

A ROLE FOR OPERATIONS RESEARCH IN THE GLOBAL FIRM

by

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The global firm is facing unprecedented challenges. Many of these challenges come from within the firm's competitive environment. Technological change is shortening life cycles and obsoleting products and processes with increasing rapidity. Success with the achievement of high levels of productivity is short-lived as demands for even higher levels must be met. Skill and knowledge levels of employees, customers and suppliers must continually be upgraded. Management systems and organizational structures need constant attention.

Many of these challenges come from forces outside the firm's direct environment but must be dealt with by the firm. National political structures are changing in many parts of the world. Industries are being denationalized and deregulated. Tariff and trade laws and barriers are being modified. Exchange rates are more volatile and affected by non-economic forces. The world's environment and ecology are becoming more inter-dependent. The public in many nations are aware of industries' impacts on the ecology and environment.

What must global firms do to survive and flourish in this environment? These firms must create systems to acquire and use knowledge and information on an ever enlarging scale and scope to make optimal firm-wide world-wide decisions.

How can operations research play a role in this process? Operations research has the methodologies and processes to construct knowledge and information based systems to enable the global firm to continuously create competitive advantages to realize economies of scale and scope. OR can also help the firm play enhanced contributing roles in the societies and nations in which they choose to compete by analyzing alternative plans for operations in these societies.

For more than a decade now, it has not been sufficient for global firms to essentially exploit their global markets and supply sources and the physical and social environment. Due to mass media and rapid information transfer, and to the growing power of the press and public awareness, exploitation often quickly surfaces. For this reason, the global firm must seek and implement enlightened social environmental and national strategies to achieve economies of scale and scope for its competitive advantage.

The key to the long-run success of the global firm lies in four basic areas. First, the firm must build and maintain a fundamental set of capabilities and an organizational structure to utilize these capabilities. Second, it must establish a process to continuously renew, develop and expand these capabilities through innovation and improvement of its products, services, processes, human resources, technologies and organizational structures. Third, and this is what is gaining growing importance for the global firm, it must become a force for improvement in all of the societies and nations in which it operates, not just in its "home base" society and nation. Indeed, the concept of "home base" society and nation will increasingly blur for the globally-successful firm.

Fourth, the global firm must learn to cope with the sheer size and complexity of itself, its operations and its competitive environment many divisions which are already large companies in their own right. Top executives of these firms increasingly find it difficult to know well the range of products and technologies in their divisions and to handle increasing numbers of complex decisions. So for these reasons, the breadth and scope of internal decisions, the complexity of global operations in a geo-political environment and the rapidity of competitive change, top managers need to acquire and/or use new management skills, techniques and methodologies to guide their firms to long-term success.

Three such areas where OR can and will play a leading role are:

1. Large scale, integrative knowledge systems for strategic as well as operational decisions.
2. Transnational scenario analysis for evaluating geo-political and economic change.
3. Core knowledge creation and maintenance using intelligence in the organization.

These new techniques and methodologies stem from our older well-known ones. They represent advances in handling larger, richer, more complex problems. These new developments are aided by greatly enhanced computer speeds, multiprocessing techniques and large data base collection and management systems that are now and will be available. The combination of these new and enhanced techniques and methodologies, with advances in computing and information acquisition, push back the limits of bounded rationality inherent in the size and scope of the transnational firm.

I. Large scale integrative knowledge systems for strategic as well as operational decisions.

Large scale integrative knowledge systems are just being developed which integrate methodologies and techniques from several areas. These systems combine data base management with expert systems, operations research models and algorithms, and supercomputing to provide real time interactive decision support for handling very large scale problems across the strategic and functional areas of a firm. In finance, these systems formulate portfolios of securities involving billions of computations per second to optimize the returns on investments in real time. In

marketing and production for consumable retail products, product scanner data allows real time analysis of marketing, advertising, promotion, pricing and sales strategies with production and distribution decisions, to gain real time competitive advantage at the wholesale and retail levels. In integrated supplier-production-assembly-distribution decisions for manufactured products, large scale integrated knowledge systems are being developed to optimize the production and assembly of products across the supply chain, to take advantage of labor and materials costs, exchange rates, tariff and trade regulations and restrictions and other factors which affect global operations.

For many years OR has used large scale systems analysis in petroleum drilling, pumping, shipping, refining and distributing activities. These models have optimized the flow of petroleum products from wells to markets. Other large models have been used in processing, manufacturing distribution and marketing areas. Perhaps the greatest prior use of large scale systems models has been in the military where training of personnel, logistics, inventory control, C³ and war games are analyzed. The new work that will be developed moves beyond single functional areas to large scale integrated models.

II. Geo-political theory, global economics and transnational scenario sculpturing

The risks to top management of decisions for locating plants and/or distribution and marketing capabilities in emerging markets such as in Eastern Europe, China, Soviet Union and parts of South America and Asia may be poorly understood without an excellent grasp of global economics, geo-politics, cultures, religions, and social trends. What is emerging are new global economic and political theories and theories of human behavior which can be used to build trend analyses to analyze the risks and benefits from different scenarios. Formal quantitative and qualitative assessment and forecasting techniques are also being developed to evaluate possible

futures. These techniques and methodologies are coming from decision analysis, risk assessment and decision processes. In combination, they are more effective in analyzing the behavior of individuals and groups when faced with making risky decisions to avoid losses and achieve gains. By knowing this behavior, firms and governments can implement more effectively decisions to enter new markets, build offshore production capabilities, expand existing activities and/or assess competitive reactions.

An example of how OR can be used to plan and forecast risks and benefits for the firm is given by the modelling being done to implement strict product, safety and environmental standards and to reduce long term risks to health, the ecology and the environment. These political and economic changes, as a result of historic and other processes, are creating problems for many firms. But, other firms see these changes as opportunities to create, develop and market new products, services and processes. An appropriate systematic analysis of the risks and benefits using techniques and methodologies for incorporating risk and behavior into the analysis leads to first mover competitive advantages.

Another example on a world scale of changes in political and economic structures, in the move to stronger market economies, is the de-nationalization and deregulation of industries. Analysis of where, how, when, with what speed and to what extent this devolution is occurring can present new market and production opportunities and competitive advantages. Indeed, when any geo-political and global economic changes are occurring there are always opportunities and threats. Trend and scenario modelling, using risk and behavioral analysis as well as other techniques and methodologies, find growing use in corporate strategy, planning and operations.

Recognition by transnational firms that the governments and societies of more and more industrialized and industrializing countries are beginning to realize that a nation's goals should be to improve the long run quality of life and the standard of living of their people will enable these firms to adopt strategies and policies which will not only benefit the firm but will also help these governments achieve their goals. Transnational scenario sculpturing will aid in this process.

III. Core knowledge creation and maintenance using organizational intelligence

As described by Professor Alfred Chandler in his books, The Visible Hand and Scale and Scope, the great sustaining globally competitive manufacturing firms developed core knowledge, i.e. basic knowledge and capabilities in specialized areas of science and research, production processes and distribution networks which enabled them to exploit economies of scale and scope. Recently, Professors C.K Prahalad and G. Hamel termed these basic capabilities, "core competencies." The key idea is that globally successful firms develop techniques and methodologies to create, harmonize and extend streams of knowledge and technologies in the firm. This is done by coordinating and integrating all functional departments, continually innovating and upgrading products, processes and services, and organizing all work to add value to the products and services. The intent is to understand one's business very well by top and middle management and to institute a process for continual improvement and enhancement.

In the past, much of these "core knowledge processes" have been embodied in such programs as R & D, statistical quality control (SQC), Industrial Engineering, Value Analysis/Value Engineering, and the like. The current idea moves beyond quality, productivity and flexibility to ask questions about what and how to build and maintain the core knowledge of the firm to sustain

or acquire competitive advantage (usually manifested in economies of scale and scope) using problem solving methodologies from Operations Research, Management Sciences and Informatics.

The fundamental idea has two parts: first, every individual and group in an organization have intelligence and capability to improve the organization; second, by structuring the organization appropriately and with the right integrative problem solving processes this atomistic intelligence can be magnified to an organizational intelligence which transcends the sum of the individuals, groups of individuals and the total organization itself.

As firms move from global to transnational in organization and operation it is essential to have in place processes to capture the growing knowledge and intelligence in the organization. This is particularly important as new cultures, mores, national peculiarities in laws and social interactions are added to the firm's core of knowledge and competencies.

An example of new OR work in this area are the ideas being formulated and developed by Professor Takehiho (Bill) Matsuda in his concept of "organizational intelligence." The process of organizational intelligence involves all members of the firm in building the core knowledge, by providing a systematic cyclic way to recognize problems, to formulate these problems, to solve them and then implement the solutions. The process never ends for as one problem or set of problem solutions are implemented, changes occur which restart the process. Indeed, all phases of the process are ongoing at all times. In this manner, the core knowledge of the firm is continually being renewed and expanded.

In summary, the successful transnational firms of the future will need to accept more societal responsibility in enhancing the quality of life and standard of living of the nations in which

they operate. This dimension along with the sheer size and complexity of the transnational firm as it seeks competitive advantage in many markets demands that the firm have well organized systematic methodologies and techniques to cope with the integration of masses of data, problems, personnel and organizational structures. It must continually build its core knowledge. It must efficiently integrate its functional activities under changing technologies, products, markets and other conditions for strategic advantage. It must better understand geopolitical and global economic affairs and the firm's role in creating the wealth of nations. OR is beginning to play an important role in these activities.