
A FRAMEWORK MEASURING INNOVATION STRATEGY AND TRENDS COHERENCE

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Abstract: Organizations build their vision to guide their strategies, hypothesise and develop future products in their research labs. But strategy does not concern only the comprehension of the market of today, but also the identification of possible scenarios of the markets of tomorrow.

The literature does not provide us with precise and complete methodologies on how to check the alignment of trends, visions and products. Therefore this article proposes a methodology, called coherence framework, to check the content and the coherence of the vision and of the products of the organization in relation to trends. The methodology has then been tested in a company in the ICT industry in order to verify its operational feasibility. The test showed its ability to indicate the points of consistence and defect of vision and products related to industry trends and give additional information and suggest how to improve the focalization.

Keywords: Corporate Foresight; Coherence; Trend; Strategic Direction; Future Focalization; Case Study

1 Introduction

The strategic decision-making for innovation and the understanding of the direction to where to orient the business are difficult challenges for companies. In many industries, in fact, they have to face an even more complex and dynamic context, characterised by discontinuous conditions of political-economical, socio-cultural and technological environment.

Literature, on one side, highlights a frequent lack in gathering business and innovation opportunities, underlining the importance of weak signals (Ansoff, 1987) and of discontinuities for innovation (Christensen, 1997). The study of weak signals and of emerging markets for disruptive technologies and radical products development, in other words how organizations can identify, foresee and manage discontinuities and prepare for an uncertain future, is called Corporate Foresight (Schwartz, 1991; Becker, 2002; Van Der Haiden, 2004).

On the other side, future studies are a fundamental element in every strategy for innovation (Hamel and Prahalad, 1994). The need to take strategic decisions and the continuous innovation pass not only through the analysis of past mistakes or the comprehension of the market of today, but also through tomorrow market possible scenarios detection. This implies the need to monitor industry trends. For an organization, in fact, it is opportune to be aware and verify which is and will be its own path, that has to be aligned with the industry trends: it is useful that the organization looks to its past, its present and its possible future growth and confront its path with the development of the scenarios related to its industry.

But the focus-point is that all the organizations, and also the ones that do not base strongly on Corporate Foresight, build the visions to guide their strategies and produce and hypothesise future products in their research labs. But then it is possible to ask: what does it happen if the vision and the products are not coherent with the future?

This article tries therefore to answer to the following research question:

- *How is it possible to understand if your own innovation strategy is oriented in the same direction of industry trends?*
- *Is it possible to measure the alignment?*

To solve this gap, this paper proposes a methodology to check content and coherence of company's vision and products in comparison to future, and to eventually supply information to improve them in order to augment the innovation capability.

The proposed methodology, that we called coherence framework, has two phases: the characteristics analysis and the alignment analysis. The characteristics analysis regards the study of the external and internal environment: the industry scenarios (external environment) will be studied through Corporate Foresight, moreover also the vision and the past, present and future products of the company (internal environment). The alignment analysis is formed by a triplex comparison of the characteristics of these three elements: an alignment analysis scenarios-vision (external environment – internal environment), an alignment analysis scenarios-products (external environment – internal environment) and an alignment analysis vision-products (internal environment - internal environment).

The proposed methodology permits therefore through corporate foresight to read the organization strategy, concretized in the vision and in the products, and to comprehend its alignment or not with the trends of the industry of membership. The methodology has then been tested in a company in the ICT industry in order to verify its operational feasibility. The test showed its practicability and its ability to indicate the points of consistence and defect of vision and products related to industry trends and to give additional information and suggest how to improve the focalization.

After explaining the research methodology (par. 2) and highlighting the literature gaps (par. 3), it is described the proposal of the coherence framework (par. 4), that has then been tested with a case study (par. 5), and finally we conclude with managerial and academic indications and possible future research developments (par. 6).

2 Research methodology

The research methodology is composed by a first part of literature analysis on Corporate Foresight (CF), Innovation Management and Strategic Management, from which the coherence framework proposal was derived, and then tested through a case study.

The literature analysis evidenced a limited knowledge on the topic and its novelty. The single case study is particularly appropriate for completely new and explorative investigations (Eisenhardt, 1989; McCutcheon and Meredith, 1993; Meredith, 1998). In particular, the case study has had the aim to test the coherence framework proposed and to improve it from a practical point of view.

The choices specifically related to the case study, as for example number of experts involved, number of interviews made, times chosen and so on, are described in section 5.

3 Literature analysis

The study of the future is as old as mankind is, and the importance of the anticipation of the future has been underlined in different fields. As regards economics and management, already from the 80s, literature (e.g. Okun, 1981) has underlined the relevance of forecasts as regards the economic trends, but this importance is equally true also for technological (innovations, technology transfers, new products and applications, etc.), sociological (demographic changes, consumer tastes evolutions, etc.), cultural (sensing ways evolution, etc.) and political (evolution of the norms and regulations, etc.) trends.

Porter (1985) highlights that the aim of the strategy is the acquisition and the sustainability of the competitive advantage in the ambit of the company's industry sector, defined taking as a basis the concept of enlarged competition. It is then to build up scenarios of the competitive system of the sector.

Given the importance of the forecasts, the problem is now their integration in the choices and in the decisions of the company. Many authors underline how an excess of concentration inside the company and the difficulty in taking the external environment evolution in account and incorporating it in the corporate strategy could theoretically come from the short-time profits obsession (Coda, 1988).

The aim of the company-system changes in response to external environmental factors and to internal development ones. An organization is in fact a complex system that operates basing on adaptive expectations and modifies its behavior as a consequence of learning from its environment (e.g. its behavior, the competitors'

behavior, its sector industry evolution, etc) (De Toni and Comello, 2004). As regards the industry considered for the benchmark, the main problem is to interpret correctly the signals, mainly the weak ones (Ansoff, 1987), and to understand in which way they can have an influence on the organization in itself.

Literature (e.g. Godet, 1985) underlines the necessity to operate a welding between the possibility of exploring the future environment evolution and the strategic analysis requirements and needs. The proposed methodology follows this optic and is a tool that tries to contribute to this welding between trend analysis and strategic implementation (in terms of vision and products). It is based from a theoretical level on the Corporate Foresight (CF) research area, whose implementation remains still limited (Liebl, 1996), despite the recent and increasing interest on the topic (as claimed by Schwarz, 2007; Rohrbeck and Gemünden, 2008), maybe because of the encountered difficulties from the companies in the identification of the emerging opportunities (Day and Schoemaker, 2005) or from the missing of applicative know-how (Liebl, 2005) or from the general resistance to scenarios development (Gill, 1986).

The methodology proposes to analyze the alignment three times: as first, between industry trends and organization vision, second between vision and products and third between industry trends and organization products. Many authors underline the importance of the trend analysis (Isernia, 1987) and the importance of the coherence between strategic direction and trends (Huss, 1987). Strategic marketing tries to understand which sort of product typology the company could produce in relation to the actual and potential customers market analysis. But, despite these facts, the indications on how to proceed on an implementation level remain narrow. The literature proposes, in fact, procedures for the internal scenario coherence analysis (Von Reibnitz, 1987) or to check the consistence of the own vision (Boaventura and Fischmann, 2008), but it is not present any complete methodology that permits the comprehension of the coherence of the company strategic direction (vision and products) in reference to trends and megatrends of the industry the organization belongs to. In other words literature does not provide precise and complete methodologies on how to understand the innovation level of a company and how to bind or check trend and strategy alignment

4 The theoretical proposal: the coherence framework

Strategic Management literature highlights how it is opportune for the companies to understand in which direction they are moving in relation to trends and megatrends of their industry sector (Porter, 2004).

As literature doesn't present any complete methodology to suggest the companies on how to proceed in the analysis of their own business orientation, we propose a new methodology, the *coherence framework*, which suggests the steps to understand if the direction of strategic growth is coherent with the industry trends direction. The proposed framework is based on the utilization of foresight and aims at analyzing the alignment between external environment (industry trends) and internal environment (vision and products). It is useful to check if the company direction of strategic growth is coherent with the direction of industry trends, in other words to verify if the orientation to the future of the company is correct and opportune.

The analysis takes place thorough a triple comparison: industry megatrends with company vision, vision with products and finally megatrends with products. Corporate Foresight has a supporting role on this analysis, because it permits to individuate which the industry trends are, and then precede comparing vision and products. In this way the company attains in understanding if the own strategy is aligned with what is happening externally, in the PEST context (Political, Economical, Environmental, Social and Technological), in the competitors context and in its customers context, and with what is happening internally, both at the cultural and vision level, both at own research and present and future products.

Figure 1 schematizes the proposed framework, that explains how CF is a support and permits an evaluation of the company strategic coherence (analyzed through vision and products) respect future scenarios.

After having identified the scenarios and the specific industry trends (through corporate foresight), there is a double analysis between the external and the internal contexts of the company: these trends are compared first with the vision and then with the products, to check if vision and trends are going in the same direction of the industry trends, in other words if the company's orientation to the future is consistent. Finally, an other analysis, this time completely internal, is the coherence and the alignment between vision and products, that gives an answer to the question if the products follow the declared line of the company, in other words if the products made today and the products thought for the future go in the same direction that the company sees for its future, declined and expressed by the vision.

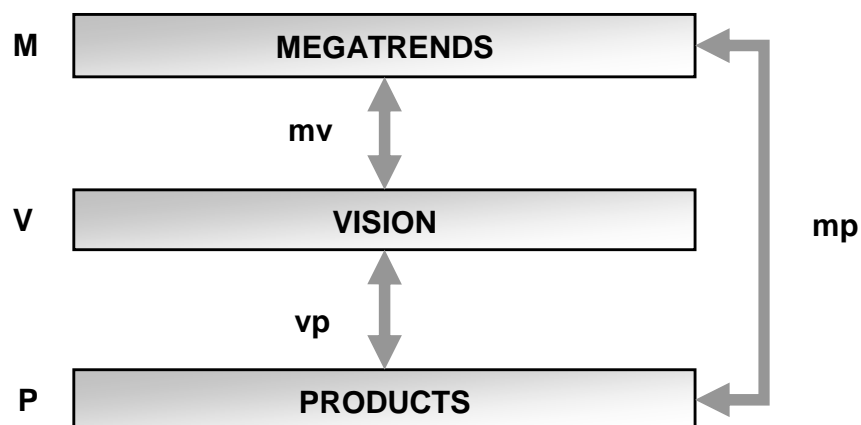


Figure 1. The coherence framework

The proposed methodology, to read the company strategy through Corporate Foresight, takes place in two macro-phases:

- a characteristics analysis;
- an alignment analysis.

The *characteristics analysis* investigates the single factors - megatrends vision and products (M, V, and P respectively) - and individuates which are their main characteristics. The *alignment analysis* instead compares the factors M, V and P crossing them two by two, so a megatrend-vision (mv) analysis, a vision-products (vp) analysis and a megatrend-products (mp) analysis.

Figure 1 shows the three factors (M, V, P) and the three comparisons (mv, vp, mp).

In Table 1 the macrophases and phases of the coherence analysis megatrend–vision–products are evidenced.

Table 1. Macrophases and phases for the coherence analysis in a CF optic

MACROPHASES	PHASES	
CHARACTERISTICS ANALYSIS	Trends and megatrends characteristics analysis	M
	Vision characteristics analysis	V
	Products characteristics analysis	P
ALIGNMENT ANALYSIS	Megatrends – vision alignment analysis	mv
	Vision – products alignment analysis	vp
	Megatrends – products alignment analysis	mp

In the next paragraphs we will in details explain the proposed methodology phases and we will use a case study to illustrate the functioning of the coherence analysis tool.

4.1 Characteristics analysis

The characteristics analysis began with the analysis of the three factors:

M. trends and megatrends characteristics analysis;

V. vision characteristics analysis;

P. products characteristics analysis;

for each of these factors, it is necessary to evidence the main principles and characteristics, as they will be comparable with the principles and characteristics of the other factors.

Trends e megatrends analysis

The megatrends analysis considers the specific industry sector, and investigates and individuates for the specific company and for its environment which the scenarios in the PEEST development context are. It has been chosen to analyze only the specific reference sector following Porter (1985)'s suggestions: the basic analysis unit to understand the competition and the uncertainties of the system is the analysis of the inside of the industry sector. As regards the weak signals or the so-called fat tails (wild cards) we invited the experts to highlight also these kinds of possibilities.

The megatrends analysis is an analysis of the external context of the company, in other words the possible developments of the industry sector scenarios are described. The trend analysis is done referring to the main industry sector, and it has the aim to investigate the state of the art of the overview, but not only technological (new technologies, areas and competence centres at an international level where technology is developing,

interdependences among different sectors/technologies, etc.), but also inside the all PEEST environment where the company finds itself.

Normally, these investigations begin with the individuation of the keywords in meetings with experts and local operators, made to discuss and evidence the main themes of interest of the analyzed sectors. In particular, information research are made, both in technical-scientific data stores, with techniques of business intelligence and the relative results are classified through text mining and clustering tools. In fact, when the effectuated researches produce a considerable number of results, it is practically impossible to analyze manually the single gained information. In these cases it is necessary to utilize dedicated softwares for the data analysis that permit, in a completely automatic way, the clusterization and a synthetic knowledge extraction from these sets of results, finding and quantifying in documental groups (also in graphical form) the discovered information and correlations, sometimes unforecastable and of high informative value. These instruments constitute a decisional support of high level and are used in many fields of the company and research activities, anywhere there are "information mines" to explore and analyze. Finally, the clustering tools permit also a correlation statistic analysis among the variables, in order to eliminate the eventual redundancies. Moreover, beside the trend definition, often the experts are asked for an impact evaluation of the specific trends on the sector: positive, negative or neutral.

Finally, it has to be reminded that the use of information clustering tools characterises in a significant way the methodology of research, as it permits to analyze an enormous quantity of data to group them in terms of sophisticated text mining algorithms. This permits a more easy reading of analyzed information in order to individuate the ones that result of major interest and that worth to be singularly deepened.

Moreover, the researches are conducted by technical staff adequately prepared, but not necessarily expert in the themes analysed; for this reason the collaboration of the actors operating in the sector is fundamental in order to give further useful elements to individuate the cues of major interest and deep the most relevant themes.

Vision analysis

Vision, together with mission and objectives, is an important tool for any organization. Actors in fact act to create a well coordinated system, and strain to reach a determined future scenario; vision is essential to establish an identity, to give a rout to follow, to point out a horizon, a passage from the actual situation to a possible future one, if jointly realized.

An effective vision, in fact, concerns what the organization wants to be and gives a direction through a series of indications connected to future. Besides, these few lines will be the tool that has to carry the enterprise to reach the excellence, remembering to all the distinctive competences that allow it to be different from others. The vision is, therefore, the desired future state of the business.

Vision is as a horizon: by itself it is not obtainable but it is dreamt. And it is the dream that can push the company toward an unattainable horizon that can have different tones according to which direction you look from. Vision usually answers to the question: "How/where would you want to see you in 3 or 5 years?" (Collins and Porras, 1996).

As regards the proposed methodology, the vision characteristics analysis is necessary to understand in what direction the company is moving and would like to move, in other words what its idea of future is. The vision analysis doesn't only consider the "spot" sentence that is contained in the word vision, but it is wider and investigates an enlarged vision, in other words what the whole vision of the future of the analyzed company is.

Products analysis

Products are a practical and operative realization of the company vision. They are the present state of the company practicality. But there are also the products presents in the research labs, the hypothesised products, the products that will be the basis of the future operations of the company.

It is necessary that the vision and the products are aligned to have a company with internal coherence, in other words coherence between its own vision of the future and its own objectives and what it is indeed actually realizing. Then it is also necessary that the products are coherent with the trends of the industry sector, because this means that what the company operationally does, goes toward the correct direction of the trends.

4.2 Alignment analysis

The alignment analysis is deployed through three comparison types:

- mv.** megatrends – vision alignment analysis;
- vp.** vision – products alignment analysis;
- mp.** megatrends – products alignment analysis.

This analysis is based again on the experts' judgment and on the Delphi panel (Dlakey and Helmer, 1972): they, in fact, have to express (also in numerical form through scales) some subjective judgments on the congruence of

the various intersections among variables. The alignment analysis' outputs are different comparison matrixes, in fact, by comparing the three elements two by two, a matrix cascade can be originated (see Figure 2).

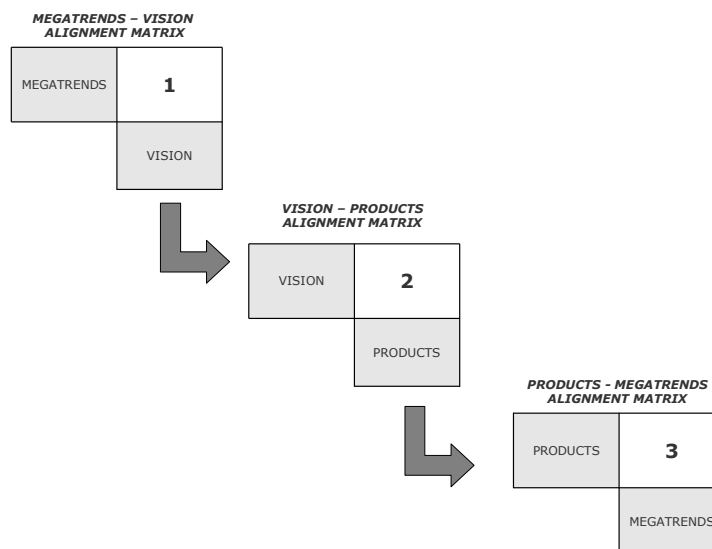


Figure 2. Matrixes cascade from the alignment analysis

Megatrends - vision alignment

The megatrends-vision comparison is an analysis of external-internal alignment. After the identification of the characteristics connected to trends and megatrends and the characteristics connected to the vision, these characteristics are crossed to evaluate which one of these correspond to the others, in order to appraise an alignment or not of vision on trends and megatrends.

This evaluation is also expressed by experts, who jointly give a discreet evaluation from 0 to 3 on the alignment of the single characteristic of the vision with the single megatrend (measure *a*): the value 0 expresses null alignment, the value 1 low alignment, the value 2 middle alignment and the value 3 high alignment.

The value *b*, which is built through the average of the measures *a*, expresses both a measure of alignment of the single characteristic of the vision on single megatrend, both a measure of presence of the single megatrend on the single characteristic of the vision. From the average of the values *b* in horizontal the value *c* is originated, that expresses the measure of the presence of the single megatrend in the vision. From the average of the values *b* in vertical instead, the value originated is *d*, which expresses the measure of alignment of the single characteristic of the vision with the megatrends. Finally, from the average of the values *c* in vertical, the measure of presence of the megatrends in the vision is originated, that coincides with the average of the values *d* in horizontal, which is the measure of alignment of the vision with the megatrends.

From the comparison framework, therefore there are originated two measurements: the alignment and the presence. In fact, after having established if the single characteristic of the vision is lined up with the single trend of the megatrend (*a*), it is derived the measure of alignment of the single characteristic of the vision with the specific megatrend (*b*), that can be also be read as the measure of presence of the megatrend in the specific characteristic of the vision (*b*). Grouping data and reading the matrix horizontally, it is originated the measure of presence of the single megatrend in the whole vision (*c*). Grouping data and reading the matrix vertically, the measure of alignment of the single characteristic of the vision with the megatrends (*d*) is originated. Finally, the final value (*e*) that is obtained expresses both a measure of alignment of the vision with the megatrends both a measure of presence of the megatrends in the vision.

For a better clarity, Table 2 exemplifies the general comparison framework between trends and megatrends and vision, with the legend below that reports the measurements explained here above.

Table 2. Megatrends - vision (mv) comparison framework

MEGATREND	TREND	COMPANY VISION					VISION CHARACTERISTIC VN	
		VISION CHARACTERISTIC V1	VISION CHARACTERISTIC V2	VISION CHARACTERISTIC V3	...			
MEGATREND M1	TREND T1	b	a					c
	TREND T2							
	TREND T3							
	...							
MEGATREND M2	TREND T1							
	TREND T2							
	TREND T3							
	TREND TN							
MEGATREND M3	TREND T1							
	TREND T2							
	TREND T3							
	TREND TN							
...	TREND T1							
	TREND T2							
	TREND T3							
	TREND TN							
MEGATREND MN	TREND T1							
	TREND T2							
	TREND T3							
	TREND TN							
		d					e	

a	ALIGNMENT MEASURE OF SINGLE VISION CH V1 ON SINGLE TREND T1	Measure from 0 to 3 through experts judgement, that says if and how much (0 null, 1 low, 2 middle, 3 high) the vision characteristic V1 is aligned with the single trend T1	Built trough experts judgments
b	ALIGNMENT MEASURE OF SINGLE VISION CH V1 ON SINGLE MEGATREND M1	Value from 0 to 3 that measures how much the characteristic of the vision V1 is aligned with the single megatrend M1	Calculated through measures a average coinciding values
b	PRESENCE MEASURE OF SINGLE MEGATREND M1 ON SINGLE VISION CH V1	Value from 0 to 3 that measures how much the megatrend M1 is present in the single characteristic of the vision V1	Calculated through measures a average
c	PRESENCE MEASURE OF SINGLE MEGATREND M1 ON VISION	Value from 0 to 3 that measures how much the megatrend M1 is present in the vision	Calculated through measures b average horizontally
d	ALIGNMENT MEASURE OF SINGLE VISION CH V1 ON MEGATRENDS	Value from 0 to 3 that measures how much the characteristic of the vision V1 is aligned with the megatrends	Calculated through measures b average vertically
e	ALIGNMENT MEASURE OF VISION ON MEGATRENDS	Value from 0 to 3 that measures how much the vision is aligned with the megatrends	Calculated through measures d average horizontally coinciding values
e	PRESENCE MEASURE OF MEGATRENDS ON VISION	Value from 0 to 3 that measures how much the megatrends are present in the vision	Calculated through measures c average vertically

Vision – products alignment

The vision-products comparison corresponds to an internal alignment analysis. The question to answer is: given a vision of the company, are the products that the same company produces coherent with what is declared in the vision?

This analysis is developed from a temporal point of view: the main products existing in the company are analyzed, but also the products of the past (or however the products on which the firm founds its tactic) and the future products (in other words the products that have not been realized or commercialized yet, but are still ideas or as prototypes).

The vision-products comparison is an analysis of internal-internal alignment. After having identified the vision characteristics and the products ones, they are crossed to evaluate which one of these ones correspond to the others, in order to evaluate an alignment or not of the vision on the products.

This evaluation is also done by experts, who jointly give a discreet evaluation from 0 to 3 on the alignment of the single characteristic of the vision with the single product (measure a). From the a values average in horizontal the value originated is c, that expresses the measure of presence of the single characteristic of the vision in the products. From the a values average in vertical instead the value originated is d, that expresses the measure of alignment of the single product with the vision. Finally, from the average of the values c in vertical the measure of presence of the vision in the products is originated, that coincides with the average of the values d in horizontal, that is the measure of the alignment of products with the vision.

Also from this comparison scheme therefore there are originated two measurements: the alignment and the presence. In fact, the final value (*e*) expresses both a measure of alignment of the products with the vision both a measure of presence of the vision in the products.

Table 3 exemplified the vision-products comparison framework.

Table 3. Vision - products (vp) comparisons framework

VISION	PRODUCTS				
	PRODUCT P1	PRODUCT P2	...	PRODUCT PN	
VISION CHARACTERISTIC V1	<i>a</i>				<i>c</i>
VISION CHARACTERISTIC V2					
VISION CHARACTERISTIC V3					
...					
VISION CHARACTERISTIC VN					
	<i>d</i>				<i>e</i>

<i>a</i>	ALIGNMENT MEASURE OF SINGLE VISION CH V1 ON SINGLE PRODUCT P1	Value from 0 to 3 obtained by experts judgement, that says if and how much (0 null, 1 low, 2 middle, 3 high) the vision characteristic V1 is aligned with the single product P1	Built through experts judgments	
<i>c</i>	PRESENCE MEASURE OF SINGLE VISION CH V1 ON PRODUCTS	Value from 0 to 3 that measures how much the characteristic of the vision V1 is present in the products	Calculated through measures <i>a</i> average horizontally	
<i>d</i>	ALIGNMENT MEASURE OF SINGLE PRODUCT P1 ON VISION	Value from 0 to 3 that measures how much the products are aligned with the vision	Calculated through measures <i>a</i> average vertically horizontally	
<i>e</i>	ALIGNMENT MEASURE OF VISION ON PRODUCTS	Value from 0 to 3 that measures how much the products are aligned with the vision	Calculated through measures <i>c</i> average horizontally	coinciding values
<i>e</i>	PRESENCE MEASURE OF PRODUCTS ON VISION	Value from 0 to 3 that measures how much the vision is present in the products	Calculated through measures <i>b</i> average vertically	

Megatrends – products alignment

It is possible that the three elements are not perfectly lined up among them, therefore a following and third analysis is needed. Obviously, if the elements are lined up between them (if $M = V$ and $V = P$), the comparison analysis between the other two factors will give as output $M = P$. However it more often verifies the case that M and V and V and P are not perfectly coherent among them, and it can also for example be that the vision is totally not aligned with megatrends, but that instead megatrends and products are lined up.

The third comparison is therefore that of megatrends-products, that is an external-internal alignment analysis. For each product, its characteristics are compared with the trends and megatrends ones, trying to identify if there are correspondences or not. Usually analysis considers the past products, the present products and the most innovative products or the products that are still prototypes or still in the research, this to understand if the growth direction is lined up with the trends direction.

Also in this case, the first evaluation is given by experts, saying if and how much (discreet values from 0 to 3) the single product is lined up with the single trend (measure *a*).

From the comparison framework, two measurements are originated: the alignment and the presence. In fact, after having established if the single product is lined up with the single trend of the megatrend (*a*), the measure of alignment of the single product with the specific megatrend (*b*) is derived, that can be also be the measure of presence of the megatrend in the specific product (*b*). Aggregating data and reading the matrix in horizontal, the measure of presence of the single megatrend is originated in the whole set of considered products (*c*). Aggregating data and reading the matrix in vertical, the measure of alignment of the single product with the megatrends is originated (*d*). Finally, the final value obtained (*e*) expresses both a measure of alignment of the products with the megatrends both a measure of presence of the megatrends in the products.

For a better clarity, Table 4 exemplifies the general scheme of comparison between trends and megatrends and products, with the underlying legend that shows the measurements just explained.

Table 4. Megatrends - products (mp) comparison framework

MEGATREND	TREND	PRODUCTS						
		PRODUCT P1	PRODUCT P2	PRODUCT P3	...	PRODUCT PN		
MEGATREND M1	TREND T1	<i>b</i>	<i>a</i>					<i>c</i>
	TREND T2							
	TREND T3							
	...							
MEGATREND M2	TREND T1							
	TREND T2							
	TREND T3							
	...							
MEGATREND M3	TREND T1							
	TREND T2							
	TREND T3							
	...							
...	TREND T1							
	TREND T2							
	TREND T3							
	...							
MEGATREND MN	TREND T1							
	TREND T2							
	TREND T3							
	...							
		<i>d</i>					<i>e</i>	

<i>a</i>	ALIGNMENT MEASURE OF SINGLE PRODUCT P1 ON SINGLE TREND T1	Value from 0 to 3 obtained through experts judgement, that says if and how much (0 null, 1 low, 2 middle, 3 high) the product P1 is aligned with the single trend T1	Built trough experts judgments	
<i>b</i>	ALIGNMENT MEASURE OF SINGLE PRODUCT P1 ON SINGLE MEGATREND M1	Value from 0 to 3 that measures how much the product P1 is aligned with the single megatrend M1	Calculated through measures <i>a</i> average	coinciding values
<i>b</i>	PRESENCE MEASURE OF SINGLE MEGATREND M1 ON SINGLE PRODUCT P1	Value from 0 to 3 that measures how much the megatrend M1 is present in the single product P1	Calculated through measures <i>a</i> average	
<i>c</i>	PRESENCE MEASURE OF SINGLE MEGATREND M1 ON PRODUCTS	Value from 0 to 3 that measures how much the megatrend M1 is present in the products	Calculated through measures <i>b</i> average horizontally	
<i>d</i>	ALIGNMENT MEASURE OF SINGLE PRODUCT P1 ON MEGATRENDS	Value from 0 to 3 that measures how much the product P1 is aligned with the megatrends	Calculated through measures <i>b</i> average vertically	
<i>e</i>	ALIGNMENT MEASURE OF PRODUCTS ON MEGATRENDS	Value from 0 to 3 that measures how much the products are aligned with the megatrends	Calculated through measures <i>d</i> average horizontally	coinciding values
<i>e</i>	PRESENCE MEASURE OF MEGATRENDS ON PRODUCTS	Value from 0 to 3 that measures how much the megatrends are present in the products	Calculated through measures <i>c</i> average vertically	

5 Eurotech case study

5.1 Choice of the case study

This paper focuses now on the application of the coherence framework to an enterprise that operates in the ICT sector: the Eurotech holding. It has been selected the research methodology of the case study selecting a strongly innovative firm and a case of success within the corporate foresight.

The coherence framework examines the trends and the megatrends in the PEEST environment, and compares them with the vision and the products in order to understand if these three elements are coherent among them, and therefore to identify if the company direction is channeled in the direction of the trends. This coherence has been analyzed in reference to vision and products of the past and vision and products of the present, so that to understand if and how much the corporate foresight has influenced the company growth.

The case study has therefore the aim of evaluating the coherence between trends and megatrends of the biotechnological evolution and the vision and the products of this innovative and visionary company of the ICT sector, Eurotech. Then the coherence has been evaluated between trends and vision, between vision and products and between trends and products, as schematized in Figure 1.

Eurotech's headquarters are located in Amaro (Udine, Italy), but it is a multinational company (examples of its international presence are its quarters in Europe, America and Japan). Its principal market is the one of the pervasive computation, which can be divided into the ones of the nano-PC and the HPC (high performance computers).

The analysis, which the case study refers to, has been conducted from March 2006 to March 2007. Particularly, the analysis of the external environment (of megatrends and trends) refers to the same period, as the company analysis. The vision is then referred also to that period, and also the analyzed products have been selected with a temporal criterion: in fact, we will see that the analyzed products are the embedded pc (considered "products of the past" in terms of innovation, because they are the products with which the company was born in 1992 and on which there are more development studies than research ones), the supercomputers (within the HPC market), the wearable computers (the 2006 Eurotech most innovative product within the pervasive computation market) and the integrated sensors (product that was still in the phase of research and prototyping, and that will be go out of the market during 2007).

5.1 Characteristics analysis

Trends and megatrends analysis

The identification of the characteristics of the megatrends and trends related to the ICT sector has been conducted through different procedures:

- analysis of the literature on the trends of the ICT sector;
- use of Corporate Foresight techniques (Delphi analysis, technology roadmapping, brainstorming, etc.);
- involvement of actors with experienced profiles but coming from different sectors (economy, electronics, biology, computer science, etc.) in order to augment the cognitive diversity of the group;

so that to allow a profitable exchange of ideas and a best identification of the trends due to the difference of sources and used techniques. Besides, clustering tools have been used and possible redundancies among variables have been eliminated.

The ICT sector is a particularly complex and dynamic environment, that continually transforms itself due to the strong acceleration of the technological change (Kurzweil, 2006). The exponential progress of the digital technologies in terms of speed, miniaturization and connection conducts in fact toward a different environment, characterized by strong uncertainty.

The trends and megatrends analysis underlines as from the end of the 20^o century we are assisting to the revolution conducted by the new digital information and communication technologies, an irreversible revolution destined to change in depth the areas of the society and of the individuals too. In this sense, the evolution of the man and the evolution of the computer are converging more and more, it is called in fact biotechnology evolution.

The trend for the computers is toward the miniaturization, the diffusion and the integration in the environment (embeddedness) and the so-called "invisibility", this new paradigm is the one of ubiquitous computing (or pervasive computing). The trend from an anthropological point of view outlines the phase of the homo technologicus or homo zappiens, symbiosis of man and technology. The computer is being in fact integrated more and more with the man: from the personal computer on the desk to handheld computer (cellular phone, PDA), now the computer is becoming wearable in other words it can be found on the man as a suit (wearable computer), and the future sees its passage inside the man (see researches on chips for medical applications for example for cures inside the body).

In Table 5 there is the framework of the theoretical proposal of trends and megatrends that will be used for the coherence analysis.

The fifteen trends have been divided in similar groups from which the five megatrends of the biotechnological co-evolution have been derived: changes acceleration; technology essentiality; man-technology interaction; augmented reality; symbiosis.

Table 5. Trends e megatrends characteristics of the industry sector of Eurotech (M)

MEGATRENDS	TRENDS
CHANGES ACCELERATION	Acceleration
TECHNOLOGY ESSENTIALITY	Essentiality
MAN-TECHNOLOGY INTERACTION	Irreversibility
	Conditioning
	Man-technology transformation
AUGMENTED REALITY	Expansion and contraction
	Invisibility
	Pervasivity
	Augmented reality
	Connectivity

SYMBIOSIS	Informationalism
	Iperstuality
	Technology-man transformation
	Organic and e inorganic integration
	Convergence

Vision analysis

The analysis of the vision characteristics in Eurotech has been conducted through different channels:

- consultation of company official documents (website and internal documents);
- consultation of the press-review related to the company;
- consultation of interviews released by the key stakeholders of the company (CEO, CTO, CFO, etc.)
- direct interviews with two key actors of the company: the CEO and the CTO.

Also for the vision, clustering tools have being used and eventual redundancies among variables have been eliminated.

The philosophy at the basis of Eurotech is connected to the principle of Mark Weiser, father of the ubiquitous computing, that is: “The most important technologies are the ones that disappear, they wave themselves in the fabric of everyday life until they are undistinguishable from it”. This characteristic of invisibility is given from the progressive diffusion of the technologies and from their integration with the everyday life that is the “assimilation” in the daily objects. The direction of the invisibility from a technical point of view takes to the revolution of the ubiquitous computing: the miniaturization and the integration (embeddedness) of the computers will conduct to the “smart dust”, the computers will be smaller and smaller up to become smart grain of sand.

From a conceptual point of view instead we are now entering the symbiotic era of the man-machine interaction, this means that biology and technology are progressively converging the one to the other. Eurotech thinks that the computers will disappear, the computers are becoming pervasive, and the characteristics that will distinguish them are:

- high-band connection to internet in every moment;
- a lot of available computation on demand through the GRID network;
- mini embedded computers: in the environment; in our dresses; in our body;
- augmented reality.

In reality the Eurotech vision is not only limited to these aspects, but it has been widened according to different images of future that the firm outlines as possible.

After having understood the Eurotech vision and the declinations of this vision, its characteristics have been synthesized, as it can be seen in Table 6.

Table 6 – Vision characteristics in Eurotech (V)

EUROTECH VISION
Computing directions: supercomputer, pervasive
Acceleration
Network humanizing technology
Interconnection
Informationalism
Symbiotic era, homo zappiens

Products analysis

Also the products analysis of Eurotech has been conducted through different channels:

- consultation of official documents of the company (website and internal documents);
- consultation of the press-review related to the company;
- consultation of interviews of the company key stakeholders (CEO, CTO, CFO, etc.)
- direct interviews with two key actors: the CEO and the CTO;
- analysis of the products technical characteristics;
- analysis of the products functional characteristics;
- analysis of the markets of the products.

Besides, in the analysis we tried to maintain also a historical perspective, we have therefore chose to analyze the embedded pc and the today’s most innovative products, as the wearable computer Zypad and the

supercomputers ApeNEXT and Clù, and finally the sector transport has been analyzed generally and particularly with the product Vista. From this analysis the principal characteristics of these products have been underlined¹.

The Eurotech market is the one of the pervasive computation: high-performance computers, embedded computers, network computers, wearable computers, smart sensors. The pervasive computing includes smart devices (nanoPC), infrastructures of digital communication and high-performance distributed computers (HPCs), and these together create the environment of pervasive computing. This all infrastructure is called GRID.

The Research and Development of Eurotech is directioned along two extreme directives: on one side the miniaturization, with the study of sensors and small computers for the information elaboration (pervasive, wearable computer), from the other the supercomputers, because it is necessary a central elaborator that has the function of control and elaborates together all the information derived by the sensors (supercomputer).

The addressable markets, as regards the nano-PC are mainly the defense, transports, medical and industrial sectors; as it regards the HPCs the principal clients are universities, research institutes and calculation centers.

We choose to write here the characteristics analysis of only some Eurotech's products. The embedded pc have been chosen as "products of the past" (from which Eurotech has begun its business in 1992), and as "products directed to the future" for the orientation of the pervasive computing the integrated sensor Vista and the wearable computer Zypad, and for the orientation of the HPC the supercomputers Apenext and Clù.

Successively, we schematize briefly the description of the considered products.

Table 7. Eurotech products characteristics (P)

PRODUCT	CHARACTERISTICS
EMBEDDED PC	<ul style="list-style-type: none"> • miniaturized computers • highly reliability for a use in critical environments • integration of intelligence and connectivity functions
INTEGRATED SENSOR (VISTA)	<ul style="list-style-type: none"> • systems of vision, called "digital eyes": combination of computing resources and vision functions (System-on-chip) • smart miniaturized videocamera able to analyze static or move objects • applied to the rear-view mirrors of the cars, it can understand other vehicles coming near, and it can signal it to the driver with an acoustic signal (recalling attention and reducing the risk of incidents) • it can also be used as an auxiliary camera for the automatized drive
WEARABLE COMPUTER (ZYPAD)	<ul style="list-style-type: none"> • PC that can be worn in the wrist • high computing power • "hand free" principle • constant connection on web
SUPERCOMPUTER (APENEXT, CLU')	<ul style="list-style-type: none"> • parallel machines, that give a calculation power of ten and more Teraflops • high computing power • reduced energy consumption • reduced occupied space • more accessible technology • Clù is a Personal Supercomputer

5.3 Alignment analysis

Megatrends – vision alignment

The following table schematizes the comparisons between megatrends and vision of the case study: the application of all the technology megatrends previously determined can be found in the Eurotech vision.

In synthesis, the megatrends and vision comparison is being highlighted in the following table (Table 8).

The analysis can be a useful tool to suggest to the company in which directions to move to be innovative and in line with trends. The analysis shows, in fact, which ones of the characteristics of the vision are less mirrored in the trends are (in the Eurotech case interconnection and informationalism) and which ones the megatrends less mirrored in the vision are (as the megatrend of man-technology interaction).

Eurotech has (as underlined by the alignment value of 2,18) a very high alignment between megatrends and vision, and it is therefore classifiable as a case of visionary and strongly innovative company.

¹ Due to reasons of company secretiveness, we report only the final schemes of the alignment analysis.

Table 8. Values of the megatrends-vision alignment analysis (mv)

		EUROTECH VISION												
MEGATRENDS	TRENDS	Computing directions: supercomputer, pervasive		Acceleration		Network humanizing technology		Interconnection		Informationalism		Symbiotic era, homo zappiens		
CHANGES ACCELERATION	Acceleration	3,00	3	3,00	3	2,00	2	2,00	2	2,00	2	2,00	2	2,33
TECHNOLOGY ESSENTIALITY	Essentiality	3,00	3	3,00	3	3,00	3	1,00	1	1,00	1	3,00	3	2,33
MAN- TECHNOLOGY INTERACTION	Irreversibility	1,00	1	2,33	2	1,67	0	0,67	0	1,33	1	2,67	2	1,61
	Conditioning		0		3		2		1		3			
	Man-technology transformation		2		2		3		1		2		3	
AUGMENTED REALITY	Expansion and contraction	3,00	3	1,00	2	2,57	2	2,86	2	2,71	2	2,86	2	2,50
	Invisibility		3		0		2		3		3			
	Pervasivity		3		0		2		3		3		3	
	Augmented reality		3		2		3		3		2		3	
	Connectivity		3		1		3		3		3		3	
	Informationalism		3		1		3		3		3		3	
	Iperstuality		3		1		3		3		3		3	
SYMBIOSIS	Technology-man transformation	2,00	2	1,67	2	2,67	3	1,33	1	2,00	2	3,00	3	2,11
	Organic and e inorganic integration		2		1		3		1		3			
	Convergence		2		2		2		2		3		3	
		2,40		2,20		2,38		1,57		1,81		2,70		2,18

The megatrends-vision analysis in Eurotech has underlined a substantial alignment of the company vision with the sector megatrends. It can be also noticed that this tool of analysis can represent a useful tool for suggestions and following considerations, for example we can notice as the megatrend “man-technology interaction” presents a value of presence in the vision inferior than the other megatrends, and therefore we can suggest monitoring better this megatrend and increasing its presence in the vision.

Vision – products alignment

The internal alignment analysis occurs between vision and products, for Eurotech the analysis between vision and products has underlined a substantial coherence. We made two analyses, the first one considering also what we called the “products of the past” (Table 9) and another without (

Table 10).

In the first table, it can be noticed (by the analysis of the first column in comparison to the following three) how Eurotech passed from embedded computers to pervasive computers; while from the comparison of the numerical results of the first table and the second one, there can be noticed higher values of alignment in the second table, fact that points out as the actual vision is more mirrored in the actual products.

Analysis can be a diagnosis tool in two senses: to underline which characteristics of the vision are not found in the products, or to underline which products are more lined up with the vision.

From the analysis, it is underlined as on one side all the characteristics of the vision are found in the products, from the other as the products is lined up to the vision in mid-high measure, as the supercomputer, and in very high measure, as wearable computer or integrated sensor.

As regards the internal alignment, therefore Eurotech reveals itself as a case of excellence, above all if (as it is more correct) we consider the value without the products of the past (2,39), that is a very high value and it mirrors the internal coherence of the company .

Table 9. Alignment analysis of vision-products (vp)

EUROTECH VISION	EUROTECH PRODUCTS				
	PC EMBEDDED	SUPER COMPUTER	WEARABLE COMPUTER – ZYPAD	INTEGRATED SENSOR - VISTA	
Computing directions: supercomputer, pervasive	0	3	3	3	2,25
Acceleration	0	2	3	3	2,00
Network humanizing technology	0	3	3	3	2,25
Interconnection	2	1	3	3	2,25
Informationalism	1	1	2	2	1,50
Symbiotic era, homo zappiens	0	1	3	1	1,25
	0,50	1,83	2,83	2,50	1,92

Table 10. Alignment analysis of vision-products (vp) without the “products of the past”

EUROTECH VISION	EUROTECH PRODUCTS			
	SUPER COMPUTER	WEARABLE COMPUTER – ZYPAD	INTEGRATED SENSOR - VISTA	
Computing directions: supercomputer, pervasive	3	3	3	3,00
Acceleration	2	3	3	2,67
Network humanizing technology	3	3	3	3,00
Interconnection	1	3	3	2,33
Informationalism	1	2	2	1,67
Symbiotic era, homo zappiens	1	3	1	1,67
	1,83	2,83	2,50	2,39

Megatrends – products alignment

The comparison analysis between megatrends and products has been developed comparing every product family previously analyzed with the individuated scenarios.

In synthesis, the following tables (Table 11 and Table 12) show the synthesis schemes of the megatrends-products alignment analysis, considering the “products of the past” or not. The analysis has underlined a substantial coherence of the theoretical proposal, in fact all the five megatrends are reflected in the products.

Moreover the analysis can be a useful diagnosis tool, mainly in two directions: on one side in fact the most innovative and future-oriented products can be underlined and from the other one there can be underlined the megatrends that have not been found in the products.

As regards the most innovative products, this is evidenced from the comparison between the first table and the second one, where the “products of the past” have been removed. The embedded pc, in fact, show a low alignment with trends, this doesn't obviously mean that the firm doesn't have to point on these products anymore, but simply that they are products proper for today's market but that in the tomorrow market could not be sufficient to win the challenge of the competition. They are the products with which Eurotech has begun its business in 1992, that are improved in the “development” area and on which the company found its “hard core” of its business. A judgment can also be given on the other three products: the analysis, in fact, underlines as the integrated sensor is middle directed to the future, while the supercomputer and the wearable computer are strongly directed. These considerations could suggest to the company where and how to invest in greater measure to be deeper future-oriented.

As regards the megatrends instead, we notice as the megatrend “man-technology interaction” is less present in the products, with a value of 0,58 or 0,78 (in the case we don't consider the “products of the past”). The research of Eurotech could think then to an improvement of the considered products adding some characteristics with the finality to satisfy also this megatrend.

Table 11. Megatrends-products alignment analysis (mp)

		EUROTECH PRODUCTS								
MEGATRENDS	TRENDS	EMBEDDED PC		SUPERCOMPUTER		WEARABLE COMPUTER - ZYPAD		INTEGRATED SENSOR - VISTA		
CHANGES ACCELERATION	Acceleration	1,00	1	3,00	3	2,00	2	1,00	1	1,75
TECHNOLOGY ESSENTIALITY	Essentiality	2,00	2	3,00	3	2,00	2	2,00	2	2,25
MAN-TECHNOLOGY INTERACTION	Irreversibility	0,00	0	0,67	1	1,33	1	0,33	1	0,58
	Conditioning		0		0		1		0	
	Man-technology transformation		0		1		2		0	
AUGMENTED REALITY	Expansion and contraction	0,57	2	2,71	3	2,57	3	3,00	3	2,21
	Invisibility		0		2		3		3	
	Pervasivity		1		2		3		3	
	Augmented reality		0		3		3		3	
	Connectivity		1		3		3		3	
	Informationalism		0		3		2		3	
	Iperstestuality		0		3		1		3	
SYMBIOSIS	Technology-man transformation	0,33	0	2,33	3	3,00	3	2,00	2	1,92
	Organic and e inorganic integration		0		1		3		1	
	Convergence		1		3		3		3	
		0,78		2,34		2,18		1,67		1,74

Table 12. Megatrends-products alignment analysis (mp) without the “products of the past”

MEGATRENDS	TRENDS	EUROTECH PRODUCTS						
		SUPERCOMPUTER		WEARABLE COMPUTER - ZYPAD		INTEGRATED SENSOR - VISTA		
CHANGES ACCELERATION	Acceleration	3,00	3	2,00	2	1,00	1	2,00
TECHNOLOGY ESSENTIALITY	Essentiality	3,00	3	2,00	2	2,00	2	2,33
MAN-TECHNOLOGY INTERACTION	Irreversibility	0,67	1	1,33	1	0,33	1	0,78
	Conditioning		0		1		0	
	Man-technology transformation		1		2		0	
AUGMENTED REALITY	Expansion and contraction	2,71	3	2,57	3	3,00	3	2,76
	Invisibility		2		3		3	
	Pervasivity		2		3		3	
	Augmented reality		3		3		3	
	Connectivity		3		3		3	
	Informationalism		3		2		3	
	Iperstuality		3		1		3	
SYMBIOSIS	Technology-man transformation	2,33	3	3,00	3	2,00	2	2,44
	Organic and e inorganic integration		1		3		1	
	Convergence		3		3		3	
		2,34		2,18		1,67		2,06

5.4 Case study conclusions

In conclusion, the test has underlined as the proposed framework for checking the coherence of the strategic direction in comparison to the trends is feasible from an operational view point, and it introduces also some characteristics of diagnosis and it can be used as a correction tool.

The coherence analysis applied to the case-study has underlined, through a relatively easy methodology, which ones the variables that influence in stronger measure the company sector and it has underlined which industry sector trends are not reflected in the vision and in the products of the company.

The analysis confirms Eurotech as a particularly innovative and visionary firm, in fact its vision and its products result strongly lined up and coherent with the growth direction of sector ICT trends. Table 13 shows the synthesis of the alignment values underlined in the case study.

Table 13. Case-study synthesis

ALIGNMENT	VALUE IN EUROTECH	VALUE IN EUROTECH without “products of the past”
MEGATREND-VISION	2,18	2,18
MEGATREND-PRODUCTS	1,74	2,06
VISION-PRODUCTS	1,92	2,39

6 Conclusions and future developments

Starting from a literature gap of a complete method to understand and to check the strategic direction in comparison to the trends of the industry sector, this work had the aim to propose a methodology to analyze the coherence of the internal context of the company (vision and products) in comparison to the external context of the company (trends and megatrends of the own sector).

It is therefore possible to build a matrix 9x3 of alignment, as shown in Figure 3.

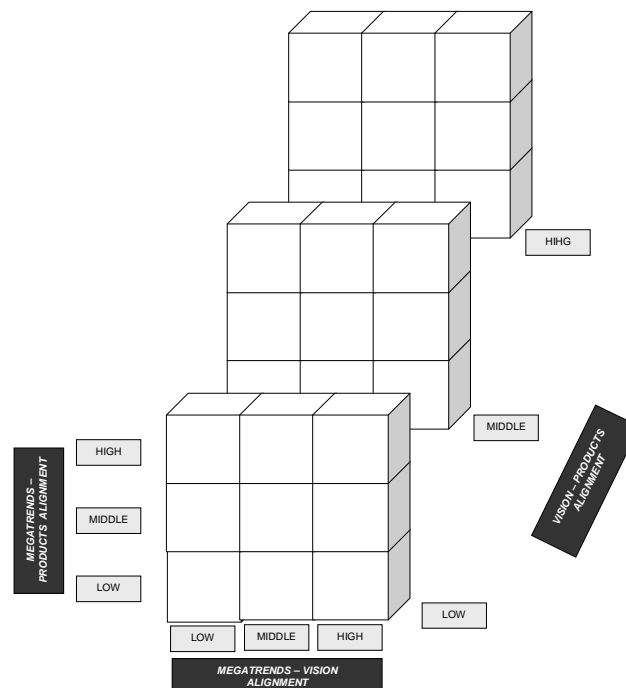


Figure 3. 9x3 coherence matrix

The position in the principal façade, formed from the x and y axes (mv and mp), points out the orientation of the company strategy in comparison to the future, in other words the real coherence megatrend - strategy (external - internal). We can divide then the principal façade in three areas according to the orientation to the future: a zone of low orientation, a zone of middle orientation and a zone of high orientation, as illustrated in Figure 4. The axle z (vp) finally adds the internal-internal analysis dimension.

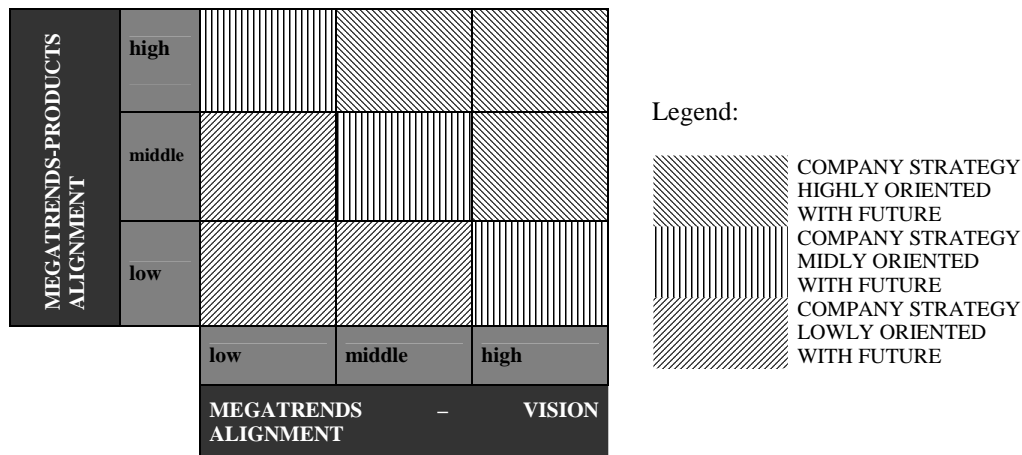


Figure 4. 3x3 external-internal coherence matrix

The proposed methodology finds its main outputs in giving some values with which this alignment can be measured.

Surely, a value of alignment equal to 3 in all the three evaluations is impossible to be reached, because an absolute or perfect forecast is impossible: the absolute forecast is possible only whereas the research is limited in noticing preexisting schemes of a closed or mechanic system, but instead in an open system the invention is a game of emergence and it is not possible to obtain a precise individuation of results. Hypothetically therefore, it can be supposed that a value above 2 is a good value, that attests the innovativity and the orientation to the future of the company, a value among 1 and 2 is a middle one and a value among 0 and 1 is a low one.

We underline as these values certainly result indicative and also the considerations that can be done on their positivity are hypothetical, in fact it would be necessary to do surveys and market analyses to define which range of final values can be considered as low, middle or high alignment. A future development of the research, and toward which the authors are working, is certainly the verification of the results through survey.

The methodology introduces implications both for the academics and for the managers.

On a practical level, in fact, the methodology suggests to managers the steps to complete for detecting if the strategic direction is directed to the future and aligned up with the trends of the own sector, through a simple and effective process that compares trends, vision and products.

From the analysis it is also possible to understand what the variables of great interest and toward which it is opportune to invest in a greater measure in the future. Besides, it is possible to develop also an internal analysis to understand if the strategy (vision) and the operations (products) of the company are coherent or not.

Finally, to the literature advancement level, the lack of a complete link between trends and megatrends, vision and products has been underlined and we therefore proposed a framework that fills the lack of indications of implementative type in respect of the Corporate Foresight.

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