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Barriers to Planning in Business:
Toward Information Systems to Help Overcome Them

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Abstract

Several barriers impede the formation and execution of long-range strategies for marketing and producing products, processes, and services to meet the needs of potential customers. A key barrier to adoption of an innovation, for example, is lack of support by top management. Hypotheses about the potential of computer information systems for overcoming these barriers are proposed for testing. The main new tool proposed as an addition to the decision support repertoire is a guide to help business planners choose wisely among all the options that exist.

1. Introduction

According to Peter Drucker [6], the purpose of business is to create customers. To do this, any business enterprise engages in two basic entrepreneurial functions: marketing and innovation.

Marketing a product or service requires identification of human needs, desires, and requests. It also requires identification of the persons or groups of persons who have those needs or requests. It involves helping them to attain awareness of their needs and commitment to satisfy these needs. It means informing them about relevant products and services so that they can make an informed choice among options. Finally, marketing includes delivering goods and services that are purchased and ensuring that they are responsive to the

customers' needs. It is the marketing function that distinguishes business organizations from other human organizations.

Innovation is the provision of better goods and services. It pervades all phases of a business. Four stages can be identified in the process leading to acceptance of an innovation [7]. The first is invention/discovery. It is marked by a seminal patent or publication providing the first description of an idea, process, method, device, etc., and a claim about its value that anyone skilled in the field could verify. The second stage is a commercial-scale field trial. The third is adoption and spread of the invention/discovery-in-practice. It is newsworthy during this stage, and news spreads rapidly. In the last stage, the innovation is accepted as a standard, as state of the art.

The duration of this four-stage process varies with the field and within each field. In the building construction industry, for example, it varies from 8 years for the climbing tower crane to 36 years for shell-roof construction. In the computing industry, the U.S. has led in the development of very large-scale integrated circuits in which numerous firms, small and large, have participated, with the result that computational power per dollar has been doubling nearly every year. The time from invention to state of the art has been reduced from over seven years to less than a year. U.S. firms are now working hard to produce a 1/4-megabyte chip. Japan is about to announce a megabyte chip and expects to develop a 4-megabyte chip soon.

Planning a business involves the formulation of strategies for marketing and innovative production. A plan is a tentative strategy that is specified by (a) an image of the world that those affected by the plan can anticipate and recognize, (b) a motivational or value structure by which they can assign priorities and limits of acceptability to certain states as ends and to certain actions as means, (c) temporal and spatial correspondences among operations that

constitute a procedure to attain a desired goal/end-state, and (d) justification for the procedure.

The planning process involves (a) the design and formulation of such strategies, (b) the authority to decide about their adoption and the allocation of needed resources, and (c) the commitment and expertise necessary for execution of the plans, combined with ability to learn from the consequences and willingness to modify the plans.

The present state of the American economy is attributable to some extent to a lack of effective long-range planning in business. Some of the reasons for the absence of long-range planning in business practice stem from disincentives, such as the emphasis on earnings per share of stock corporations announce each quarter year, with bonuses to executives who increase them. Some reasons stem from the self-selection of executives who are risk-averse and the reinforcement of that behavior. Information systems, insofar as they affect primarily cognitive functions, are unlikely to effect much change in these organizationally and emotionally rooted practices. But there is a class of barriers to long-range planning that information systems can help to overcome. It is these that this paper addresses. The assertions about the likely effects of information systems are to be regarded as hypotheses worthy of experimental testing but by no means scientifically established, though the author has reason to believe in their validity.

2. Overcoming Barriers to Innovation

Nine independent studies of what accounts for a successful innovation in a firm agreed on the following factors [22]:

(a) Top management must fully support it, by allocating sufficient resources to see it through its critical phases. Projects that are not taken

seriously by top management do not succeed. Failing to obtain the attention and support of top management is a key barrier.

(b) Open-minded, progressive middle-level managers of high ability must be involved.

(c) An active and vigorous marketing program for users with well-defined needs is essential. The various studies revealed that innovations failed when the firm made no inquiries of users; made them but made too few or used poor instruments; ignored or misinterpreted answers; conducted no market research; failed to educate and train users; or failed to anticipate changes in the market.

(d) It is necessary to follow through on a new product, process, or service with sufficient technical service, spare parts, and training.

(e) It is necessary to collaborate and communicate effectively with potential users from the very start. Communication barriers must be overcome.

(f) Efficient research, development, testing, and evaluation should eliminate most of the bugs prior to marketing.

(g) There is some correlation between success and a professional approach to planning and managing the innovation process.

Failures also occur when an innovation depends too much on outside expertise; when insufficient resources are allocated; when an invention encounters unanticipated, superior competition; when a field is crowded; when innovators are too junior, weak, or inexperienced; when product champions are strong but wrong; and when internal communications are poor.

Tasks (a), (b), (f) and (g) involve overcoming cognitive barriers. This is likely to be facilitated by the use of information systems able to provide valid answers to the key questions likely to be asked by chief executives in ways they can easily understand. If after receiving this information executives still

fail to support a proposed innovation, it is at least not because of failure to bring all the relevant knowledge to their attention. Innovations are generally presented to top management in the form of oral and written reports, supplemented by briefing and opinions from trusted experts, staff discussions, and presentations in which key questions are posed and answered spontaneously. This might well be augmented by the use of on-line question-answering or expert systems, of which about 50 are under development [21]. In fact, the first step toward such a system already exists [1,9,11,15]. Managers at 40 companies have begun using a program called "Intellect" which allows them to enter requests resembling memos without using a conventional programming language.

The search for open-minded middle-level managers of high ability is likely to be improved by a computerized expertise directory [10]. The use of time-management aids such as novel versions of on-line calendars is likely to improve the efficiency of research, development, testing and evaluation. Computer-aided instruction at its present state of development has considerable potential for helping to make planning and innovation management more professional. If nothing else, a good management support system enables its users to avoid the most common causes of failure by means of checklists to which they are periodically asked to attend.

There is an important difference between success in scientific research and success in innovation. In the former, successful projects differ from less successful ones in that they pose a clear question derived directly from current developments in science, and they provide answers of obvious interest and importance to peers in the field [19]. In business innovation, the questions are motivated primarily by economic or social utility. They are derived primarily from a recognized economic need and only secondarily from scientific or technological opportunities. Scientific projects with a primary stress on

utility tend to fail. Success in scientific projects also depends heavily on the quality and interest as well as commitment of participating scientists; on the presence of a persistent core of scientific leaders; and on the degree of project independence from funding sources. Innovative change in business, however, may require a greater degree of perseverance and confident commitment.

3. Overcoming Barriers to Marketing

Tasks (c), (d), and (e) in the above list can be done more effectively and efficiently with the help of information systems. The administration of inquiries to potential customers is not only helped by the use of computers but may require it if the sample is at all large. To start with, on-line bibliographic search systems can inform the market researchers about instruments that are better than the ones they are planning to use. Computer-initiated reminders to make inquiries of users and to pay attention to the responses once again can play a key role. Obtaining assistance in the design of market surveys from expert-statistician systems, which could be developed by the current techniques of knowledge engineering that led to other expert systems, could be very valuable. Storage, retrieval, and analysis of the responses can be accomplished readily with current database management systems; if the sample is not too large, the very easily used systems now available on microcomputers (e.g., APPLE) that most small businesses could afford (PRS for $95, DATADEX for $250, DBMaster for $229, DATAFACTORY for $300 - used by Disney, ABC News, hospitals, etc.) are appropriate. Constant monitoring of the state of the market, using indicators to flag any changes as soon as they are detected, should also be feasible.

Follow-through of a new product, process, or service could be implemented by tracking systems for each customer, as if the latter had a personal

serviceman on call at all times. To maintain effective communication between marketing and potential customers, the use of computer conferencing has considerable potential, if it is properly managed [14]. Of course, if the barriers to communication are social or emotional - if two persons simply do not want to communicate, for whatever reason - no technology will help. If they wish to communicate badly enough, they will find ways to overcome any obstacles. But computer conferencing, if inexpensive and convenient to use, can convert into communicators groups of people with a marginal propensity to do so.

A more elusive but more important challenge to marketing is the discovery of wholly new markets. The idea that the American farmer, prior to the turn of this century, constituted a separate and distinct new market escaped the attention of many firms. It was the vision, know-how, and courage to try to reach the farmer which enabled Sears and Roebuck to overcome the fear of failure and other barriers, and to assume the role of leader. An information system is not likely to stimulate or generate vision or courage where there is none; but it can add to a person's know-how if he or she has a certain minimal amount to start with. The first proposal for a "business intelligence system" [18] used the idea of "selective dissemination of information" to alert marketing professionals to newsworthy publications likely to provide clues about new potential markets. There is now a large variety of good on-line services, such as Predicasts or Automatic Science Citation Alerts.

4. Overcoming Other Barriers

Perhaps the most important barriers are of a political or interpersonal nature. Some dominant and egotistical personalities find it difficult to adopt ideas that are not theirs or to participate in the cooperative effort required for innovative change. This trait may take the form of unwillingness to share

expertise freely, subconscious resistance to change, or unwarranted defense of the present state. In a large organization, no major change takes place without consensus among key people. This does not necessarily mean unanimity or a homogeneous view. But no key person who is in a position to sabotage the change must oppose it, and concurrence is required of everyone whose participation is essential. The consensus may be of a polyocular kind [9], that gives a system using two "eyes" (two one-eyed seers) the possibility of perception in three dimensions when a single "eye" produces only a two-dimensional percept.

A computer-based information system to which a proposal is attributed can serve the role of scapegoat or lightning rod, taking the blame when that becomes necessary. It may also circumvent some of the barriers that are due to "not invented here" attitudes. This is not because anyone really believes that a computer system originates an idea, an innovation, a plan, or even new knowledge. It is simply a make-believe game that the computer culture engenders. Indeed, the use of special computer-based games can go far toward helping players become more inquiry-oriented, less risk-averse, more open-minded, trusting, and cooperative [16]. A most important kind of educational game is one that plants in the minds of its players specific ideas about "creating customers," about the invention or discovery of whole new markets made possible by the latest advances in science or made necessary by the side effects of technologies that have changed our life-styles. It is far more significant to think of and to establish such markets, as in the replacement of fountain pens by ball-point pens, than to expand existing markets.

5. Conclusions

Many of the assertions made above require substantiation. They may be of value to researchers looking for hypotheses to be tested and rejected, accepted,

or modified by experimental or empirical data. The controlled experimental design following the conventional paradigm of confirmatory research, however, can rarely be realized in this field. Laboratory conditions cannot approximate well enough the conditions in which information systems are used by business planners in practice, if only because the pressures are different. On-line usage is very different when it is part of a job in which the focus is entirely on the results and the computer's presence is a distraction than when it is done to test the computer system in which the computer's presence cannot be modified.

It is therefore necessary to approach such investigations as quasi experiments that serve both to shed light on an assertion and to make the assertion true if that is considered desirable [3]. There is, however, some evidence in the literature to support all the assertions made here. It appears now to be widely recognized among the enlightened (but not necessarily among the leaders) that U.S. industry is passing through a critical transition, with a rapid shift from an industrial to a postindustrial base. In heavy manufacturing industries, such as steel, plate-making, petroleum, cars, etc., the fully automatic, worker-less factory and robotics are likely to reduce the workforce in that sector to a far greater extent than we are observing presently, perhaps to a few million by the end of the millenium. Numerous businesses based on high technologies, with 10 to 20 employees, may make up for some of these job losses. Long-term planning, however, will be increasingly vital. The field of small companies exploiting artificial intelligence is rapidly becoming as crowded as that of biotechnology, and sociotechnology. Rapidly advancing research fronts in science are opening up vast opportunities for new business entrepreneurs with adequate vision, courage, know-how, and capitalization [5,8]. The technology required to realize the assertions in this paper is advancing more rapidly than our ability to use it effectively in business. The program Xcon, for example, uses about

1200 rules and 500 descriptions of parts and constraints to assemble a large computer system to a customer's specifications at lowest cost. The French company Schlumberger is spending over $5 million annually in three artificial intelligence laboratories, with such applications as deciding where to drill for oil and gas. The Japanese government plans to spend $45 million by 1985 and $450 million over the next decade to plan and develop a "fifth-generation" computer technology aimed at applications of artificial intelligence.

Nearly all the tools in the armamentarium of decision support systems can be brought to bear on supporting the planning function. All the technologies of management science and operations research, together with computer programs and on-line documentation to help nonusers, are of potential value to people planning a business. Indeed, they are likely to be bewildered by the options and lack the wisdom to choose as confidently as they would like from the entire range of options. What they therefore need most is a meta-tool, a guide that will efficiently and effectively help them to narrow down the options.

The same can be said for networking [4,13], office automation [12,17], and database management systems [2,23]. In the case of networking, the need is for guidance in choosing among the full spectrum of resources available through a network. Few users can take advantage of all the languages available on one large computer, let alone those on other host computers. In the case of database management, the use of even several database query languages can lead to confusion, and keeping in mind the abbreviations or even the existence of fields in several databases is too much to expect of a planner. The business planner should be able to concentrate without distraction on the task of creating a customer. The use of computer information should support and help, not hinder and distract him [20]. Only then can it help him overcome the barriers to planning in business.

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