RESEARCH AND DEVELOPMENT FOR CORPORATE SURVIVAL. A CASE STUDY OF A BREWERY CORPORATION IN COLOMBIA.

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ABSTRACT

The model presented in this paper establishes the role of Research and Development for survival and growth of a brewery corporation in a particular environment. Simulation results confirm poor performance under pessimistic scenarios including little investment in research, high competition and poor political, economical and social conditions.

1. INTRODUCTION

There is apparently no question nowadays of the need for corporate Research and Development in the industrialized world. Nevertheless the appropriate amount of resources to be allocated for this matters are not easily established due to the multiple factors involved (such as innovation capacity, country dependency, economy sector and market dimension) in different economic activities.

In spite of abundances of natural resources, the technological development of many third world countries is extremely poor, specially in the goods production and services sectors, mainly because of the inadequate research infrastructure, lack of skill labor and quality problems. Among other circumstances these might come as result of national industrial protection policies which are now changing very rapidly towards a more open world wide market.

In developing countries the long term and even sometimes the medium term management perspective is often misconceived. There is no sufficient awareness of the importance of Research and Development for sustainable business growth under the new world market conditions. It is often believed that cash or sales are robust indicators of corporate performance, but considering the near future it is absolutely clear that in order to survive industry will have to start investing much more in knowledge.

System Dynamics is an appropriate tool to help thinking in terms of variables interaction within the organization, to build plausible scenarios and to aid the planning process to formulate policies and strategies, through the analysis of simulations outcomes. Therefore, System Dynamics supplies an excellent support to evaluate the role of Research and Development for corporate survival under a particular environment.

The problem or Research and Development has been discuss under a different perspective in Forrester (1961), Wang et al (1991) and Xu et al (1991).

2. MODEL STRUCTURE

Figures 1 to 4 show the most important variables incorporated in the causal diagrams. In figure 1 two positive and four negative loops are found; the first positive one includes sales, production, final product inventory, investment in marketing, per capita consumption and sales; the other one includes sales, production, final product inventory, investment in marketing, costumer and sales. The first negative loop consists of sales, final product inventory, investment in marketing, per capita consumption and sales. The second one includes sales, final product inventory, investment in marketing, customers and sales. The third one comprises sales, investment in marketing, per capita consumption and sales. The last one contains sales, investment in marketing, customers and sales.

Per capita consumption and/or customer amount tend to decrease as the competition increases, while marketing effort grows. Additionally, the increase of population favors costumers increment through vegetative growth.

In Figure 2 three negative loops are found. First, production, supply demand, financial resources, investment in research, research in development, developed products

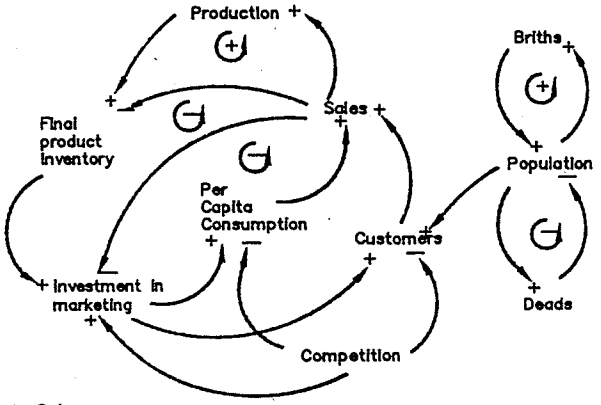

figure 1. Causal diagram 1. Sales

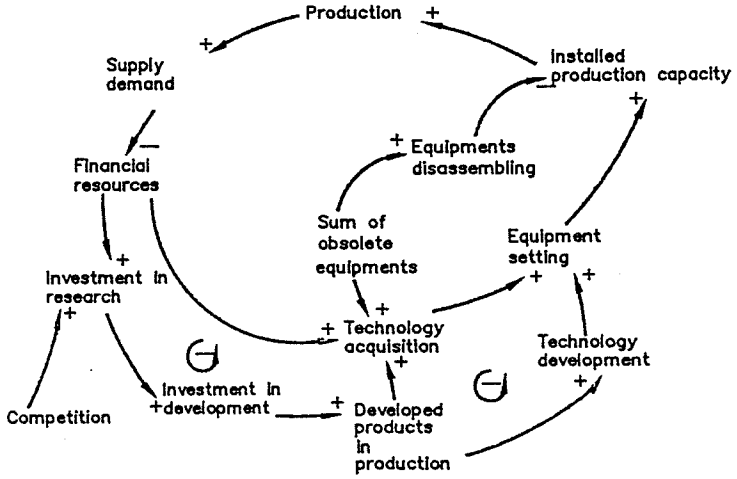

figure 2. Causal diagram 2. Research and development

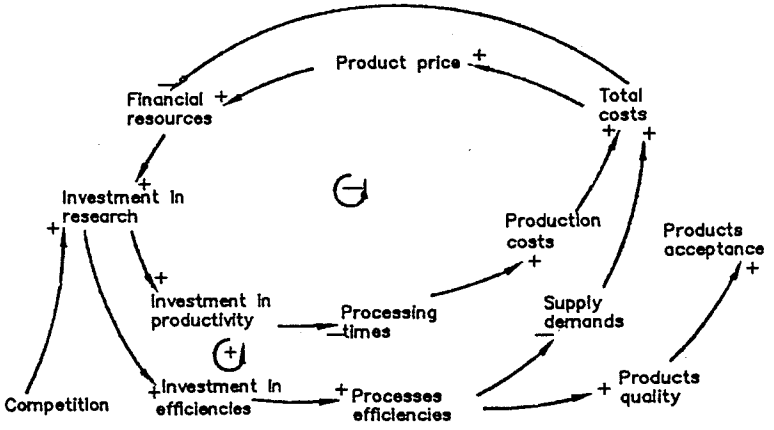

figure 3. Causal diagram 3. Production

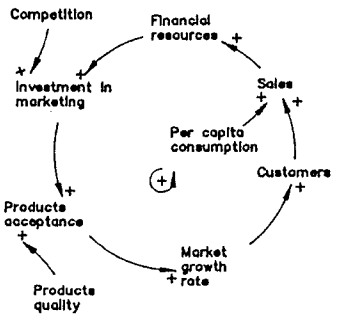

figure 4. Causal diagram 4. Marketing

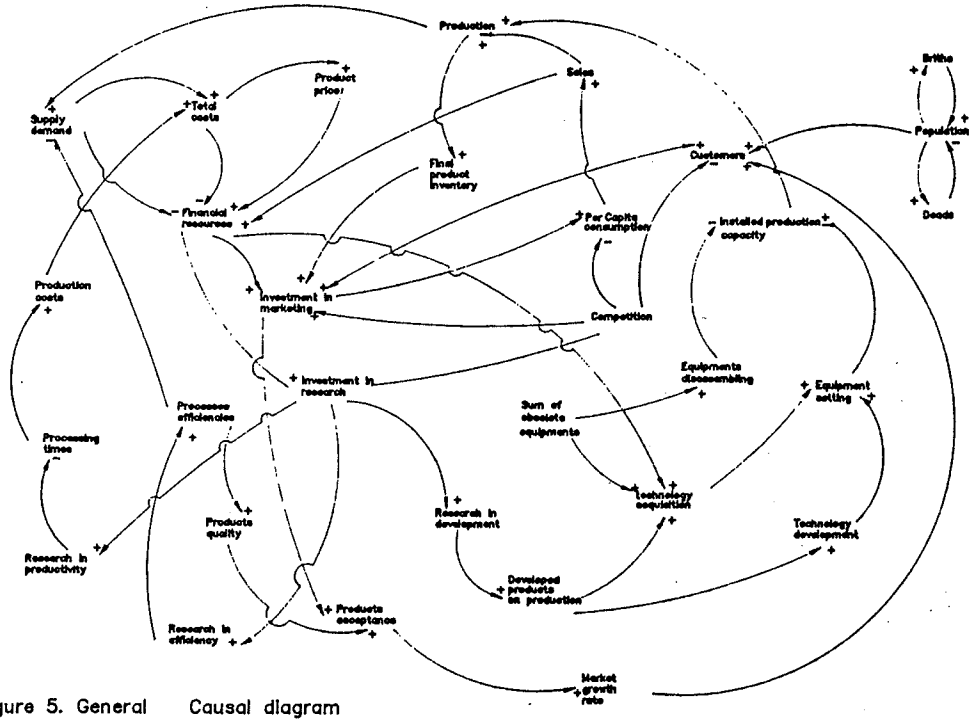

figure 5. General Causal diagram

in production, technology acquisition, equipment setting, installed production capacity and production. Second, production, supply demand, financial resources, investment in research, research in development, technology development, equipment setting, installed production capacity and production. Finally, production, supply demand, financial resources, technology acquisition, equipment setting, installed production capacity, production.

Investment in research must increase as competition grows. Technology acquisition grows due to an increment of obsolete equipment which generates growth in equipment disassembling and consequently diminishing installed production capacity.

In Figure 3 two positive loops are found. First, financial resources, investment in research, research in productivity, processing times, production costs, total costs and financial resources. Second, financial resources, investment in research, research in efficiency, processes efficiency, supply, demand, total costs, product price and financial resources.

In figure 4 a positive loop is illustrated; financial resources, investment in marketing, product acceptance, market growth rate, customers, sales, financial resources.

The above are the main hypothesis where the model lays. There are other important relationships included in the model. Financial resources availability or gross utility is the result of sales minus total costs. Total cost is the result of input materials costs - direct costs, plus production costs - and indirect costs, among which equipment and labour are found. Note that gross utility is the available resource for investment in research and in marketing, that are both function of the competition level. Additionally the model takes into account elements like the economical, political and social situation of the country which has an affect on the purchase capability and the vegetative growth rate of the market niches.

Research reflects three basic aspects: development - innovation of products that satisfy the changing customers requirements; productivity - innovation in processes that must demand less time; and efficiency - innovation in processes that must demand less input material quantities to produce the same products with the same satisfaction level.

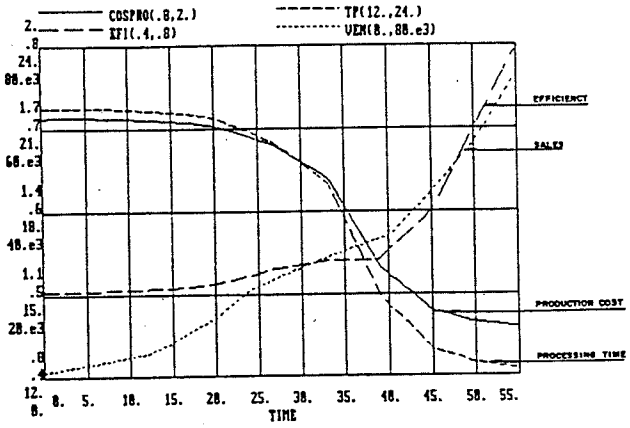

FIGURE 6. BASIC SCENARIO

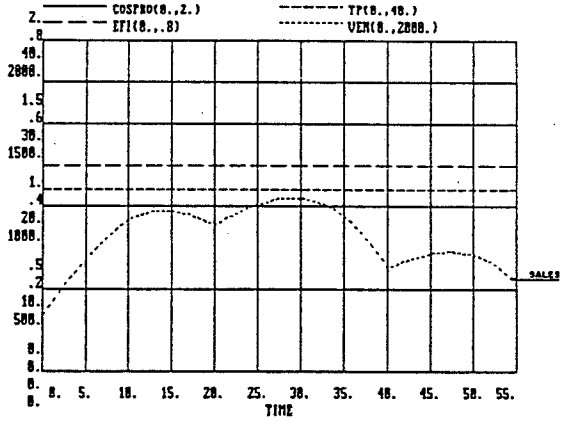

FIGURE 7. SCENARIO 2

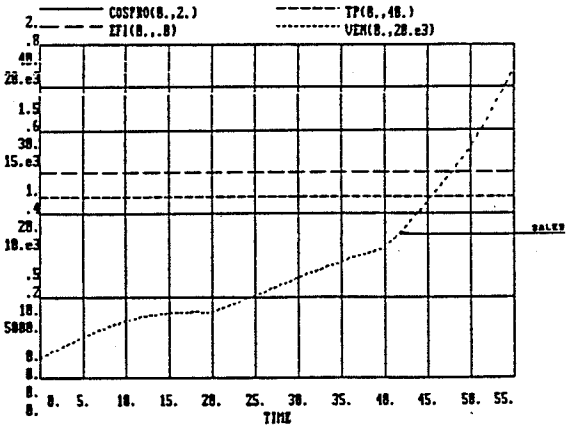

FIGURE 8. SCENARIO 3

These are the main the concepts illustrated in the General Causal Diagram, Figure 5.

3. POLICY TESTING

Figure 6 shows how under a rational policy of investment in Research and Development the corporation accomplishes to decrease production processes time and to increase efficiency. Further, it can be seen the expected benefits in terms of robust indicators such as sales and profits.

Figure 7 illustrates a different scenario. In this case it is assumed a very small market share, no resources allocated to Research and Development, and low investment in marketing. As expected, sales decrease and efficiency remains constant at low levels.

Figure 8 exhibits interesting results under a scenario of a small market share, decreasing investment in research but a great effort in marketing. Sales remain almost constant at low levels during the first period simulated. At the end, sales increase as result of the amount of resources allocated to Research and Development during the first period and as consequence of market policies.

4. REFERENCES

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