STRATEGIES FOR COTTON YARN EXPORT: AN OBJECT-ORIENTED APPROACH

by

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ABSTRACT

This paper gives an overview of the strategic decision-making for cotton yarn export in the Indian context. Furthermore, a knowledge-based system's design is proposed for this domain using an Object-Oriented approch giving necessary justification.

Key-words : Strategic Market Planning, International Marketing, Decision Support Systems, Expert Systems, Knowledge-based Systems, Object-Oriented approach.

1. INTRODUCTION :

During the 80s, international trade in cotton yarn, which is amongst the most traditional businesses in the world, witnessed several interesting and far-reaching structural changes. Though international trade in cotton yarn will grow at slightly lesser rate in the 90s the re-discovery of the virtues of cotton in the apparel markets and the tendency of the developed countries to move away from spinning has spurred developing countries like India to look more closely at their yarn export situation.

Globally, cotton yarn exports registered an increase of 88% in the eighties. More than half of the world imports are by just four countries, viz. Hong Kong, Japan, former West Germany and Italy, with the first two sharing one-third of the total. (Refer Table 1) [12]. Amongst the exporters, Pakistan is by far the largest, having a 27.4% share, followed by China. India ranks only seventh.

However, the difference in market share3s (India's 3.5% to Pakistan's 27.4% and China's 11.8%) indicates wide gap as well as potential scope for the expansion of India's exports. Besides, India possesses the advantages of being a leading producer of a wide variety of raw cotton, having 20% of the world's installed capacity for yarn production and a long tradition of excellence in textiles coupled with cheap labour.

One important strategic requirement for decision making in exports is availability of timely information and expert knowledge. Intelligent decision support systems (DSS) and expert systems (ES) are a class of information technology used in strategic decision-making. While the DSS helps the decision-maker (DM) in 'what if' analyses, ES tend to embody the systems enough competence to perform specific knowledge-based or expert tasks. Recent literature [4,15,16] talks about interaction or congruence of DSS and ES and the need to integrate and implement different knowledge-processing components [7,11].

In this paper, a brief theoretical overview is given and the need for a knowledge-based system for cotton yarn export is discussed in Section-2, followed by a brief description of the decision-domain knowledge. An attempt has been made to describe the proposed architecture of the system and this is followed by concluding remarks.

2. NEED FOR STRATEGIC FOCUS :

While developing a knowledge-based system for cotton yarn export, one has to take a thorough look at the domain of decision making and the characteristics of available expertise for decision-making. We need to study the types of organisations engaged in exports and their strategic and tactical decision-making pattern. In this section, we give a brief outline of the strategic management principles and the object-oriented approach to knowledge representation.

The textile firms in India are mostly in the private sector and under indigenous ownership. India is a relatively new entrant in the international market and even its firms in the organised mill sector are small by international standards. They, therefore, lack the resources and power needed to dominate their environments. The international cotton yarn market is changing from a low complexity, low competition condition into a more turbulent and complex one. This makes it necessary to focus on the firm's strategic relations with its total environment [5]. Also, since small firms have to adjust to changes, it may be better for them to change their strategy in small steps rather than sweepingly. In rapidly changing international markets, a shorter, even if less perfect, decision-making process is required [13,14].

Successful exploitation of potential markets depends on the evaluation of a strategic market plan. According to Abell and Hammond [1], strategic market planning,

> " describes the process of planning that (a) is built on sound assessment of market opportunity and company capability as well as careful cost analysis and (b) involves the development of a firm's total strategic approach to a market place .....(p 14)"

Such an approach is important in terms of the degree of freedom a company has in choosing its target markets and in the way it subsequently goes about matching the market demand [6].

Indian textile firms seeking foreign markets are faced with a large number of product-market options. Due to liberalization and due to the efforts of Indian textile research and promotion institutions, cotton yarn exports from India have registered a significant growth in recent years. Though exports are made to as many as 56 countries, we can group them continent-wise as in Table 2 [12]. It can be seen that Europe is one important destination for our exports because of the high demand for yarn of high quality there. As regards counts, India can export yarn ranging from very coarse counts (like 2^S to 4^S) to very fine counts like 100^S and 120^S), a privilege not enjoyed by other countries [3]. The major share of exports is of the 21^S to 30^S, count group, followed by the 11^S to 20^S count group. From the end-use point of view, the target markets are the garment sector and the industrial sector. this leads into a three-dimensional "choice matrix" of market potential for cotton yarn export as presented in Fig 1.

3. EXPERT SYSTEMS FOR STRATEGIC DECISIONS : Conventional design vs. Object-Oriented (O-O) approach :

To appreciate how expert systems can assist decision-makers and in what capacity, it is helpful to know the various tasks that expert systems perform in general. Holsapple et.al [9] classify the domains of export systems into six generic groups viz., interpretation, diagnosis, monitoring, prediction, planning and design. If we classify an organization as having top, middle and lower levels to perform strategic, tactical and operational decisions respectively, the classification can be combined together as given in Fig 2.

For cotton export firms, particularly small and medium sized Indian companies, the conceptual boundary between the domains of strategic and tactical decisions is somewhat blurred. Also, the domain knowledge of these levels seems to differ from that of operational levels on two aspects. The decision processes at the top and middle levels of export-oriented firms tend to be more strategy-driven. They require global knowledge of the firm vis-a-vis the international marketing environment. Also, the complexity unstructuredness involved in decision making is much greater at the top level.

Earlier AI systems were stand-alone and problem-motivated. Another striking feature of these systems was that their knowledge-domain hovered around the lower levels of organizational decision-structure with near static decision-domains. Thus, from simple rule-based systems, the systems have grown into frame-based formalisations and procedures. But the

systems for strategic-decision making need to integrate the procedures of highly volatile knowledge and models for demand-supply forecasting. Also, the data needs to be used efficiently as the rates of repeated-data usage would be high.

Most management decisions are based on a mixture of rules and procedures, which the conventional rule-based systems can't handle. Object-oriented design approaches are based on identifying the classes of objects in a system [2,8,10]. the classes are described in terms of their behaviour and structure. An object is an independent entity modelling a real-world concept, represented by some data and a set of operations (methods and capabilities). Each object is a member of a class and the operations are defined for all the members of the class. Knowledge (K) can be formally represented by three tuples, K = (C,I,A) where C is a set of classes, I is a set of instances represented by class and instance objects, and A is a set of attributes of these classes and instances.

Amongst the many aspects of O-O design, two advantages seem to be prominent, viz., property of inheritance and polymorphism. By inheritance it is meant that a new subclass of objects are derived from existing ones, thus have properties of the parent class and can have additional distinguishing properties. For example, if a polygon is the general class and its properties

are a number of sides and the longest side, a rectangle would be a subclass of the polygon and a square that of the rectangle. Polymorphism refers to the ability of an entity to refer at run time to instances of various classes. Hence, the actual operation performed on the receipt of a message (that returns an object) depends on the class of the instance. Thus object-oriented knowledge has the same flexibility as semantic nets, but it is more structured. For large databases, when the rules become unmanageable, the object-oriented approach provides a better solution due to its modularity.

4. STRATEGIES FOR COTTON YARN EXPORT

Some basic steps for developing the overseas markets are:

1. IF the firm is not currently an exporter OR IF the firm seeks to expand into new foreign markets, THEN it must determine export needs.

2. Evaluate the potential of a new foreign market. Through market research, assess

   (a) market attractiveness (profitability)

   (b) degree of competition

   (c) associated risk.

3. Check the international trade laws that may apply as well as restrictions or trade barriers.

4. IF the current and future (forecast) market potential is high AND IF no restrictions or major trade barriers exist,

THEN select it as the target market.

ELSE evaluate the alternative market. (GO TO Step 2).

5. Set up new capacity or expand installed capacity to manufacture the required quantity, of the desired quality.

6. IF target market is chosen,

THEN - (a) Decide on a mode of entry into the target market;

(b) Draw up the marketing program, after finalising the marketing mix variables;

(c) Set up a marketing organisation for effective implementation.

7. Export monitoring. (Maintaining export schedules, effective quality control, improving marketing program - creating new capacity).

The decision process involved in developing overseas markets includes raising the following questions by experts.

* Market attractiveness
  - Is the market big?/What is the current size of market?
  - What is the forecast growth rate?
* Degree of competition :
  - How many firms compete in the market?
  - What is the industry structure? (Monopoly, oligopoly)
  - How big are the competitors?

* Associated risk :

  - How stable is the country politically?

  - How is the country's trade balance?

  - How does its currency fluctuate vis-a-vis ours?

* India's International trade laws :

  - Does a quota system operate in the target market?

  - Are there threats of countervailing duties?

  - What non-tariff barriers exist?

* Entry strategies :

  - Which mode is to be used - independent sales subsidiary/route through export houses/join cooperative organisations?

* Product Characteristics :

  - Should we enter into exports of coarse/medium/fine varieties of yarn?

  - Which sector to serve - industrial or garment sector?

  - Which market segments to focus on - knitted fabrics or woven garments?

* Manufacturing aspects and technical standards :

  - What degree of underspinning is to be employed?

  - How many and what type of beating points should be installed?

  - What is the most optimal (cost effective) mix of manual labour and automation?

- Do we satisfy Uster 25% standards?

- Are tenacity, trash content and nep levels within expected tolerance limits?

Thus, we can see the following hierarchy of decision making :

i) Market research, demand-supply estimates; (Use of spread-sheets eg. LOTUS 1-2-3)

ii) Market segment(s) decision; (X-axis, Fig.1)

iii) Product(s) - selection decision; (Y-axis, Fig.1)

iv) Quality(ies) of cotton yarn decided; (Z-axis, Fig.1)

And finally, the exporter has the option (s) of

- proceeding with the market-product-yarn quality mix (a cell or cells in Fig. 1).

- increasing his capacity and proceeding with export (above-step), or

- becoming an arbitrageur and executing the export order.

The same can be illustrated as in Fig. 3.

5. THE KNOWLEDGE-BASED SYSTEM DESIGN

Here, we propose the following design architecture : The database and the knowledge base have to be modularised on -

* Market segments (countries, demand estimates)

* Product segments (specifications of yarn types),

and * Quality parameters of yarn internal availability of raw materials, process parameters to achieve quality standards, quality control measures) [3].

Within each of these modules, we declare the objects their classes, attributes and the actions to be performed ("message passing"). A database is created in a spread-sheet 9LOTUS 1-2-3 file and forecasting is done for demand estimates using the popular trend projection or end-use estimate. A small rule-set is arranged to select the right model interactively depending on data availability.

The ES shell LEVEL-5-OBJECT [17] is proposed to be used, mainly because of its user-friendliness, its capabilities of object-oriented approach for knowledge representation and its facility for interfacing with spread sheets. (For more details LEVEL-5-OBJECT User's Guide [17] may be referred). In LEVEL 5 - OBJECT the attributes consist of Name, Type, Facets, Methods, Rule Group and Demon Group. Since the export decision goes best with backward chaining process (as the goal is certain), the Rule Group is used instead of Demon Group. During actual interaction, the instances' can be given interactively or read from a db file. Unless otherwise specified, LEVEL 5 - OBJECT supplies default query goals for certain attributes' actions.

Next, a conclusion is reached, which involves

logical deductions (class inheritance - "type of yarn to quality parameter"),

rule based inferences,

procedural executions

(eg. market demand estimation)

Finally, a recommendation is arrived at.

Thus, the architecture of the proposed design can be given as in Fig. 4. The design of an object-oriented approach for knowledge representation and inference, which is relatively a new approach as compared to conventional rule-based ES shells. Here both the procedural and declarative forms of knowledge representation are adopted. LEVEL 5 also supports the use of external programs from a rule, demon or method [17] through the use of commands ACTIVATE and ESTABLISH. Also, the use of model-management for forecasting is achieved externally through spread-sheet packages by invoking appropriate 'messages' embedded in the 'rules' of the object-oriented system.

6. CONCLUSION

At present there is literature [7,11] on 'intelligent systems' which may have many more features of a black-board architecture. Though to visualize the advent of such systems in a business environment will be difficult, if not impossible, the use of the object-oriented approach will be quite appropriate for a system's maintenance and enlargement. In this paper, we have proposed exactly that approach, though from a black-box point of view. It wouldn't be difficult to design such a prototype or even a working system, as only commercially available shells and packages (e.g., LEVEL-5-OBJECT, LOTUS 1-2-3) have been cited.

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TABLE 1

COTTON YARN TRADE : MAJOR EXPORTERS & IMPORTERS

S.No.	Major exporters	% of world exports	Major importers	% of world imports
1	Pakistan	27.4	Hongkong	17.1
2	China	11.8	Japan	16.1
3	Turkey	6.9	W.Germany	10.3
4	Egypt	5.9	Italy	7.6
5	W.Germany	4.4	U.K	5.1
6	Brazil	3.6	France	4.7
7	India	3.5	S. Korea	4.3

(* - 1988 trade level; all other figures represent 1989 levels)

Source : The Indian Textile Journal, June 1991, p. 150 [12].

TABLE 2

Continet	Exports in the years					
	1988		1989		1990	
	Qty.	Value	Qty.	Value	Qty.	Value
1. Asia	21.84	126.13	29.65	187.64	35.75	205.39
2. Africa	1.55	7.32	3.18	16.75	4.21	24.40
3. Europe	18.29	94.18	17.81	98.81	41.03	233.88
4. Oceania	0.86	3.51	1.36	5.88	1.33	6.55
5. America	0.68	3.37	0.66	2.64	0.72	5.36
Total	43.22	234.51	52.96	311.72	83.04	475.58

(Qty. in million kg; Value in crore Rupees; 1 crore=10 millions)

Source : The Indian Textile Journal, June 1991, p. 150 [12].

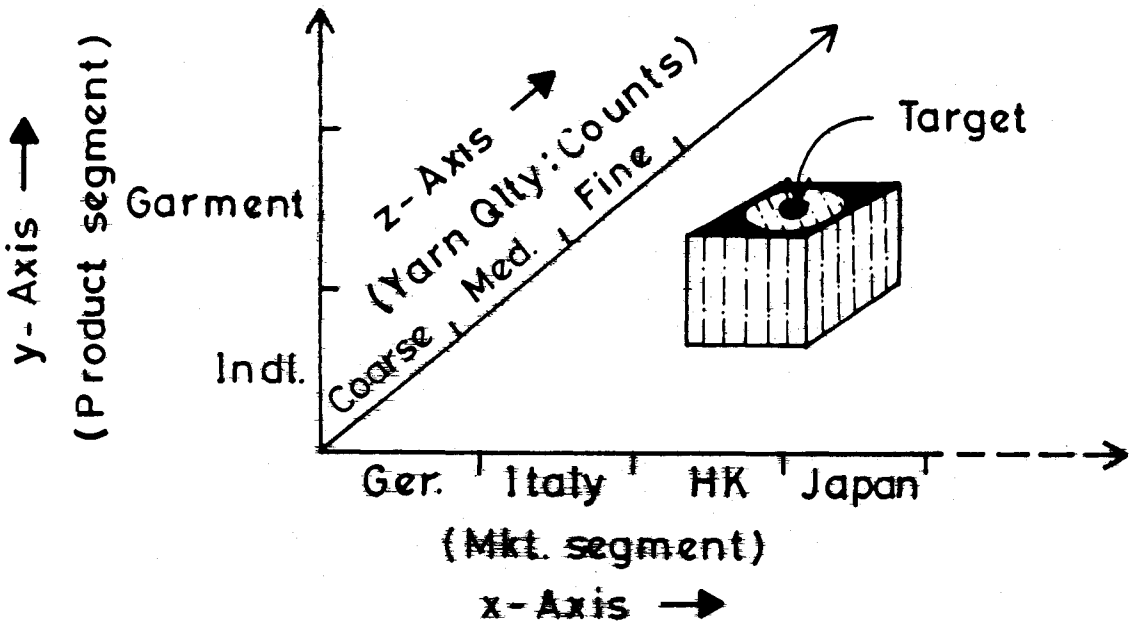

Fig. 1 Choice matrix : Cotton yarn export decision.

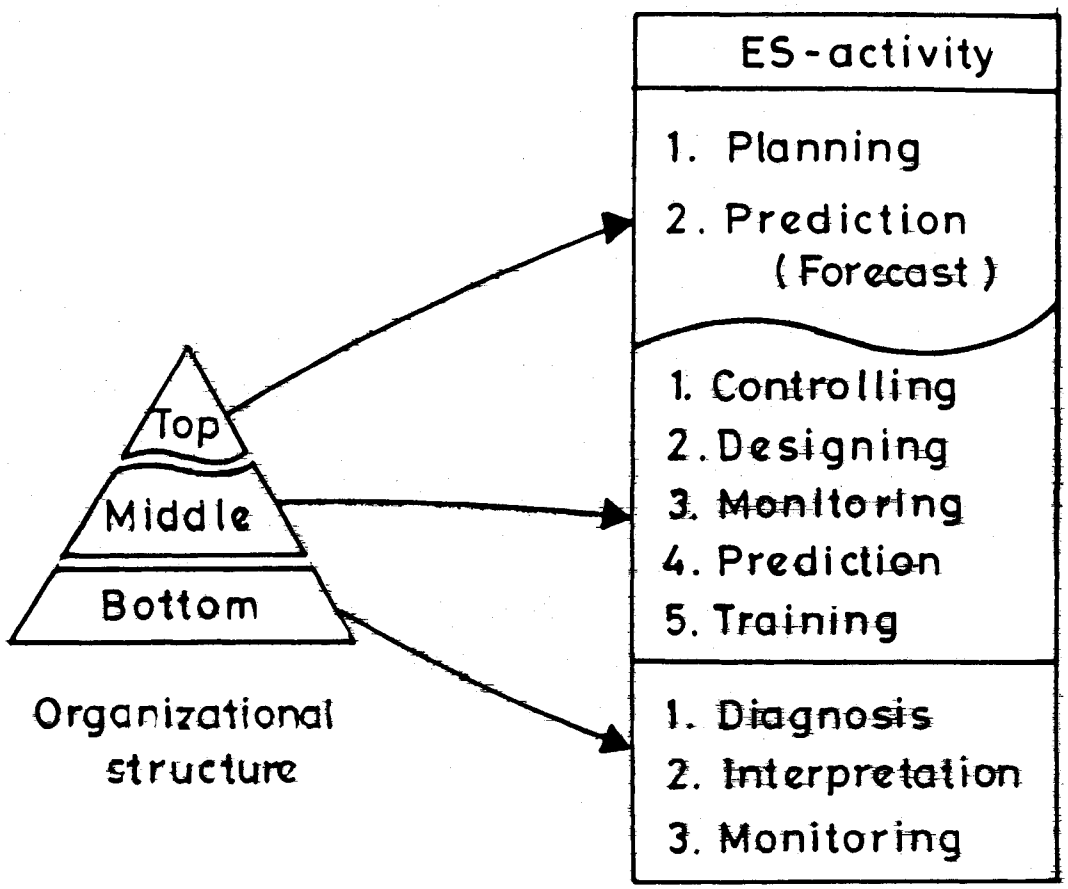

Fig. 2 Organizational structure and possible expert system domains.

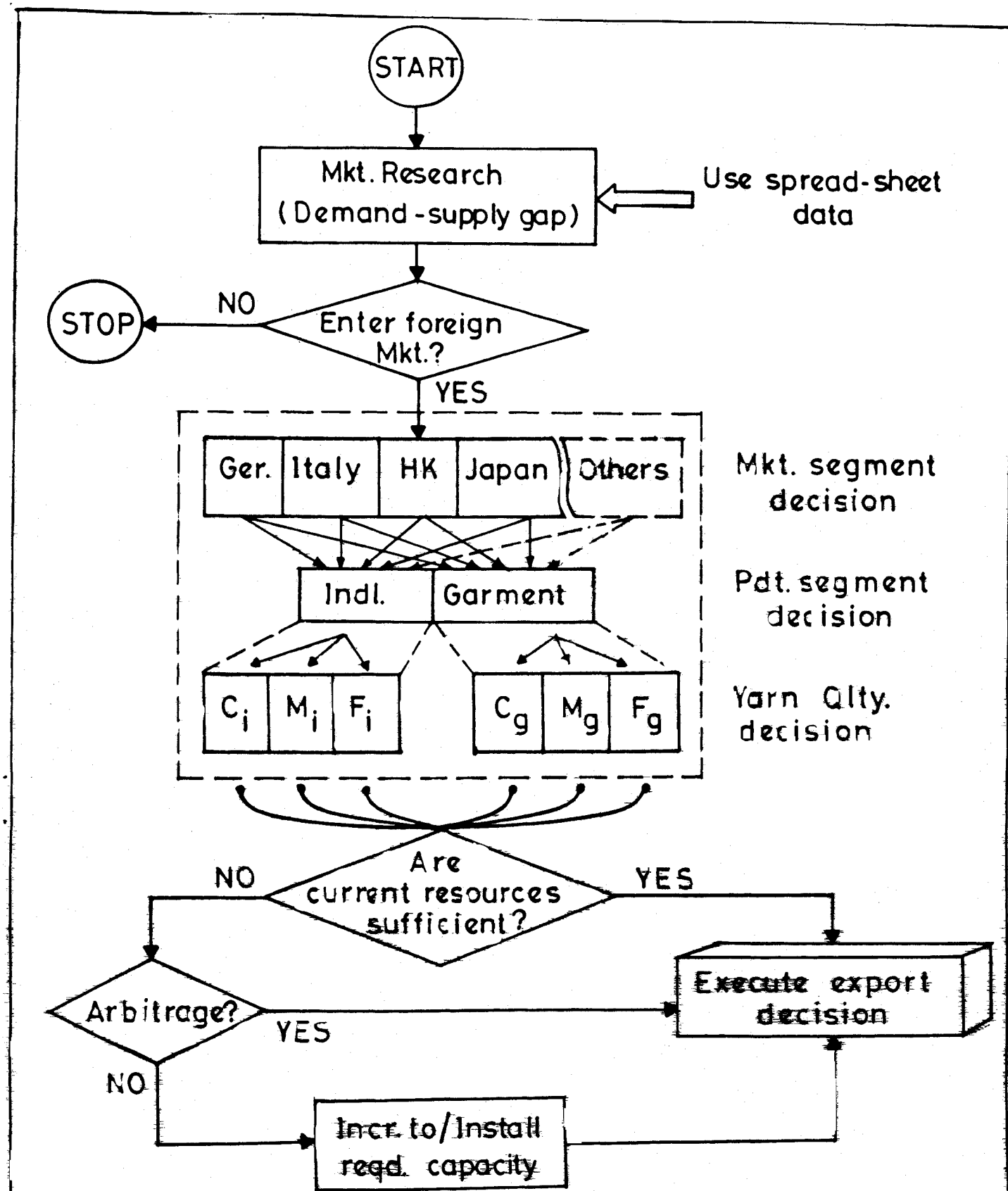

Fig. 3 Strategic - Decision hierarchy for cotton yarn export.

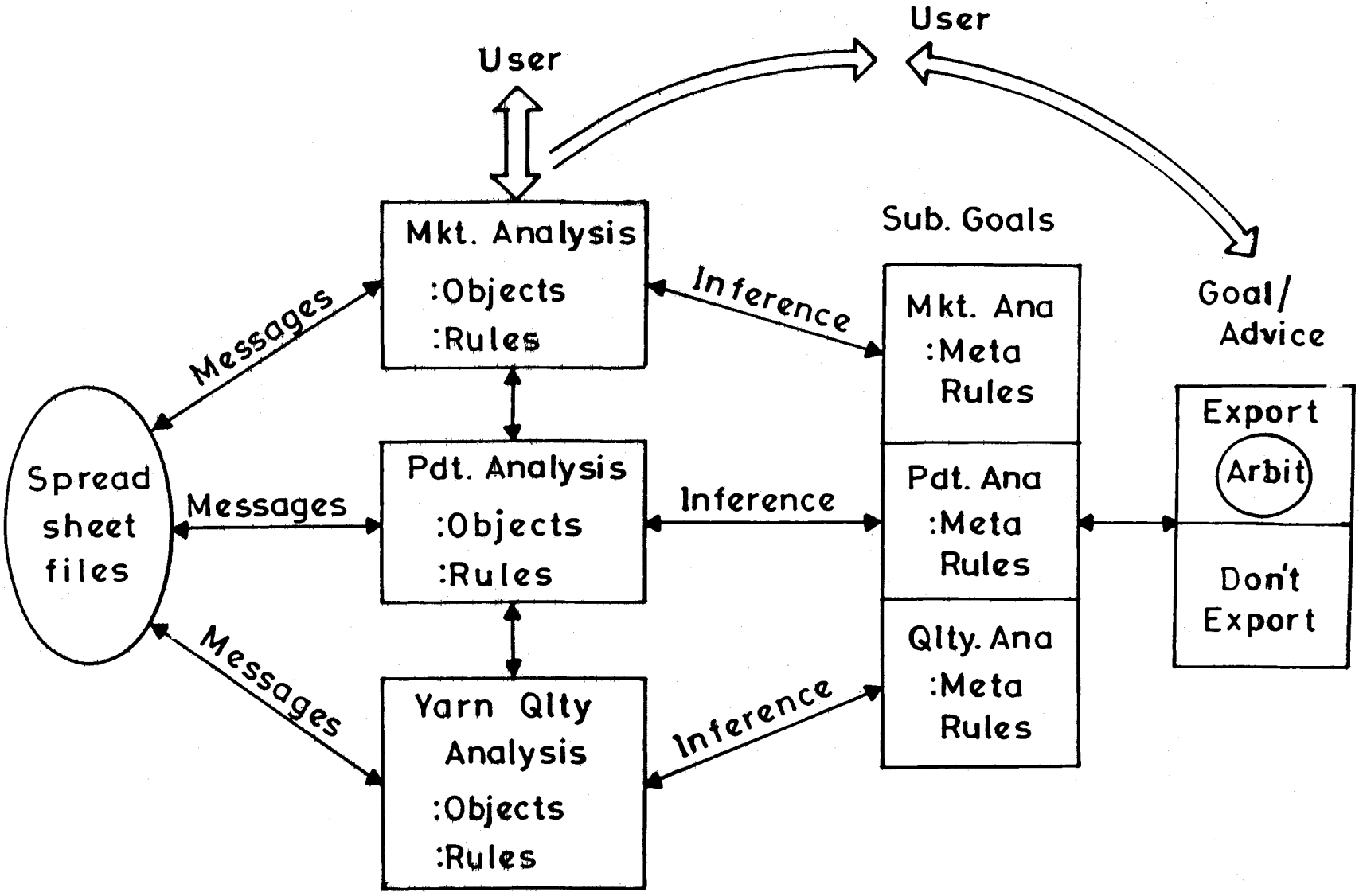

Fig. 4 Proposed system design (0-0 approach)