemented by a statement of changes in the composition of net working capital. As a whole, this budget is followed by a verification of its financial feasibility (resulting from the contrast of sources and uses) and monetary (related to the contrast between income and expenditure). More generally, if the different types of feasibility (economic-income, technical, financial-monetary) of the company budget are not verified, the budgeting process will have to be reviewed and redefined.

1.2.7.1: Different kind of budget

The economic budget

It has the accounting form of a profit and loss account. It is essentially a document drawn up for internal purposes (therefore not for disclosure to third parties), of an operational nature, the writing of which will hardly resemble that of the profit and loss account destined, at a later stage, for external publication. Its main function is to highlight the net income of the year to sell, but it also takes into account numerous other results, which are essential for the analysis of management efficiency, such as gross contribution margin, operating income, profit and loss before tax. There are also two other kind of budget such as:

The financial budget

It contains values relating to financial flows. These may be broken down into global financial resources flows and cash or cash flows. In the first case, the expression "budget of sources and uses" is also commonly used, aimed at highlighting the need for global financial coverage, while in the second case the name of "cash or cash budget" is usedThe aim is to highlight the need for short-term cash.

The patrimonial budget

It shall take the form of an estimate of assets, as at 31 December of the following financial year, or that of the budget. As with the previous economic budget, it does not coincide perfectly with the document drawn up for civil or tax purposes because it is structured according to financial criteria or drafted by reclassifying the original document in order to distinguish between uses of capital and sources of financing.

1.2.7.2: Zero-based budget

The Zero Based Budget allows you to eliminate one of the main disadvantages of the traditional budget preparation system. It happens quite frequently, in fact, that in the traditional budgeting system you choose to follow an incremental approach. The Zero Based Budget allows to overcome this vision, which can be clearly inefficient, through the design phases previously mentioned and related to all the various decision packages proposed to the management. In the following table we intend to compare briefly, the two budgeting approaches mentioned, that is the traditional one, based on an incremental logic, and the one defined as *zero-based budgeting.*

In summary, the Zero Based Budget approach addresses and substantially supports planning processes, decision-making, strategy development and implementation, and resource allocation in the company. In all these moments the Zero Based Budget forces the subjects involved to explain and to confront with the aims and the goals established to business level or of single unit. If properly implemented within a company, the ZBB can therefore be of assistance to the various managers in order to:

1. developing and/or modifying the *mission and* aims of the entire organization.
2. facilitate the implementation of business strategies, based on compliance with the *mission* stated and the achievement of the objectives identified.
3. identify efficiently the most desirable programs to be implemented at a later stage.
4. allocate the appropriate level of resources in relation to each individual program.
5. monitor and evaluate each program during and at the end of its implementation;
6. enable comprehensive reporting on the levels of effectiveness and efficiency achieved by each program.

Ultimately, the Zero Based Budget, if consistently implemented, is a great tool within an organization in order to plan and then take the correct decisions related to the different ways in which the available resources could be allocated and in order to achieve the mission and business objectives. A final remark deserves to be made in relation to the Zero Based Budget. This procedure is usually carried out in the company only for new projects or for particular cost/expense items, which could be those relating to research and development function. In this sense, some company functions deserve special attention because of the organizational and operational characteristics that they present: among the various that could be remembered, are undoubtedly those of Research and Development and training. These functions usually differ from the high areas mentioned above, mainly because in the budgeting process they articulate the forecasts by project. In these sectors, the project constitutes the basic unit of aggregation of costs. The same projects, moreover, will frequently be of a multi annual nature and Consequently, for the purpose of drawing up the annual budget it will be necessary to constantly consider their progress and calculate

their respective shares of the administrative period to budget. In addition, this kind of approach can be used to identify the cost items of these projects. In the table we want to compare the two approaches of budgeting, the incremental one, and the one defined as zero-based budgeting.

	TYPICAL BUDGET	ZERO BASED BUDGET
EXPENDITURE PERIOD	The attention is given to the estimations of the previous period	The estimations of the previous period are useless
BUDGET INFLATION	The managers can manipulate their evaluations	The managers must explain their surveys so they can't manipulate their evaluations
RESPONSABILITY	Top managment takes resposability for resource allocation	Managers in each area are responsible for allocating the required resources
POSITIONING	Accounting	Decisions
APPROACH	Routine	Based on the company needs

(Source: personal elaboration)

CHAPTER 2: "SALES FORECAST & DEMAND PLANNING

2.1: Purposes of forecasting

For a company, regardless of the sector in which it operates, forecasts on the trend of its sales and global demand have a substantial operational importance:

- Short period, to organize resources and business functions such as purchases, production, personnel, etc.
- Long period, to decide on the possible investment programs.

Having the opportunity in some way to predict what will happen in the coming years seems now natural and also necessary, because otherwise it is not possible to make rational decisions.

Prediction takes on its fullest meaning if it helps to identify choices within our reach and accidents that may intervene, so that we can assume the most rational behavior.

"Knowledge of all the laws that govern phenomena would allow us to predict exactly any event". (P.S. Laplace)

In other words, the problem of predicting would not exist if the explanatory model, complete with all interactions and feedback, of the phenomenon under analysis were known.

In statistics, prediction has as its objective that of orientation and strategic decision and is therefore a hypothetical construction which tends to reproduce, in an approximate way, a pattern of behavior of one or more phenomena, within a time interval that includes a future period.

It should be borne in mind, however, that in a model developed for the study of any economic phenomenon, it is not possible to include all the variables and relationships necessary to create a 360-degree interpretation of the data. Moreover, random events and the inadequacy of the basic forecast data can completely deflect the validity of the results obtained, although the model applied with reference to the future is methodologically refined.

In some situations, it is reasonable to assume that the information available for the past, properly processed, is likely to reduce uncertainty about future events.

It is necessary to draw from the experience of the past the strong signals (the components that exert decisive influence far beyond the present) and to grasp the so-called weak ones, precursors of change and possible innovation. Prediction, in any case, presupposes a reading of the past, with the awareness that history teaches, but without repeating itself.

It is also important to be aware that, although conditioned by the evolution of the past and current trends, the events that have not yet happened contain a decisive portion of novelty and unpredictability, which at least in part can be assessed ex ante.

Talking about predictions in the economy, Alfred Marshall says: "explanation and prediction are the same operation in two opposite directions and that only interpretations of past events that are based on in-depth analysis can serve as good guides for the future".

It should not be forgotten that, "although observation and history may tell us that a given event occurred before or at the same time as another, or after it, they cannot tell us whether the first was the cause of the second."

In the economic field, therefore, even if the facts of the past are known, we must overcome the illusion of being able to reach certain predictions; even less is it worth resorting to particularly sophisticated forecasting methods if mediocre data are available.

2.1.1: Using Forecasts

The forecast of the sales of the products, is an important objective since it allows to have all the information of base in order to make that the resources are organized in efficient way the available business functions: from the purchases to the production, staff, marketing and financial management. It is therefore an operation that plays a central role for the company, provided that it is carried out within the economic and environmental scenario in which the company itself operates; a condition requiring estimates of the corresponding market demand and knowledge of the general economic situation.

Predicting means: seeing ahead, knowing in advance, "foreshadowing". In current companies, the structuring of an effective forecasting process for product sales is of fundamental importance for the organization of the company itself.

Forecasting is the key to efficient management and is an essential element in the management of an enterprise to ensure the adequacy of production and marketing policies.

As has already been pointed out, any decision concerns what is to come and it is essential that it is based on as precise an estimate of the future as possible. The forecast of sales is therefore defined in the estimation of the future evolution of a quantity starting from the current state and its previous evolution.

The formulation of accurate sales forecasting plans and market evolution is the basis for mediating the objectives of all the functions of the company, since all the budgets that will be carried out during the year, depend on or are bound by the volume of sales.

Forecast and budget, while closely related, are very different.

The forecast is a passive element resulting from the trends that represent the market at a given time.

The budget is a dynamic program that tries to represent the objectives of the company towards which the same hopes to get active for their achievement.

Forecasting methods are a valuable aid in identifying the relationships between marketing policies to be implemented and sales increases, these methods allowing the decision-making group of the company to modify only the variables that may be useful to expand its market.

They therefore have a key role in the strategic process because they can:

1. Define the limits for any corrections, avoiding that they corrode the validity of the guidelines previously set.
2. Always have control over strategic actions.
3. Be modified as you specify the obstacles along the way.
4. Ensure that strategic actions are chosen in such a way that they remain valid over as long a period of time as possible.

The more precise determination of future sales makes it possible to limit unnecessary investments in production, producing only to meet the expected number, without overprudction or underproduction.

Thanks to controlling models developed in Japan it has been understood that the production just in time, therefore with times of production and sale reduced to a day with the consequent advantage of a management that, without having to bear costs of stockaggio, allows to serve the customer with absolute rapidity and precision.

Just-in-time allows therefore to reach the absolute efficiency in a company based on the constant improvement of productivity and the continuous elimination of waste, that is, of everything that does not add value to the product.

This is enough to get an idea of the importance of anticipating sales in the near future.

Internal Forecasts

Sales forecasting plans can be drawn up by multiple components of the company system: by executives, sellers, staff or internal analysts.

In large companies, sales targets are assessed through a process that leads to consensus between the different components of management. In this case, the evaluations are guided mainly by the knowledge of the product and the situation of the industrial system.

The contribution that is given by the managers and the sales force, therefore, is of subjective type, from the moment in which it is based on the intuition, the perspicacity, the opinion or the prejudice of the single subjects.

In the everyday life of efficient enterprises, subjective methods are used in combination with the most sophisticated objective methods in order to highlight the deviations that are created with the statistical approach.

If it is clear that objective analysis is more valid than informal analysis for the formulation of a forward-looking plan, making the method repeatable over time, it must be said, however, that in this way the analysis is restricted to the only variables that can be used in the model, without considering a number of factors that may change the economic environment over time.

In reality, indications are very often used that have more than the planned, desired, expected than predictable in accordance with quantitative assessments about production conditions, sales force, investment in advertising, competition and market demand.

This means that the human element, with its own judgment, has the opportunity to identify and anticipate new variables and also changes in the market.

These assessments must be summarised, otherwise they may escape due to the difficulty of including them in the statistical model being used.

In addition, the use of qualitative analysis, allows you to add the indispensable element of "novelty" that a purely statistical setting can not easily integrate.

In order to understand the role of subjective forecasting in the formulation of a forecasting plan, it is useful to analyse, for example, the contribution offered by the sales force.

The starting point for forecasting a product already on the market or being introduced is characterised by analytical data on past sales, the behaviour of like products and the performance of competing products.

These data, initially, must be cleaned and arranged according to known elements and highlighted by experience before they can be used in plans and prediction models of objective type. The sales force is the most useful and suitable business component to provide the aid requested, if properly solicited, it is able to provide data on market trends, also managing to estimate future sales in individual territories.

Thanks to this survey it is possible to identify efficient forecasting models, highlighting the market mechanisms underlying the trend in sales (strength and weakness of the product line, effectiveness of distribution, market penetration, etc.).

Hence we understand the result of a mix of subjective and objective methods, emphasizing the importance of the procedures used to formulate a forecasting process.

The knowledge of elements outside the domain of the statistical model used to make the predictions therefore allows to intervene on the model itself, through the attribution of subjective weights to some values of the historical series and the introduction of variants in the parameters.

To conclude, the model must be the result of the iteration between the two methods, the experts who carry out the forecasting project are also an active part of it, as components for it are at least as essential as the statistical apparatus.

External Forecasts

The complexity of the processes that characterize a market can hinder the achievement of the objectives. For a good business strategy, it is necessary to avoid the use of rigid settings that risk blocking the development, it is necessary to be as flexible as possible in order to allow the adaptation to a constantly changing economic environment.

The short-term forecast must allow a dynamic and continuous management of the whole company providing guidance on the immediate future to all business managers.

Various categories of persons may be affected:

- Production: they have the possibility to optimize the production processes.
- Administrative: they have an optimal management of short and medium-long budgets

  term.
- Commercial: they can quickly and accurately know the trend of sales.

In general, the use of medium-term forecasts can be included in four areas:

- Planning of production.
- Market analysis and proper sales planning.
- Audit and analysis of the financial plan.
- Analysis and filtering of a lot of information in information systems that can be used for the management of the company.

2.2: Different methods for demand forecasting

Demand forecasting techniques fall into two main categories: **qualitative** and **quantitative methods.**

2.2.1: Qualitative methods

They are mainly subjective methods that are based on the experience and intuitions of the subjects specialized in the analysis of the course of the market.

They can also be used without historical data and allow factors of the external environment to be taken into account in the analysis, such as consumer behavior, economic and financial factors, such as a recession or a recovery of the economy. Qualitative methods could be:

1. *Market surveys:*

   They are directly submitted to final consumers and are used to obtain information on existing and non-existing products (such as preferences on characteristics or brands). If they are well structured and targeted to the right target of the population, they can be very effective. In general, companies specializing in market surveys are asked to draw up surveys, as the time and cost involved are not negligible.

2. *Indication from the sales force:*

   The forecasts in this case are based on the intuition of sales agents, who, operating locally directly on the territory, know closely the needs and desires of customers and consumers.

3. *Similarities between products:*

   Use often when launching new products. Since information on the product in question cannot be obtained, similar goods are sought (by type of customer, use, life cycle) and the historical data of the latter are evaluated in order to develop a forecast.

4. *Panel of experts:*

   Managers from different functional areas of the company (finance, marketing, sales, production) meet and develop forecasts. The necessary meetings can be more or less numerous depending on the business case.
   One of the advantages of this method is the involvement of different business functions; a disadvantage is the fact that, unlike as will be seen in the Delphi method, here opinions are not expressed in anonymity and therefore there may be fear of the judgment of others;

5. *Delphi method:*

Iterative technique consisting in submitting an anonymous questionnaire to a selected group of experts for several rounds. After a first round of answers, the facilitator summarizes the results obtained (always anonymously) and submits a new set of questions to specialists. In this way they, in the light of what I have just said, have the opportunity to review the answers given earlier and change viewpoint. After several rounds it is expected that the answers will go to converge towards a single opinion. The method ends when a specific criterion established initially is reached, such as almost unanimity between participants or the number of rounds carried out. The strengths of this method are that participants remain anonymous, and are therefore free to express their opinions. In addition, the creation of new ideas is stimulated by the fact that the opinions of others are also taken into account and, given the rigorous structure of the flow of information, in the end, if you acted correctly, you get a precise answer to the problem posed initially. The disadvantages of the method relate mainly to timing, as the time required to carry out the different rounds is high, the need for the presence of a facilitator and a sample of experts quite numerous.

2.2.2: Quantitative methods

They are objective techniques, based on numerical data.

Since the factors taken into account, they fall into two main categories:

Quantitative models based on time series

These methods are also called "Unidimensional" or "Reactive" methods. They assume that future demand faithfully reflects the patterns of past demand and that therefore future values can be easily deduced from past ones.

Consequently, other variables are not taken into account and then are very effective only when demand changes depend on time, and they are very inaccurate when differences depend on other variables (price, promotional activities, competition) (Zotteri & Brandimarte, 2007)

The methods that we will discuss, are: The Naive Method, Simple Moving average of k, Weighted moving average, Exponential Smoothing, Double Exponential Smoothing, Triple Exponential Smoothing, Box-Jenkins method**.**

Explanatory models

These methods are also referred to as: "Multidimensional" or "Proactive" methods and the starting hypothesis is that future demand is closely linked to changes in other external variables.

For example, an increase in sales may be linked to the decrease in prices or the increase in promotions, factors unrelated to the components of demand that are considered here. For example, if the model observes that, when the price decreases, demand rises, it will predict that if in the future the company will lower prices, surely the demand will increase accordingly.

The most common explanatory methods are: The linear regression and the multiple linear regression.

2.2.2.1: Quantitative methods based on time series

A time series is a collection of observations collected sequentially over time. As mentioned above, the goal is to find the components of the series, to elaborate a mathematical law that allows you to extrapolate the future.

Time series are classified according to the nature of the object of study:

- Economic: such as the securities market; if instead we are in the business field we analyze sales, balances, exports...etc.

- Demographic: this is how the various processes which characterize the vital aspect of a human being: birth, death, etc.

- Generated by a process control: that is, the variations that have occurred based on the services offered by a production process are considered. If observations are far removed from the target level, there is the need to bring the process under control.

- Generated by binary processes: if the series can be considered as a binary process or can take only two values, 0 and 1.

- Generated by points process: when you have sequences of events at random intervals.

Main goals of the time series forecasting method:

We distinguish 5 phases of the analysis process of a time series:

1. The description of the trend of the phenomenon, this is an important and preliminary phase to identify model of the series.

2. The filtering (also called estimation of parameters), of the non-observable components of the series itself.

3. The control (or verification of a model) that keeps under control a production process. The nature of the phenomenon represented by the sequence of observations available shall be identified.

4. The forecast of future values.

5. Optimal control of the system.

Main components of a time series:

Within the classical approach to the analysis of historical series, it is assumed that the fact studied, results from the aggregation of four components:

- *Trend:* It represents the trend reported in the long-term of the series; it changes over time but does not present predictable cycles a priori. For the analysis of the trend, it must be emphasized that there are not always valid techniques to highlight it, however, if it is monotonous increasing or decreasing the analysis is facilitated; it is usually represented with a simple mathematical function. Very often a visual observation of the series allows to diagnose the presence of a trend, but in case you are not sure to rely on simple impressions, it can be useful to analyze the autocorrelation functions. In order to "reduce" the presence of "disturbance" factors that can "hide" the trend component, there are various methodologies, among all the most used is "the following differences". This approach is very valid if we use an ARIMA model.

- *Cyclical*: It represents the oscillations around the trend due to the economic activity that expanse and contract the demand.
  The study of economic phenomena shows the alternation of periods of prosperity and depression which, taken as a whole, constitute what is known as the economic cycle. Generally, the cycle is less sharp than the other components as it often merges with the trend. Therefore, it is often ignored as an autonomous element and is incorporated into the trend, thus obtaining a mixed component that goes under the name of "cycle – trend".
  The analysis of trends is very important since the trend is the "life" of the product itself, inserted in a certain market context, and in relation to the marketing actions of the company and competitors.

- *Seasonality:* The seasonal component is constituted by movements of the phenomenon, over the year, which tend to repeat in an analogous way a certain level of demand in the same period of time in next years.

To give a more precise definition, it can be said that it is aware of the fluctuation of the phenomenon, during the year, due to social and climatic factors and it reproduces permanently from one year to another.

These events are difficult to control and, even more, it is difficult to modify any negative effects, because they are generally causes external to the economic system.

They are, therefore, conditionate by several factors that cannot be perfectly predictable.

Each group of causes can influence more or less, the various production sectors; The real challenge is to quantify the value of this influence.

There are various ways of dealing with the seasonal component, but all primarily aim to eliminate the effects of seasonality to find the "laws" that really govern an economic set. Seasonality, in fact, is a disturbing element because it can cloud the actual cyclical movement of the series.

- *Error (Random):* It is the irregular component that collects all the variations due to the most particular recurrent causes, that do not appear in the previous components. All time series that are not deterministic, have irregularities with positive or negative sign, produced by a behavior of random type, but generally cancel each other.

  For this, the error is a random variable with zero mean, constant variance, and zero autocorrelation.

In conclusion, it can therefore be said that:

$$Forecast = Seasonality + Trend + Cycle + Random$$

where t = time since, as mentioned, in methods based on time series time plays a fundamental role and is the independent variable whose demand is function.

In the image above, there are some examples of the particularities mentioned before.

Common time series patterns

Representation of demand components as a function of time (source: www.medium.com

How to use time series:

The essential steps to make a forecast using time series are:

1. Choose the appropriate model to represent the demand in analysis;

2. Collect data, which must be fairly numerous, well distributed over the time considered and not randomly extracted from a larger sample;

3. Estimate the model parameters listed above;

4. Predict future demand with the model and parameters established;

5. Evaluate the result obtained and assess whether any modifications;

In the following paragraphs some of the most common methods for the time series will be analyzed: the *Naive method*, *the simple moving averages of order k, the weighted moving averages*, the *simple exponential smoothing, the double exponential* smoothing, *the triple exponential smoothing and the Box-Jenkins method.*

The Naive Method

It is a simplistic model in which it is assumed that future demand is the same as the previous year (or time period considered). Evidently, the effectiveness of this method is reduced and is mainly used as a benchmark against the results obtained with other mathematical models.

The law of this method is as follows, where t indicates *the* time:

$$Y_t = Y_{t-1}$$

Simple Moving average of k

It is a method widely used for stationary questions. It takes into account a limited number of observations prior to the time of analysis and is defined as "moving" because, despite the total number of observations being fixed, the periods considered vary: as soon as a scenario for a more recent period is analyzed, the oldest scenario is discarded. Therefore, in order to make the forecast, it is necessary to determine the number of k periods to take into account.

For this purpose, is chosen the value that minimizes the standard deviation and so the error with the following formula.

$$\sigma_k = \sqrt{\frac{\sum_j^t (P_j - X_j)^2}{t - (k+1)}}$$

Where

- P_j represents the demand forecast at the instant of time j and is calculated as an average of the preceding k data;
- X_j represents the actual demand at time j;
- t the total number of periods
- k as stated, the number of periods to consider.

After calculating the error for the different groups of periods *k and* having found the suitable value of *k that* allows to minimize it, the demand forecast F is calculated *using* the *ideal* k.

$$F_{t+1} = \frac{\sum_i^k X_{t-k+i}}{k}$$

For completeness, the confidence interval is also calculated, in other words the two limits, lower and higher, within which you have the probability (established a priori) that the real value of the forecast falls.

$$F_{t+1} \pm Z\alpha_{/2} * \frac{\sigma_k}{\sqrt{n}}$$

Where

- t represents the value of the *Student* t (obtained from the crossing of the level established confidence and degrees of freedom, from the relevant tables),
- α the level of significance associated with the confidence band,
- σ_k the standard deviation, as appropriate,
- $t - (k + 1)$ the degrees of freedom.

Practical application:

Given the demand for an asset X in Europe expressed in hundreds from January 2020 to August 2021, we want to go and predict what will be the demand for September.
The starting data are as follows:

Year	2020												2021							
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Demand X	20	35	33	44	42	23	29	48	40	43	38	39	31	27	42	44	39	45	50	47

Simple moving average k-order application example: starting data
(source: personal elaboration)

First, we want to determine the number of periods k, and then we go to calculate the standard deviation obtained with different values of k, established a priori. For ease of calculation, the k values considered will be from 2 to 6; the formulae used are those mentioned above;

DATA		K=2		K=3		K=4		K=5		K=6	
Month	Demand X	Pj	(Xj-Pj)^2	Pj	(Xj-Pj)^2	Pj	(Xj-Pj)^2	Pj	(Xj-Pj)^2	Pj	(Xj-Pj)^2
Jan-20	20,00										
Feb-20	35,00										
Mar-20	33,00	27,50	30,25								
Apr-20	44,00	34,00	100,00	29,33	215,11						
May-20	42,00	38,50	12,25	37,33	21,78	33,00	81,00				
Jun-20	23,00	43,00	400,00	39,67	277,78	38,50	240,25	34,80	139,24		
Jul-20	29,00	32,50	12,25	36,33	53,78	35,50	42,25	35,40	40,96	32,83	14,69
Aug-20	48,00	26,00	484,00	31,33	277,78	34,50	182,25	34,20	190,44	34,33	186,78
Sep-20	40,00	38,50	2,25	33,33	44,44	35,50	20,25	37,20	7,84	36,50	12,25
Oct-20	43,00	44,00	1,00	39,00	16,00	35,00	64,00	36,40	43,56	37,67	28,44
Nov-20	38,00	41,50	12,25	43,67	32,11	40,00	4,00	36,60	1,96	37,50	0,25
Dec-20	39,00	40,50	2,25	40,33	1,78	42,25	10,56	39,60	0,36	36,83	4,69
Jan-21	31,00	38,50	56,25	40,00	81,00	40,00	81,00	41,60	112,36	39,50	72,25
Feb-21	27,00	35,00	64,00	36,00	81,00	37,75	115,56	38,20	125,44	39,83	164,69
Mar-21	42,00	29,00	169,00	32,33	93,44	33,75	68,06	35,60	40,96	36,33	32,11
Apr-21	44,00	34,50	90,25	33,33	113,78	34,75	85,56	35,40	73,96	36,67	53,78
May-21	39,00	43,00	16,00	37,67	1,78	36,00	9,00	36,60	5,76	36,83	4,69
Jun-21	45,00	41,50	12,25	41,67	11,11	38,00	49,00	36,60	70,56	37,00	64,00
Jul-21	50,00	42,00	64,00	42,67	53,78	42,50	56,25	39,40	112,36	38,00	144,00
Aug-21	47,00	47,50	0,25	44,67	5,44	44,50	6,25	44,00	9,00	41,17	34,03
TOTAL			1528,50		1381,89		1115,25		974,76		816,67
(t-k+1)			17,00		16,00		15,00		14,00		13,00
σ			9,48		9,29		8,62		8,34		7,93

Example simple moving average application of order k: calculation of the standard deviation (source: personal elaboration)

The calculations show that the lower quadratic deviation is obtained with k=6. Therefore, this value will be used for the calculation of the forecast.

$$F_{Sep21} = \frac{(42 + 44 + 39 + 45 + 50 + 47)}{6} = 44.5$$

Considering then a level of significance of 5% and 13 degrees of freedom (since 20-(6+1)=13), the value of t-Student is derived from the tables below and the confidence interval could be calculated, as the sum or subtraction to the mean value of forecast of a variability defined on the historical data for the value of the t-Student from which t = 2.16 and therefore the September forecast, associated with its confidence band, will be equal to:

$$44.5 \pm (2.16 * 7.93) = 44.5 \pm 17.06$$

Table of the Student's *t*-distribution

The table gives the values of $t_{\alpha;\nu}$ where

$\Pr(T_\nu > t_{\alpha;\nu}) = \alpha$, with ν degrees of freedom

α \ ν	0.1	0.05	0.025	0.01	0.005	0.001	0.0005
1	3.078	6.314	12.076	31.821	63.657	318.310	636.620
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Table for the determination of Student T, starting from the level of confidence and degrees of freedom (source: www.reddit.com)

Note that the calculation of student t must be done considering a single tail. If we want to obtain a total significance level of 5%, we have to make the calculation considering a significance level of 2.5% (0.05/2 = 0.025; one of the two tails), which leads to a confidence level of 0.975 (1-0.025=0.975).

The Moving Averages method is a simple method that can dampen stochastic variations; the biggest disadvantage is that trends and seasonality are not taken into account and

should therefore be used for stationary applications, which do not show sharp increases or decreases.

Weighted moving average

This method consists in refining the Simple Moving Averages, in fact, in addition, allows to assign a different weight to each data. In this way, for example, more weight can be given to the data of the more recent past as they are believed to be more reliable than very old data.

In this case, in addition to the number of periods k, the weight w associated with each data (and thus with the actual demand for each period) should be determined.

The method, therefore, although very expensive in terms of time and amount of data required, is used in cases where it is important to give a different relevance to the data.

Exponential Smoothing

Exponential Smoothing is a technique similar to weighted moving averages, which involves the descending association of weights to the different values of the historical series according to an exponential rule. In fact, the concept of Exponential Smoothing provides that "the forecast is calculated using weighted averages, where the weight decreases exponentially moving towards the past". (Hyndman & Athanasopoulos, 2014)

This allows, as in the case of weighted moving averages, to give more relevance to the most recent data, as they are considered more reliable.

The technique has been developed since 1950 and has several variants. (Hyndman et al., 2002)

For example, according to the Brown model (1961) the demand forecast for the period t+1, carried out at the instant t, is calculated as follows:

$$F_{t+1} = F_t + a * (X_t - F_t) \text{ also equal to } F_{t+1} = a * X_t + (1-a) * F_t$$

By replacing Ft, the formula is generalized as follows and is used in the practical application below as an example.

$$F_{t+1} = a * X_t + \sum_{i=1}^{n} a (1-a)^i * X_{t-i} + (1-a)^{n+1} * F_{t-n}$$

Where

- a is the damping constant, between 0 and 1.

In case a is close to 1, the model will be able to react quickly to changes in demand; Instead, when it is close to zero, the model's reaction time to demand changes is greater. To define a, the same method is used to determine k in the case of moving averages: values are defined at the beginning, and the choice is made for which the standard deviation of the forecast error is minimized. In this case, since the degrees of freedom are t-2, the standard deviation is calculated as follows:

$$\sigma_k \sqrt{\frac{\sum_{j=2}^{t}(P_j - X_j)^2}{t-2}}$$

Practical application:

We repeat the example already used in the previous paragraph for the estimation of the demand of product X in the month of September 2021, but this time using the technique of Exponential Smoothing simple.

The values of the damping constant a, chosen a priori, are equal to:

- *0.3*
- *0.7*
- *0.9*

Year	2020												2021							
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Demand X	20	35	33	44	42	23	29	48	40	43	38	39	31	27	42	44	39	45	50	47

Application example Exponential Smoothing Simple: starting data (source: personal elaboration)

To initialize the parameters, assume $P_1 = X_1$ so $P_1 = 20$.

For j = 2 and for each α, we calculate: $P_2 = a * X_{j-1} + (1 - a) * P_{j-1}$.

Then proceed with the calculation of σ (using the formula above) for each α and choose the value with the lower error. In this case, the degrees of freedoms are equal to 18 and the minor σ, equal to 8.38, is obtained with = 0.6. Therefore, this value will be the one used in the calculation of the forecast.

DATA		a=0.3		a=0.6		a=0.9	
Month	Demand X	Pj	(Xj-Pj)^2	Pj	(Xj-Pj)^2	Pj	(Xj-Pj)^2
Jan-20	20,00	20,00		20,00		20,00	
Feb-20	35,00	20,00	225,00	20,00	225,00	20,00	225,00
Mar-20	33,00	24,50	72,25	29,00	16,00	33,50	0,25
Apr-20	44,00	27,05	287,30	31,40	158,76	33,05	119,90
May-20	42,00	32,14	97,32	38,96	9,24	42,91	0,82
Jun-20	23,00	35,09	146,28	40,78	316,27	42,09	364,45
Jul-20	29,00	31,47	6,08	30,11	1,24	24,91	16,74
Aug-20	48,00	30,73	298,38	29,45	344,27	28,59	376,71
Sep-20	40,00	35,91	16,74	40,58	0,33	46,06	36,71
Oct-20	43,00	37,14	34,39	40,23	7,67	40,61	5,73
Nov-20	38,00	38,90	0,80	41,89	15,15	42,76	22,66
Dec-20	39,00	38,63	0,14	39,56	0,31	38,48	0,27
Jan-21	31,00	38,74	59,89	39,22	67,61	38,95	63,16
Feb-21	27,00	36,42	88,68	34,29	53,13	31,79	22,99
Mar-21	42,00	33,59	70,70	29,92	146,03	27,48	210,85
Apr-21	44,00	36,11	62,18	37,17	46,70	40,55	11,92
May-21	39,00	38,48	0,27	41,27	5,14	43,65	21,67
Jun-21	45,00	38,64	40,50	39,91	25,94	39,47	30,63
Jul-21	50,00	40,55	89,39	42,96	49,52	44,45	30,84
Aug-21	47,00	43,38	13,09	47,19	0,03	49,44	5,98
TOTAL			1384,38		1263,36		1342,28
(t-k+1)			18,00		18,00		18,00
σ			8,77		**8,38**		8,64

Application example Exponential Smoothing Simple: calculation of the standard deviation (source: personal elaboration)

Finally, the September forecast and the relative confidence interval (with a 5% significance level) are calculated as follows:

$$F \text{ (September 2021)} = 0.6 * 47 + (1 - 0,6) * 47.19 = 47.07$$

Exponential smoothing is a very simple technique to implement, which allows to obtain an accurate forecast, giving more relevance to the most recent data. The main disadvantage, however, is that, as with moving averages, it can only be used in cases of stable demand, which presents only random fluctuations.

To meet this limit, other methods have been developed, able to manage trends and seasonality and therefore be able to examine non-stationary questions.

Double Exponential Smoothing

Also called Holt's model, it is a simple Exponential Smoothing more general, from the moment it is applied to time series that also have a trend that grows or decrease and that in the sub-time intervals can be considered linear.

In this case there are two damping constants, both between 0 and 1. These are called:

- α, the same in the case of simple Exponential Smoothing;
- β, related to trends;

The formulas used in this case are the following:

$$P_{t,t+c} = S_t + \beta * G_t$$

$$S_t = a * X_t + (1 - a) * (S_{t-1} + G_{t-1})$$

$$G_t = b * (S_t - S_{t-1}) + (1 - b) * G_{t-1}$$

Where:

- "t" is the time interval between the data.
- S_t indicate the estimated intercept of the series at time t.
- G_t indicate the estimated slope of the series at time t.

The prediction, as the time series is considered linear locally, is then obtained from the sum of the intercept and the slope multiplied by the time factor "t".

The parameter initialization process requires two estimates before start:

- It is assumed that at $t=1$ the intercept is equal to demand: $S_1 = X_1$;

- As for the slope at $t=1$, it is assumed that $G_1 = X_2 - X_1$;

- As for damping constants "α" and "β", is chosen the combination that minimizes the error. (The degrees of freedom in this case are equal to t-3)

$$\sigma_k = \sqrt{\frac{\sum_j^t (P_j - X_j)^2}{t-3}}$$

Practical application:

Starting from the example of Simple Exponential Smoothing, we want to calculate the demand forecast for good X for the month of September 2021. Assume that the damping constant is equal to 0.6, while for you have to go to evaluate the value that optimizes the model between 0.3 and 0.5;

DATA		a=0.6 B=0.3				a=0.6 B=0.5			
Month	Demand X	St	Gt	Pt,t+1	(Pj-Xj)^2	St	Gt	Pt,t+1	(Pj-Xj)^2
Jan-20	20,00	20,00	15,00			20,00	15,00		
Feb-20	35,00	35,00	15,00	39,50	20,25	35,00	15,00	42,50	56,25
Mar-20	33,00	39,80	11,94	43,38	107,79	39,80	11,94	45,77	163,07
Apr-20	44,00	47,10	10,55	50,26	39,19	47,10	10,55	52,37	70,05
May-20	42,00	48,26	7,73	50,58	73,56	48,26	7,73	52,12	102,47
Jun-20	23,00	36,20	1,79	36,73	188,60	36,20	1,79	37,09	198,58
Jul-20	29,00	32,60	0,18	32,65	13,31	32,60	0,18	32,68	13,56
Aug-20	48,00	41,91	2,92	42,78	27,21	41,91	2,92	43,37	21,47
Sep-20	40,00	41,93	2,05	42,54	6,47	41,93	2,05	42,95	8,73
Oct-20	43,00	43,39	1,87	43,95	0,91	43,39	1,87	44,33	1,76
Nov-20	38,00	40,91	0,56	41,07	9,45	40,91	0,56	41,19	10,16
Dec-20	39,00	39,99	0,12	40,02	1,05	39,99	0,12	40,05	1,10
Jan-21	31,00	34,64	-1,52	34,19	10,16	34,64	-1,52	33,88	8,31
Feb-21	27,00	29,45	-2,62	28,66	2,77	29,45	-2,62	28,14	1,30
Mar-21	42,00	35,93	0,11	35,96	36,43	35,93	0,11	35,99	36,17
Apr-21	44,00	40,82	1,54	41,28	7,40	40,82	1,54	41,59	5,82
May-21	39,00	40,34	0,94	40,62	2,64	40,34	0,94	40,81	3,28
Jun-21	45,00	43,51	1,61	43,99	1,01	43,51	1,61	44,32	0,47
Jul-21	50,00	48,05	2,49	48,79	1,46	48,05	2,49	49,29	0,50
Aug-21	47,00	48,41	1,85	48,97	3,87	48,41	1,85	49,34	5,47
TOTAL					553,53				652,28
(t-k+1)					15,00				15,00
σ					6,07				6,59

Application example Exponential Smoothing Double: calculation of the standard deviation

(source: personal elaboration)

In the first case we consider a=0.6 and b=0.3. Initialize the parameters and go to calculate the error, which results to be equal to 6.07.

The procedure is repeated for case a=0.6 and b=0.5; In this case the error is equal to 6.59. Therefore, being the lowest error, for the calculation of the September forecast will be used the values of the damping constants of the first cases. The September forecast will therefore be equal to:

$$F \text{ (September 2021)} = 48.41 + (0.3 * 1.85) = 48.96$$

As mentioned above, the *Exponential Double* Smoothing allows to model historical series characterized by trends. Like any quantitative model, it is based on strong assumptions and, as the time line becomes longer, the more the forecast becomes sensitive to errors in the estimation of the trend factor. Another major disadvantage of this method is the inability to model seasonal series. For this last case, in fact, we use the Exponential Smoothing Triple, or model of Winters, which will be presented in the following paragraph.

$$G_s = \frac{1}{s} * \sum_{t}^{s} \frac{X_{t-s} - X_t}{s}$$

Instant trend estimate s

$$S_s = \frac{1}{s} * \sum_{t}^{s} X\,t.$$

Instant intercept estimate s

Triple Exponential Smoothing

The Winters model is mainly used for historical seasons. The demand in these cases presents, besides the tendency to grow or decrease, some fluctuations tied to the period of the year (the seasons). Think for example of the fashion industry, where the purchase of some products is closely linked to the weather conditions (such as the costume or sweatshirt).

This method involves estimating the intercept of the series at time "t" S_t the *slope of the series at time "t"* G_t and the S_{t-s+c} seasonal component as a function of the length of a season S.

The damping constants are 3:

- $"\alpha"$ relating to the level of damping,
- $"\beta"$ concerning the trend
- $"c"$ relative to seasonality.

The choice of the coefficients of the parameters can be made, as seen before, trying to minimize the error or using a solver with an optimization algorithm.

Two models, one additive and one multiplicative, may be used to calculate the forecast. The following are the formulas to initialize the parameters and to calculate the forecast, in case of use of an additive model.

Initializing the parameters:

- Estimated intercept at instant "s":

$$S_s = \frac{1}{s} * \sum_{t}^{s} Xt.$$

- Estimate of the trend in the instant "s":

$$G_s = \frac{1}{s} * \sum_{t}^{s} \frac{X_{t-s} - X_t}{s}$$

- Estimation of the seasonal index: $C_i = X_i - S_s$

Some formulas for the calculation of the forecast:

$$P_{t,t+c} = S_t + \beta G_t + C_{t-s+c}$$

$$S_t = a * (X_t - C_{t-s}) + (1-a)(S_{t-1} + G_{t-1})$$

$$G_t = b(S_t - S_{t-1}) + (1-b)G_{t-1}$$

$$C_t = c(X_t - S_{t-1}) + (1-c)C_{t-s}$$

The triple exponential smoothing is the most complex, but on the other hand, it allows to model series affected by seasonality and trends. The main limitation of this method is that it needs a wide spectrum of information to be used properly, since it exploits many factors. Therefore, since a lot of historical data is needed, the risk is to use data even too old compared to the present (10 or 15 years before) that have little impact on the future result and therefore risk to distort the forecast (Zotteri & Brandimarte, 2007).

However, exponential smoothing is widely used to model time series, as it gives precise results in a fairly simple and fast manner.

Box-Jenkins method

The last proposed method based on time series is the Box-Jenkins method. This procedure was developed by mathematicians Box and Jenkins in the 70s and is used to build an ARIMA (autoregressive *integrated moving*-average) model starting from the observation of historical data, for the approximation in the generation process of the time series. This method requires the use of statistical software to develop this model; Only the main points that compose it will be illustrated:

1. Preliminary analysis, where it is necessary to verify that the historical series is stationary (necessary condition to use the method).
2. Identify the most appropriate model to the historical series that is analyzed using statistical software.
3. Determine the parameters of the model chosen at the previous point.
4. Verify the accuracy of the model.

2.2.2.2: Explanatory methods

Many times the market demand is not only time-dependent, for this reason there are explanatory models that also take into account other external variables such as price, competition in the market, weather conditions, traffic and anything that might affect demand.

These models analyze the relationships between demand and the variables that influence it and therefore allow, in addition to understanding the behavior of current demand, also to predict the effect of a combination of inputs on future demand (Zotteri & Brandimarte, 2007).

In these cases, in general, the analyst wants to predict the variable Y (for example, demand) from a series of "n" variables "X" explanatory (such as pricing and advertising). The aim is to achieve a X_n where the entity and the number of the latter independent variables are chosen

by the analyst himself (Chase, 2009).

The complexity of the explanatory models lies in the variables on which the demand depends that being many, of various nature and with relations between the independent variables often complicated and not linear (for example, if you apply a discount X you get an increase in demand for N units).

There are several explanatory models, including: linear regression (the most common) and multiple regression. Both will be analyzed below.

The Linear Regression

Linear regression is used to predict the value of a dependent (or endogenous) variable Y from the value of another independent (or exogenous) variable X.

From the moment that the linear regression identifies the regression model where the relationship that exists between the two variables forms a straight line, the function is expressed by the following formula.

$Y = a + bX$

where

- a represents the intercept on the Y axis
- b represents the slope of the line
- Y, the regression line (the one that best approximates the starting data of all the plane lines)

This regression line is calculated by a method known as "The least squares method". Starting from a series of points with coordinates (*X,Y*) representing the population under consideration,"*E*" the regression line is the one for which the value of (representing the deviations of the points from the tend line) is lower.

"*E*", the total error, is calculated as the sum of the squares of the distances of each pair *(X,Y)* from the corresponding point on the regression line.

$$E = \sum_{i}^{n} (ax_i + b - y_i)$$

An example of regression line and relative distances is shown in the graph below:

Linear regression line with evidence of vertical distances (Source:www.sthda.com)

At this point it is clear that if all the points were aligned, the error would be equal to 0.

Practical application:

Starting from hypothetical observations about the variation of the demand of a specific product X based on the variation of the price Y, the objective is to determine the regression line.

The data are as follows:

Month	January	February	March	April	May	June	July	August	September	October	November	December
Price	5	2,5	3,8	2,8	4,1	5,8	1,5	2	2,3	1,9	1,7	1,8
Demand	50	60	55	58	52	45	78	65	62	69	71	72

Application example Linear Regression: Starting Data (source: personal elaboration)

If you draw and calculate the regression line using a worksheet, you get the graph shown below:

Application example Linear Regression: graphical representation of the regression line

(source: personal elaboration)

*The slope **b** is -6,601 and the intercept a is 80,78. In this case, therefore, having a negative slope, means that the association between the variables and is negative X,Y as the price increases the demand for good X decreases.*

Thus, having established a price of 3,2 € , the sales forecast is calculated as follows.

$$Demand\ (Y) = -6{,}601 * (3{,}2) + 80{,}78$$

$$Y = 59$$

When using a linear regression model, to give a clearer reading of the obtained numbers, it is useful to calculate also:

1. The *Linear Correlation Index* and is indicated with . It was introduced by Bravais and Pearson and is an index of the linearity of the relationship between the variables X and Y. Its value varies between -1 and 1: $\rho_{x,y}$

    - If its value is very close to 1 or -1, it means that the relation is very linear and therefore that the method used is suitable to represent the data.
    - If the value of the correlation coefficient is close to 0, the variables are independent or linked by a non-linear type relationship and therefore the model cannot be considered reliable.

2. The *Coefficient of Determination*, which is equal to the correlation coefficient elevated$\rho_{x,y}$ to the square and is indicated with . In fact, its value is between 0 and 1. As this index measures the reliability of the model, the closer its value will be to 1, the better the representation of Y through the regression line will be.R^2

If the coefficient of determination is equal to 1 (thus, is +-1) Y is linearly dependent on X and there is a perfect linear regression, so the model perfectly represents the data.

In the practical application above and ,$R^2 = 0,8774$ then the$\rho_{x,y} = -0,93$ model can be considered reliable and the variables very linearly dependent.

The Multiple Regression

Multiple regression changes with respect to linear regression because in this case two or more independent variables are used to predict the value of the dependent variable Y.

The multiple regression additive model is described by the following equation:

$$Y = b_0 + b_1 X_1 + "\dots\dots" b_n X_n$$

In this case, the calculations are more complex and a greater difficulty lies in the choice of independent variables. In fact, it often happens that, although a large number of variables can really have an impact on the demand, only some are actually considered in the analysis and included in the regression model.

To be able to use this model it is necessary first of all to have an adequate number of data: ideally 5 observations are considered sufficient for each independent variable. In addition, these data must relate to the same time period and it must be possible to assume with a high degree of reliability that the relationship between the variables can be considered continuous in the future.

2.2.3: Methods analysis

In conclusion, the forecasting techniques mentioned in this discussion, although not exhaustive, already cover numerous different cases.

As mentioned above, the choice between one method and the other is complex, and it is also wrong, to try to establish a standard of use, since the reasons behind the decision can be of various nature.

The goal is that the selected method (or the mix of methods) is able to produce predictions that are clear and shared by management, with the aim of being used to make decisions.

It is important to reiterate that the following principles should be considered when making the choice (Makridakis & Hibon, 2000):

- Using statistically complex methods does not necessarily produce more accurate results than simpler predictive methods;

- The accuracy of the method depends on the data available. A method generally considered more accurate is not necessarily more accurate, regardless of the available data.

- The performance of the various methods depends on the length of the time-range of forecasting.

- Not always the combination of multiple methods is more accurate than the model used individually, but, on the contrary, you have to pay attention to the combination of multiple techniques.

You cannot establish a priori a forecast model that is more reliable than the others, but the choice must be taken on the basis of various factors such as: the available data, the budget, the degree of precision you want to achieve, the time available to do the analysis. Similarly, it cannot be said that quantitative models always work better and are necessarily more accurate than the qualitative ones: it depends on the type of case studies that are being analyzed and the type of demand that you want to predict. In fact, qualitative methods, besides being generally simpler, are also very flexible and therefore allow to analyze new and complex situations. On the other hand, quantitative methods, although they are less responsive to changes in demand and require assumptions about consumer behavior (stable, seasonal, growing demand, etc.) they manage to manage a greater amount of data and to obtain reliable and objective results.

2.3: Errors in forecasting

After presenting the different techniques for calculating the demand forecast, the purpose of this section is to introduce the concept of Forecasting Error and the different methods to calculate it.

It's essential that the demand forecast is as accurate as possible and reach this goal, you have to minimize the error during the process.

Forecasting Error, is equal to the delta between: effective value and predictive value.

$$Error = e_t = A_t - F_t$$

Where:

- A_t indicates the actual sales value achieved during the period t,

- F_t the forecast sale for the same period t.

Using the formula above, the error will be positive when the actual demand is greater than the forecasted one, in this case there is an underestimation, *on the other hand,* when the forecast demand is higher than that realized *there will be a* case of *overestimation*

From this formula for the calculation of the error, the accuracy of the forecast is expressed as:

$$Forecast\ accuracy = 1 - Forecast\ error\ \%$$

Forecasting errors are divided into two main groups:

- Systematic Errors: errors that always happen by default or always by excess.
- Random Errors: They vary unpredictably and each time they can influence the result by excess or by default. This type of error cannot be correlated and explained in the forecast model used.

The data used in these cases are the same for all measures and they are related to sales and sales forecasts of a product X about a hundred units.

Month (pcs)	Actual sales	Forecast sales
1	120	110
2	95	100
3	100	95
4	150	130
5	115	125
6	125	125
7	80	100
8	60	90
9	180	170
10	85	105

(source: personal elaboration)

2.3.1: Medium error (ME)

The mean error is the mean error and indicates whether the forecast error is on average excessive (ME > 0) or lack (ME < 0).

$$ME = \frac{1}{n}\sum_{t=1}(A_t - F_t)$$

Where:

- t is the time period,

- n the number of periods,

- A_t The sales during the period t

- F_t The sales forecast related to the same time period.

Practical application:

Month (pcs)	Actual sales	Forecast sales	ERROR (A-F)
1	120	110	10
2	95	100	-5
3	100	95	5
4	150	130	20
5	115	125	-10
6	125	125	0
7	80	100	-20
8	60	90	-30
9	180	170	10
10	85	105	-20
TOTAL			-40

Calculation of average error (source: personal elaboration)

$$ME = \frac{-40}{10} = -4 \ units$$

The value obtained is rather small but could misrepresent the reality. Indeed, the biggest disadvantage of this measure is that it considers the signs of errors. In this way, negative errors will compensate positive errors and the result will be better and not representative of reality.

To solve this limit, there is the MAD.

2.3.2 Mean absolute deviation (MAD)

Like ME, it is calculated as the difference between actual and expected demand, but in this case the error is considered in absolute value. The measure is then defined as "*mean of the absolute values of the deviations between the observed values and the expected values*"(source:Wikipedia)

$$MAD = \frac{1}{n}\sum_{t=1}|A_t - F_t|$$

"Where" :

- t is the time period,

- n the number of periods,

- A_t The sales during the period t

- F_t The sales forecast related to the same time period.

Practical application:

Month (pcs)	Actual sales	Forecast sales	ERROR (A-F)	ABSOLUTE ERROR
1	120	110	10	10
2	95	100	-5	5
3	100	95	5	5
4	150	130	20	20
5	115	125	-10	10
6	125	125	0	0
7	80	100	-20	20
8	60	90	-30	30
9	180	170	10	10
10	85	105	-20	20
TOTAL			-40	130

Calculation of the absolute mean deviation (source: personal elaboration)

And then:

$$MAD = \frac{130}{10} = 13 \; units$$

We can therefore note that the MAD is clearly higher than the ME, as it considers the errors in absolute value avoiding the probability where the values are cancelled.
For this reason, it is preferable to use MAD than the average error.

2.3.3: Average percentage error (MAP)

This measure is the average of all percentage errors. Like the average error, it takes into account the sign of the error and therefore can be used as an indicator of tendency to under or overestimate *forecasts*.

$$MAPE = \frac{1}{n} \sum_{t=1} \frac{(A_t - F_t)}{A_t} * 100$$

"Where" :

- t is the time period,

- n the number of periods,

- A_t The sales during the period t

- F_t The sales forecast related to the same time period.

Practical Application:

Month (pcs)	Actual sales	Forecast sales	ERROR (A-F)	ERROR %
1	120	110	10	8.3%
2	95	100	-5	-5.2%
3	100	95	5	5.0%
4	150	130	20	13.3%
5	115	125	-10	-8.7%
6	125	125	0	0.0%
7	80	100	-20	-25.0%
8	60	90	-30	-50.0%
9	180	170	10	5.5%
10	85	105	-20	-23.5%
TOTAL			-40	-80.3%

Calculation of average percentage error (source: personal elaboration)

$$MAP = \frac{-80.3}{10} = -8.3\%$$

Having obtained a negative MAP, it can be concluded that, on average, there is a tendency to overestimate the demand forecast.

As with the average error, this measure also has a large limit. Therefore, it is usually replaced with the calculation of the MAPE.

2.3.4: Mean absolute percentage error (MAPE)

The MAPE is the most widely used error measure in that, considering the errors in absolute value, it prevents the negatives and positives from being compensated.

It's very similar to MAD, but while the absolute value is expressed, the MAPE is expressed as a percentage and therefore, being a relative measure, is preferred because it facilitates comparisons.

The EEAP shall be calculated as follows:

$$MAPE = \frac{1}{n} \sum_{t=1}^{} \frac{|A_t - F_t|}{A_t} * 100$$

Despite its wide use, the present extent of the defects, of which you must be aware.

- Shall not be used when the actual demand is equal to or close to 0;

- It penalizes less in cases where the forecast is underestimated, compared to cases where it is overestimated (this is because, downwards the percentage error may not be higher than 100 percentage points, but upwards there is no limit).

Practical application:

Month (pcs)	Actual sales	Forecast sales	ERROR (A-F)	ABS ERROR %
1	120	110	10	8.3%
2	95	100	-5	5.2%
3	100	95	5	5.0%
4	150	130	20	13.3%
5	115	125	-10	8.7%
6	125	125	0	0.0%
7	80	100	-20	25.0%
8	60	90	-30	50.0%
9	180	170	10	5.5%
10	85	105	-20	23.5%
TOTAL			-40	144.5%

Calculation of the MAPE (Source: personal elaboration)

$$MAPE = \frac{144.5}{10} = 14.45\%$$

In this case, you get a much higher value than the MPE, because, as said for the MAD, errors are considered in absolute value.

2.3.5: Tracking signal (TS)

It is used when the validity of the forecast model used is uncertainty. It can express the difference between the expected value and the real one of the question, expressed like number of mean absolute deviations.

In fact, it is calculated as the ratio between *RSFE* (Running Sum of Forecast Errors), that is the algebraic sum of the deviations between the expected and real values of the question and the MAD, previously explained.

$$TS = \frac{RSFE}{MAD}$$

It is important to note that the algebraic sum of predictive errors is a cumulative sum that takes into account the signs of errors and does not use the absolute value. Therefore, the Tracking Signal can be both positive and negative, indicating the tendency to overestimate or underestimate forecasts.

Practical Application:

Considering the above calculations:

$$RSFE = 40 \quad and \quad MAD = 13$$

$$TS = \frac{40}{13} = -3.07$$

Having obtained a negative TS, it can be asserted that the tendency is to overestimate the forecast of the demand.

CHAPTER 3: "K.GROUP AND THE FASHION MODEL"

3.1: K.Group & Board

What is K.Group

K.Group is a consulting company providing expertise in knowledge management to enable companies to make the right decisions.

K.Group facilitates business processes through score carding, budgeting and planning, combining the economic with the IT knowledge, raising significantly managers' awareness of their business.

Since 1998 K.Group has provided business solutions using exclusively Board as a unified platform.

K.Group's mission is to support entrepreneurs and managers in transforming their organization into an Orange Company via a new people-centered format that promotes breakthrough knowledge, innovation, and the collective sharing of data.

"We believe in a new company model based on knowledge: collaborative, transparent, smart, and dynamic." (K.Group)

//The Orange Company

What is Board

Board is a unified platform for analysis, simulation, and planning to make business decision-making more efficient and effective.

Board's business toolkit provides all of the tools required to create and update databases, data presentations, analyses and process models, in a single visual and interactive environment.

The combination of BI dashboard tools and comprehensive analytical capabilities make it easy for business users to quickly build customized analytic, planning and simulation applications, which Board calls capsules.

"Board Capsules" are containers that can accommodate any Board object: reports, graphs, spreadsheets, folders, maps, point-and-click filters, gauges and navigation menus. These objects can be positioned on the screen from the ribbon bar and populated with drag-and-drop measures and dimensions. They are immediately synchronized with each other and with the database so that they automatically react to users' actions. (www.community.board.com)

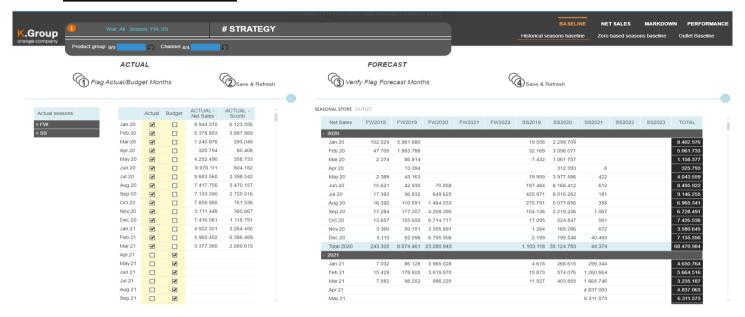## 3.2: The sales planning in the fashion industry

The project that will be presented later, is based on a well-articulated process workflow represented in the image below. As you can see from the image, we start from an initial step called "Multichannel baseline" where all the preliminary adjustments are made, this is the moment in which the user can choose from where the starting data will came from. Then there is the second step: "Net sales", here is where the user starts planning thanks to various processes that will be analyzed in detail later. The third step is the "Markdown", this part of the workflow is useful to build the commercial calendar of discounts, and thanks to the software you can set the discounts for each week of the planning period. Finally,in the fourth step: "Performance", as the last step, is not an operational part of the workflow but a more controlling part, useful to see what are the results and compare them with the expected ones and the ones deriving from the baseline, and even more you can compare them also with the last planning in order to understand better where you are going to.
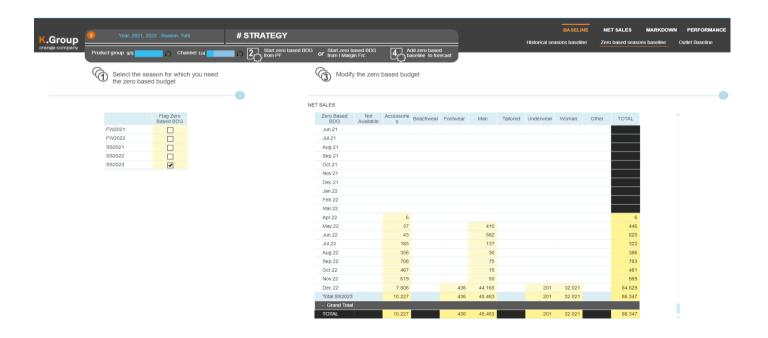

(source: project developed with K.group)

3.2.1: Baseline

"Previous season baseline"

(source: project developed with K.group)

Going into the detail of the intial step, above we can analyze what is the first screen, in this step the goal is to create a starting point that will be used in the second step of the workflow. In this first screen, starting from the fact that the planning is based on the next 24 months, you have to decide which months the user wants to initialize from the budget and for which months instead he can use the actual data (historical data).

After deciding which are the months for which the user have the data to initialize, surely there will be 2 or 3 months for which there isn't a budget or anything else that can be useful to initialize the starting point because they refer to the next two years so there has not yet been a reliable data. At this point with the technique of the "Zero Based Budget" (partly applicated here in this project) a Budget is created only for those months, so that there are no missing data for the next step but at the same time, the input data to then move the levers are as reliable as possible.

This is possible thanks to the fact that in the project is used the historical data for a past period that is the most similar to the future period without data.

"Outlet baseline"
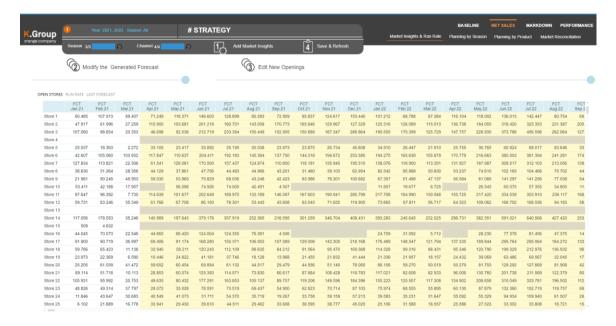

(source: project developed with K.group)

In the last screen of the first step is also developed a starting point for any outlet from the moment in which in our example the company sells both official stores and outlets where will end up those products of past seasons.

The process used for the store, is the same used for the budget but simpler because the incidence of the outlet sales are less relevant than the official stores.

3.2.2 Net Sales
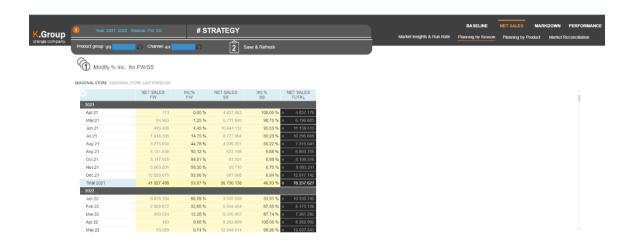
"Market insight & Run rate"

Arrived at the second step, the user can move the different levers, At the beginning it will be necessary to plan monthly sales for the next 24 months on the basis of qualitative methods such as a questionnaire submitted to the sales area or directly a meeting with the various area managers who know the trend of the market and demand related to their area.

(source: project developed with K.group)

"Planning by season"

The second point is where will be planned what will be sold divided by collection, then FW and SS, which will characterize the months of planning. Here the user can choose what is the % incidence of the single months of the season over the total sales of the year. (The calculation here is done using specific procedures that enable to calculate the total)
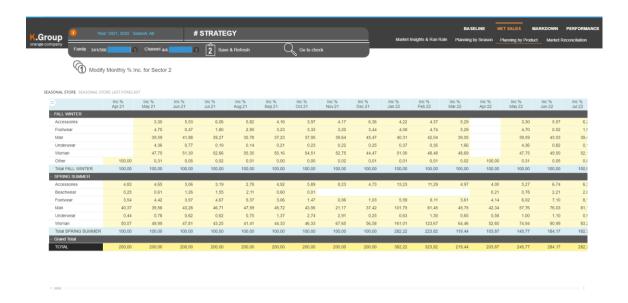

(source: project developed with K.group)

"Planning by product"

For the following step, the process is the same as before but here the user can choose the % incidence of the different kind of products over the total sales in the single month.

(Unfortunately, due to the fact that in the example I used artificial data, sometimes the total % in SS is not 100% but note that it could be 100% for each row total as for the FW)
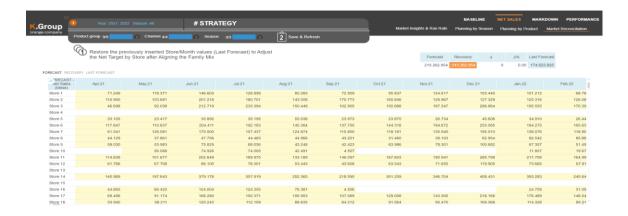
(source: project developed with K.group)

"Market reconciliation"

In the fourth and last point of the second step, there will be a summary screen where you can see the various deltas compared to the "Preliminary Base" (starting point) and especially compared to the previous schedule.

This point is fundamental in order to control those that have been the variations happened once moved the relative levers and to make of the adjustments directly on the store of reference before to launch a procedure of calculation where thanks to determined formulas, We will pass on the data that so far have been by month, in day.

This step will then serve in the third step to plan the commercial calendar "Markdown" where will be inserted what will be the discount policies for the various product categories and their stores.
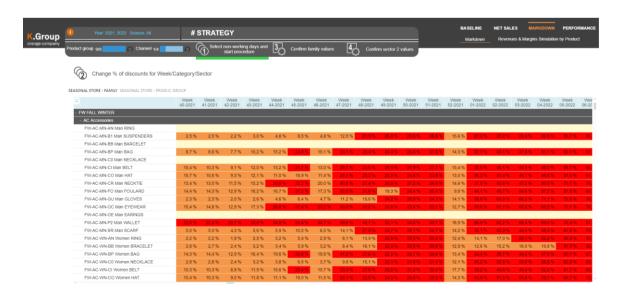
(source: project developed with K.group)

3.2.3: Markdown

"Markdown"

The third step, Markdown, is where management and the sales force begin to plan the weekly discount policy for each type of product.
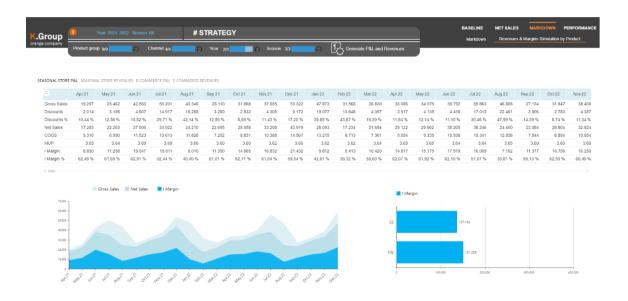
As you can see from the picture the weeks in red will be the weeks where the goods will go on sale and it is important to know what will be the maximum discount applicable for each product in the catalog.

(source: project developed with K.group)

"Revenues & Margin simulation by product"

In the second screen of the markdown, as you can see from the image, we have a summary screen where the top of the income statement is represented and for the first time we start to see the I Margin which is the result of the difference between gross sales and the cost of sales.

The I Margin is a very important point in planning because it allows you to understand how the planning went and if it meets the requirements imposed by the management in the budgeting phase

(source: project developed with K.group)

3.2.4: Perfonrmance

In the last step of the Project, performance, there are three reporting screens where we can see more clearly what are the results obtained at the end of the entire I Margin planning process.

Here we have the possibility to see the difference compared to those that are the previous planning and also compared to the planning made at the beginning of the year. This is very useful to understand the constantly evolving market placement of the policies implemented during the process, and thus understand whether the results obtained are in line with expectations.
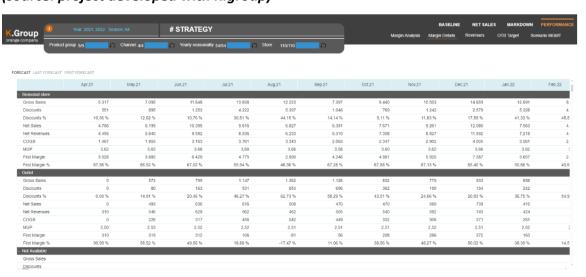
"Margin analysis & details"

Here in the dashboard below, the user can figure out what is the performance reached after planning process: in particular he can compare the last planning ("last forecast") and the first planning of the year ("first forecast"). In other words, assuming that he perform the planning periodically, he can understand better what he has to expect from the next months and, starting from the first planning, how the demand is evolved through the months

(In the second screen he can analyze it in detail but the theory is the same used for the dashboard)
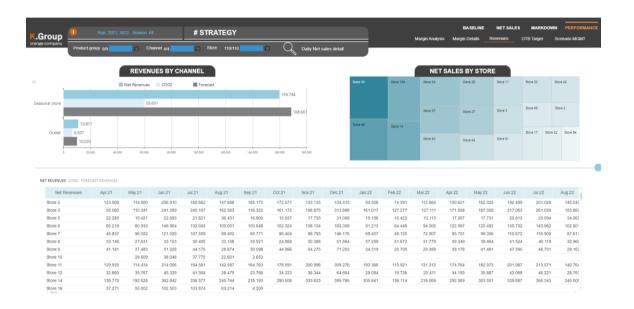

(source: project developed with K.group)

(source: project developed with K.group)

"Revenues"

After the margin analysis, the user, using the same theory, can compare the revenues, in addition to the step before, here he can also check the revenues by store and by channel thanks to the two graphs.

(source: project developed with K.group)

3.3: Considerations

Finally, I would like to analyze the strengths and weaknesses of the following project:

PRO 👌 | CONS 👎

PRO
- The model has very detailed dimensions (such as day and specific item) and you can perform a precise planning in this sense

- The process is easy to understand and is user-friendly

- The process is quite fast and you can redo it every time you want in order to respond at any market fluctuations

CONS
- The forecast doesn't take into account the external factors (trend and market variations)

- The forecast doesn't take seriously into account the past demand but uses It only to create the baseline

- The model doesn't consider statistical formulas to create the baseline, for example a simple moving average or an exponential smoothing

(source: personal elaboration)

As you can see from the table above, the biggest problem is precisely that here in the project is not used statistical methods to predict future demand over the next 24 months. Especially for such a long-term forecast, it would be appropriate to use statistical models such as those listed in Chapter 2 in order to have a basis for prediction as impartial and truthful as possible.

Using only qualitative methods such as interview and area manager collaboration, there may be problems associated with the unawareness of certain variations on the part of the subjects who contribute to this planning and thus have an unreliable end result.

CONCLUSIONS:

In this paper, after analyzing in depth, what is management control, it was very important go into details of the budgeting process.

The development of a budget for a company, especially the medium-large companies, requires a lot of time and collaboration from all those who are interested parties, from the area manager to the highest management. During this phase it is interesting to note that there is a need for synergy within the team to be able first of all to plan the sales of future periods on the basis of the insights of the various subjects and especially thanks to the data that comes out from previous years.

As for the data and their analysis, in the second chapter it has come out the importance of an analysis carried out with some real data (Thus not simply intuitions); an analysis using an "exponential smoothing" allows to have a prediction as reliable and precise as possible, especially if the "Triple exponential smoothing" is used thanks to which we can take into account external variables such as trends and seasonality that are the basis of changes in market demand today.

In my opinion, I think that nowadays all the companies need to use the statistical forecasting methods, these kind of methods as said before in the second chapter, are very precise and allow the control management to foresee the new trend and as a consequence, the company can adapt all the different processes that characterize it in order to afford the new situation.

For example if we take a look to the finance sector, the forecasting methods must be reliable and as real as possible in order to make an investment and stuff like that.

The idea is that also the productive companies must be fully aware of the importance of a demand forecasting that is consistent.

The importance of a consistent method, comes even more to light in the third chapter where we see put into practice a planning process thanks to the use of Business Intelligence software as "Board".

However, also in the project presented, there is a lack in the use of statistical forecasting methods; for a more reliable planning, we need to use the formulas explained in the chapter 2, for example, instead of create a baseline only with the data of the past season that are more similar, the idea is to modify the procedure of calculation to use on of the method explained, in

order to take in consideration also the trend or the seasonality, and all the other external factors that can influence the future market demand and not only the intuitions of the area mangers or other figures like that.

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