DYNAMIC MODELING FOR "PRODUCTS PORTFOLIO" MANAGEMENT AND NEW PRODUCTS LAUNCHING

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Abstract

The paper aims to sketch a *dynamic model* in order to support decisions for the allocation of financial (i.e. cash flow provided by current sales) and human resources to Marketing and R&D policies, in order to better manage "product portfolio" and new products launching in an industrial firm.
The working hypothesis from which the paper stems is to consider that the strategic control for launching new products and monitoring the path of the old ones along their life-cycles is not only possible through the use of *accounting models,* but also through *dynamic models.*
Both kind of models indeed can be useful in "product portfolio" management; however, each of them may better satisfy different purposes.
More particularly, *accounting models* (i.e.: those which are mainly based on General Ledger data) may better support some cognitive purposes regarding the management of *each product* separately without taking in "account" the interrelation influences between new and old products.
On the other hand, the use of *dynamic models*, which is mainly based on non-accounting data, may particularly enable to:
- *improve management learning* of the system (as a whole) to be handled;
- *implement a strategic control* sub-system of resources allocation to products, drawing more on mental models, personal experience and intuition of the entrepreneur and of management than on accounting data;
- *improve an inter-functional and inter-divisional approach* and so a better understanding of trade-off among financial, marketing, production, R&D subsystems and though decision on "product portfolio" management;
- *point out the different levers* on which management may act and evaluate the different effects they may produce in the short and in the long term, so to assess the several possible consequences of managerial decision on product life-cycle;
- *better evaluate the medium/long term effects of product discretionary costs* (Advertising, R&D, Education, etc.) on product cash flows.
This may lead to a more integrated monitoring and understanding of the paths that different products may run along their life-cycle.
The above said working hypotheses will empirically be tested in a medium-sized wine producer firm.

Introduction

The major goal of the paper is to define a dynamic modelling approach which might support decisions concerning the allocation of financial and human resources to Marketing and R&D policies in order to better manage the "products portfolio" and new products launching in an industrial firm. The working hypothesis from which the paper stems is to consider that the strategic control for launching new products and for monitoring those already exist is possible not only through *accounting models* but also by using *system dynamic* methodology. Both kind of approaches indeed are useful in "product portfolio" management; however, each of them better satisfy different purposes.

More particularly, *accounting models* are essentially based on those data which are treated by so called "transactional" systems (inventory accounting, customers, suppliers, ...) and on information elicited from firm analytical and general accounting systems.

All *accounting models*- particularly the traditional strategic marketing ones - have the following common characteristics:

- *micro* problem oriented, neglecting the interactions between high level master variables;
- *rigid*, not oriented to simulation approach;
- *analytic*, particularly oriented to feed reporting structure systems;
- *generic*, poorly focused to specific firm needs;

last but not least *accounting models* are not oriented to support management decisions because they do not include and so understand firm *system structure*, which is the core of any high level decision.

On the other hand, the use of *dynamic models*, which is mainly based on non-accounting data, may particularly enable to:

- *improve management learning* of the system (as a whole);
- *improve communication* between people, drawing more mental models;
- *improve an inter-functional and inter-divisional approach* and so a better understanding of trade-off among financial, marketing, production, R&D subsystems;
- *point out the different levers* on which management may act and evaluate the different effects they may produce in the short and in the long term, so to assess the several possible consequences of managerial decision on product life-cycle;
- *better evaluate the medium/long term effects of product discretionary costs* (Advertising, R&D, Education, etc.) on product cash flows;
- *make continue updating of the model* and so to support firm frequent scenario changing.

After a brief general description of Product Life Cycle(PLC), it will be presented the "state of the art" of traditional approaches(based mostly on *Strategic Management Accounting* systems) to "product portfolio" management, mainly to underline their limits and so to verify how *System Dynamic* approach could help the management to better analyze , understand and so decide. The description of PLC in Italian Wine Sector will introduce the process which the paper will deal with to put in evidence the strength of *Dynamic Modeling* for "product portfolio" management in *Casa di Vinicola di Duca di Salaparuta* - here and after ***Corvo*** (a wine producer firm in Sicily).

The "Product Life-Cycle"

Often management ought to face problems concerning the firm "product portfolio" and/or the selection of Strategic Business Areas(SBA) [1] in which to compete.
Some of the most important problems concerning this management area particularly refer to the evaluation of the:
- most convenient time for a new product (SBA) launching;
- economic and financial consequences;
- different alternatives concerning human and financial resources allocation;
- different policies to pursue, economic and financial opportunities for product growth rate increase or for prolonging or shortening its maturity stage;
- causal dependencies of financial and economical flows related to different products and possible *levers* used to affect their dynamics;
- most balanced "product portfolio" configuration and, particularly, of the ability of the business system to finance the new products growth through the reinvestment of financial flows provided by more mature products;

The "Product-Life-Cycle" (PLC) analysis is a key-concept in managing "product-portfolio".
PLC depicts the behavior of each product sales revenues from its introduction on the market through its obsolescence.
To assert that each product has its own "life-cycle" implies that (Kotler 1986 449):
- it may satisfy only for a limited time span the needs for which it has been conceived;
- the same needs may be felt by consumers for a limited period of time and, so, may cause products obsolescence, even though they are still in life from a technical point of view;
- product sales evolve over distinct stages, each of them stresses specific management problems;
- each product financial and economical flows are influenced by its particular evolving stage;
- it is necessary to adopt different Marketing, Financial, R&D, Production strategies on behalf of the particular product evolving stage.

Usually, PLC is defined through four stages (Forrester 1958; Kotler 1984 ,459-462; Levitt 1965; Patton 1959; Dean 1950; Polli 1969; Buzzell 1966;; Guatri 1972,74-75.; Cox 1967; Ward 1992, 33-36) :
- launching;
- growth;
- maturity;
- decline.

The *growth* stage is normally characterized by a sharp sales increase, caused by promotion efforts, sustained in *launching* phase.
During this stage, the firm has normally solved technical, production and commercial problems; this implies that product technical and qualitative parameters may become more stable inclining a more standardized production.
This may lead to important cost savings (scale and experience economies) and so to higher profits.
On the other hand, in this stage financial flows - even though having a growing dynamics - may appear still negative. Such behavior may depend on the growing financial needs required by

[1] A SBA is made up by one or more Product/Market/Technology combinations that may be considered as a synthetical profitability area, characterized by an itself economic structure and by particular management needs (Coda 1990, 50-51).

current net working capital increases (particularly for account receivable and inventories), caused by the necessity to adopt commercial policies supporting a demand increase.
In the stage of *maturity*, sales normally continue to raise with a decreasing rate, as price and promotion policies tend to lose their impact on the potential market.
Both cash flows and profits are positive. However, cash flows may remain substantially steady, in virtue of less "aggressive" commercial policies (particularly due to payment delays); on the other hand, profits may decline, owing to the growing effect of Marketing-mix and, particularly, advertising costs.
After the *maturity* stage the PLC may evolve on one of the three following alternatives:
- *decline*, and the successive product withdrawal or abandonment;
- *freezing*, i.e.: the continue achievement of a steady state in the demand level and the consequent termination of product investments due to R&D, Production or Marketing activities;
- *renewing*, i.e.: a sales increase, due to investments oriented to increase and to improve product functions (Valdani 1986, 309 ; Franchi 1987, 389)

Particularly, the *decline* stage takes place when the demand growth rate starts to be negative, sometimes smoothly, or dramatically; in this stage both cash flows and profits have a decreasing trend.
To resume the above said considerations, figure 1 shows sales revenues, cash flows and profits of a "typical" PLC.

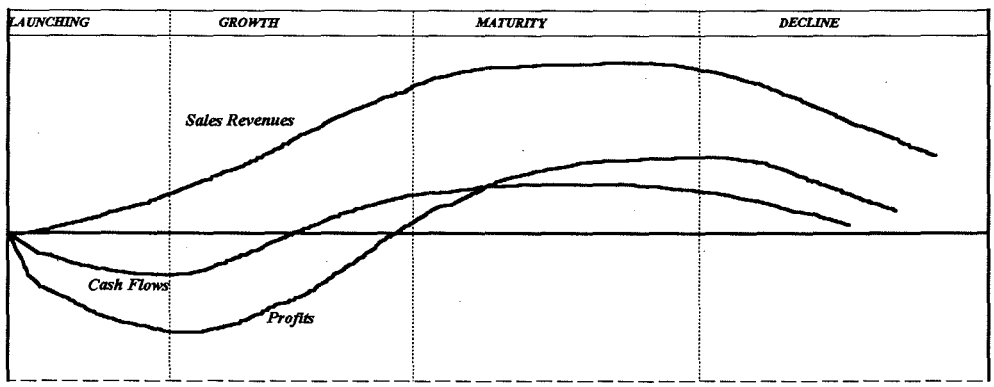

Figure 1. (from: Hax A. - Majluf N., Strategic Management,Prentice Hall Englewood Cliffs, 1984, pag.250).

The concept of PLC has been critiqued by several scholars. It has been particularly stated that:
- it is not so easy to foresee the PLC stages time length, also because they may differ according to different products and the market sector. In fact, some products take several years to by-pass the launching stage, while others are accepted in a short time by the market (Kotler 1986, 471);
- this concept independently refers to all kinds of products, without making any distinction among different levels of aggregation (e.g.: product classes, brands, or even durable and non-durable goods) (Polli 1968, 160-161; Porter 1980).
- PLC may impose a deterministic approach to strategy management decisions, that should be characterized by a dynamic point of view, being that a firm is not, by its very nature, a static system.

For example, due to a product sales reduction, the management could be tempted to believe that a stage of decline is coming next, while it may be a matter of contingent market fluctuations, or of a demand decrease caused by management and/or competitors decisions, independently on product attitude to satisfy consumer needs.

The decline stage will be unavoidable if, due to the demand reduction, top management decide to reduce funds for that product, in favor of new product investments.
It should be worth while, however, to examine different alternatives for demand stimulation changing, for example, client mix or different marketing levers, or again product positioning (Dhalla 1976).

"Product portfolio" models as a traditional tool to manage product mix.

All traditional "product portfolio" models have as a common denominator some general features that is worth while to underline.
In fact, information which could be elicited from them are as follows:
- *normative*, instead of *descriptive*;
- *partial*, instead of *systemic*;
- *static*, instead of *dynamic*;
- *exploring* of an existing state of the system, instead of *anticipating* of different possible scenarios (Ansoff 1984, 99);
- *unbalanced*, as they refer only to *some* variables as, for example, sales, revenues, cash flows, market share, ROI (Return On Investments), ROE (Return on Equity), instead of being well *balanced* both referring to key variables and to the *levers* through which it is possible to affect product portfolio performance;
- *deterministic*, instead of *stochastic*;
- *oriented to the planning staff*, instead of *to the line product management* too;
- oriented to a *cognitive*, instead of a *behavioral*, and/or *political decision making process* (Ansoff 1984, 100-101).

Traditional "product portfolio" models are, still today, main tools - also in Italian firms - on which strategic management accounting is based in order to support top management policies.
Such models, as well as those concerning management/responsibility accounting, may be defined as *accounting models*, as they draw mainly their data from a common base:
- *Transactional Systems* (e.g.: data on inventory, account receivable/payable, cash, ...),
- *General Ledger;*
- *Budgeting System.*

"Product portfolio" models are usually based on inter-relationships between market growth rate and market share for each product and/or SBA.
The model early (60's) proposed by Boston Consulting Group (BCG), represents a fundamental milestone for the ones further sketched by others.
Some of the most referenced among them are as follows:
- General Electric-McKinsey & C. model, using an *industry attractiveness-business strength* matrix (beginning 70's) (Hax 1991, 183-194);
- Arthur D. Little, Inc. model, using a *product maturity-business competitive position* matrix (1974) (Arthur D. Little 1974 1979 and 1980);
- an alternative BCG model, using a *Size of Competitive Advantage-Ways to Compete* matrix (beginning 80's) (Hax 1991, 206-207; Mc Namee 1985, 132-134);
- Marakon Associates model, using a *Profitability* matrix, crossing *business investment growth* and *Return On Equity* (ROE) (beginning 80's) (Marakon Associates 1980);

Referring to the literature on this subjects, quoted in the bibliography of this paper, it is worth while hereby to refer only to the BCG model.

The essence of the BCG approach is to represent the firm as a portfolio of different businesses, each one offering a stand alone contribution to the growth of company revenues. The firm is so viewed as a multi entity of largely independent units whose strategic guidelines are to be distinctively addressed (Hax 1984).
The matrix which is specifically represented by four-quadrant grid indicates in the x axis Relative Market Share (the strength of the firm in the SBA) and the y axis Market Growth Rate (the attractiveness of the market for the SBA). A breaking point, defined by the company, separates high-growth from low-growth business (figure 2).

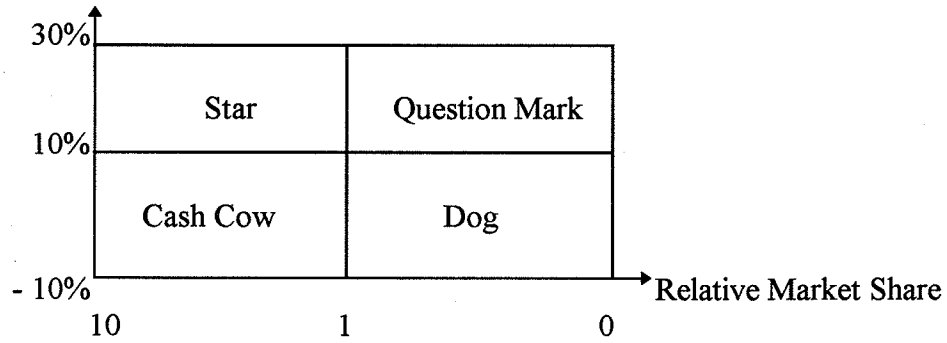

Fig. 2 - The growth share portfolio matrix

Once each product is positioned in the grid, the market man with statistics in mind associates a % which defines the contribution of the product in company earrings on sales. In fact, each product is represented on the matrix as a circle, whose diameter is proportional to its contribution.
Depending in which quadrant the product is positioned, through BCG approach it has a distinct characteristic (Morton; 1987) with regard to company cash-flow (figure 3).
So, just to conclude rapidly, this brief BCG description, the approach suggests, for each product a set of steps to undertake so to have best "feedback" from the market, taking in to account the cash transfer, from those products that are highly profitable but have a limited potential for growth, to those that offer attractive opportunities for future revenues.
Synthetically it can be affirmed;
- selective offensive strategies of "Question Marks" products;
- offensive strategies for all products in "Star" area;
- defensive strategies for "Cash Cows";
- divest or harvest strategies for Dog productions.

Morton, Löffler an Wiedmann in their paper show that BCG approach can lead to erroneous strategic choice by ignoring important feedback between the firm, its competitors and the general economic environment.
This means that, according to the BCG approach, a *balanced portfolio* has to include products simultaneously in three (Question Mark, Stars and Cash Cow) different quadrants. Even though a portfolio containing products only in the bottom-left quadrant might be considered more interesting in a *short term* perspective, on a financial point of view, it will be not so in a *medium-long term*, as "cash cow" products sales will decline and no "question mark" or "star" products will be raised to a "cash cow" class.

Concluding remarks on traditional portfolio models.

Further revisions and new formulations of portfolio models, after BCG, integrated and improved the foundations of the original concepts.

Stars	**Question Marks**
Scenario Highly attractive products, which have strong competitive position in a rapidly growing market. Interpretation Products generate large amounts of cash but at the same time require a significant inflow of cash resources to hold the competitive position in the growing market. Action Hold the position of products and invest.	Scenario Products which appear to be very attractive because of the high market growth rate, but have a low market share. Interpretation Large cash needed to stimulate market. Action Most favorable products must be selected and sufficient funds should be invested to achieve a leading position.
Cash Cows	**Dogs**
Scenario Products with extremely high competitive strength in a declining market, generate more cash than they can wisely reinvest into "Question Marks" and "Stars" Interpretation The resource allocation process has to be centralized at a higher managerial level, otherwise the management of a product will tend to reinvest in its own domain, suboptimizing the use of its resources. Action The large positive cash should be used to support the development of other businesses ("Question Marks" and partly "Stars").	Scenario Products are "great losers": unattractive and weak. Interpretation Cash generated by products at most is needed for maintaining their operations. Action If there is no specific reason, the logical strategy to follow would be harvesting or divesting

Fig. 3 Characteristics of the different product positions

The higher level of sophistication of such models has, on the other hand, weakened one of the major advantages of the traditional portfolio approach, which are particularly highlighted through *synthesis* and *immediate graphic exposition of results*.
In fact, most of methodologies adopted today are characterized by a too rigid and mechanistic approach.
This implies that if these models are simply used as "stand-alone", may be poorly efficient and unfocused to business real information needs, particularly in those contexts where it is not available neither a Strategic Management/Responsibility Accounting, nor a divisional organization structure.
Both in these last cases and, however, when the firm operates in a turbulent and complex environment, it is worth while to adopt *dynamic models* - or, at least, to put them together with traditional portfolio methodologies - so to support management through a systemic and flexible approach in understanding problems structure and market processes.
According to this view, traditional approaches may be useful in identifying *key-variables* relating to the relevant processes. However, these variables should be connected one another, usually according to non-linear relations, and possibly with other "input" variables, that could identify *management system levers* or *environmental external constraints*.

The Product Life-Cycle in the Italian wine sector.

The Italian wine sector, particularly in the last years, has been characterized by structural demand changes, due to decreasing consumption.
There are, at least, three main market segments (GPF & Associati 1994-95, 15):
1) *heavy consumers*, to which mostly correspond declining or mature products;
2) *medium consumers*, to which mostly correspond growing or already developed products;
3) *light consumers*, to which mostly correspond products in the launching stage or in transit from launching to development stage.
The first segment - even though most important from the consumption point of view - is nowadays decreasing. To this segment belong those less evolved socio-cultural classes (GPF & Associati 1994-95), who mostly drink wine during main meals and prefer *"every day" red wines*.
Wine consumption in Italy are today less and less related to daily habits (GPF & Associati 1994-95, 14) and more and more to important gastronomic and specific situations.
More evolved consumers, during daily meals, prefer either beer or new wine brands than in the past.
In conclusion, *medium* e *light consumers* segments are both increasing in respect of the first segment.
Medium consumers prefer *light wines*, both red and white, while *light consumers* prefer particularly *sparkling* and *young wines*.
In the early stage of the PLC it is possible to allocate "ad hoc" wines, either *fantasy* or *well known signed brands*, or even those labeled by the name of the species of wine.
In the growing stage it is possible to find *young* and *low alcoholic strength wines*.
Auto-consumption and *Direct supply* wines are identified in the *maturity* stage. *Sparkling* and *"DOC" fine wines* are positioned in the *renewing* stage.
Declining wines are those with a high alcoholic strength and *daily* and *low-price wines* (figure 4).

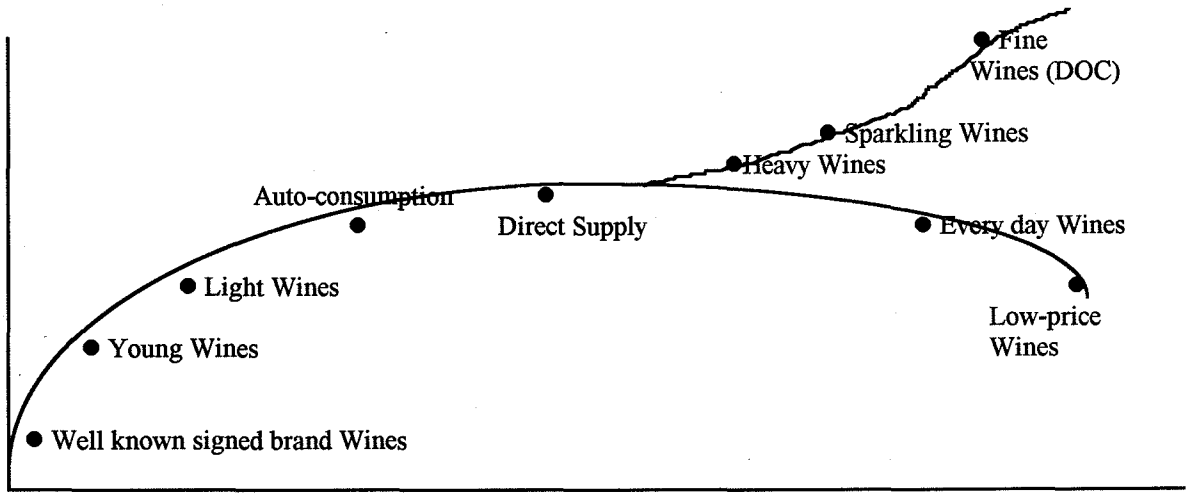

Fig. 4 - Today Italian Wine Life Cycle Position

Dynamic modeling to support "product portfolio" management in an Italian wine producer firm: Casa Vinicola Duca di Salaparuta (Corvo).

"Product portfolio" analysis in Corvo.

Today Corvo "product portfolio" is made up of 13 products, two of them are going to be launched, that may be grouped in 5 SBA:
1) *Classica*, containing *Corvo Bianco*, *Corvo Rosso*, *Corvo Rosato* and *Corvo Glicine* wines;
2) *Elegante*, containing *Colomba Platino* and *Terre d'Agala* wines;
3) *Riserve*, containing *Bianca di Valguarnera* and *Duca Enrico* wines;
4) *Specialità*, containing *Ala*, *Riserva Brut* and *Corvo Novello* wines;
5) *Giovane*, containing *Portale Bianco* and *Portale Rosso* wines.
The above said products are devided in two categories, according to their positive or negative sales trends:
a) *positives*: Corvo Rosso, Corvo Rosato, Corvo Glicine, Colomba Platino, Corvo Novello, Ala;
b) *negatives*: Corvo Bianco, Terre d'Agala, Duca Enrico, Bianca di Valguarnera, Riserva Brut.
Figure 5 shows all products position along their life-cycle curve.
After an initial analysis of the "product portfolio", it has been used the BCG methodology to identify the different policies to be pursued for each kind of wine (figure 6).
More particularly, it is possible to observe that:
- *Ala* is evolving towards *star* class;
- *Brut* and *Terre d'Agala* that impose a decision oriented to *renewing* or to *abandonment*, considering that a *decline* stage is next;
- *Bianca di Valguarnera* and *Duca Enrico*, for which it is necessary to understand if (and when) they will possibly evolve to *star* class or will permanently remain in the *question mark* class.
Colomba Platino, Corvo Glicine and *Corvo Novello*, being in the *star* class, are holding a good market position. They are good cash generators, but they require high investment support as their market segment is continuously growing.

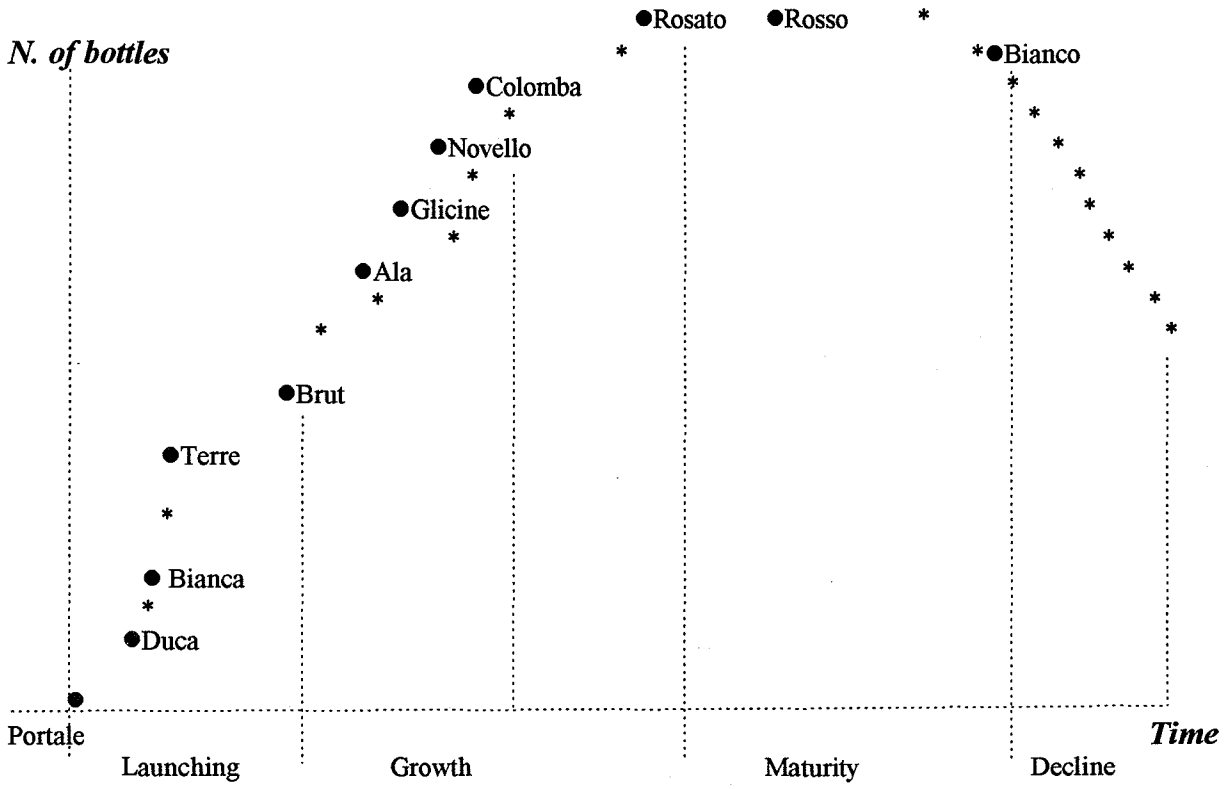

Fig. 5 - Wine position of CORVO products Life-Cycle

Classica SBA products - except for *Corvo Glicine* - are in the *cash cow* class. Particularly *Corvo Rosato* seems to be recently evolved to this class, after having been a *star* product. *Corvo Rosso* seems to be in a more advanced stage, while *Corvo Bianco* is the nearest to *dog* class.
Portale Bianco and *Portale Rosso* are new brands in a launching stage in a growing market segment, so they are positioned in *question mark* class.

A Dynamic Model for Corvo "Product Portfolio" Management.

The major goal of the model, which is still in progress, is to support management in verifying which actions to adopt in launching the two new brands/products *Portale Bianco* and *Portale Rosso* (presently positioned in *Question Mark* class), mainly taking in to account the financial constraints given by cash flows generated by *cash cow* products.
The *master variables* identified, by now, in order to simulate different scenarios are as follows:
A) Business factors
- *product*, i.e.: quality, packaging, sales delay,...;
- *price*, i.e.: mark-up, discount ranges
- *promotion*, i.e.: advertising, agents sales incentives, fairs participation, conventions,...;
- *physical distribution* (or *place*), i.e.: delivery delay, stock level,...;
B) Supply-chain factors
- *competitors*, i.e.: gentlemen's agreements, joint ventures, mutual product exchanges,...

- *distributors*, i.e.: agreements with *trade*, restaurants, small drugstores,...
- *suppliers*,:

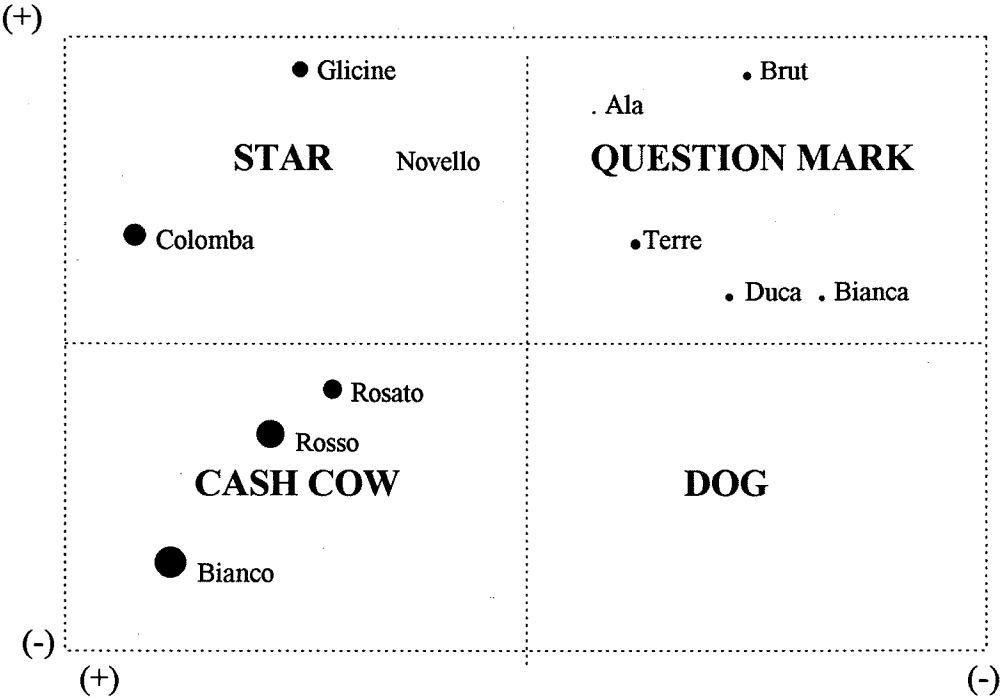

Fig. 6 - BCG matrix of CORVO Product Portfolio

Moreover, there are other *Environmental factors*, i.e.: EEC constraints, Regional Government rules, etc, that will not be considered in this first version of the model.
Both because of space limit imposed and present state of work , the model, "hopefully" with some operative results will be indicated during the presentation.

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