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Software Tools for New Product Development

Companies operating in today's competitive markets are compelled to develop new products that accomplish several objectives simultaneously. The products should be competitive in global markets, offer good value to customers, be environment friendly, enhance the strategic position of the company, and be introduced at the right time. To meet this formidable set of objectives, companies are embracing new concepts and techniques to support changes in the new product development (NPD) process. These new approaches include techniques such as quality function deployment and stage-gate reviews, measures such as cycle time, and organizational mechanisms such as cross-functional teams (see, for example, Griffin 1993; Zangwill 1993). An accompanying trend has been the growth of software tools to facilitate the new NPD processes. There is, however, little in the marketing literature that reports on the role and impact of these tools, with the exception of software for new product design trade-offs, such as conjoint analysis.

We identify and classify the major categories of software tools that are available for supporting NPD. Then, we briefly explain their role in the NPD process and outline some research issues in evaluating these tools. Our objective is to highlight the goals, advantages, and disadvantages of these tools rather than to provide complete evaluations of the merits of specific software packages. Although we describe some individual packages, space does not permit us to compile a compendium of all the software available in this area. In selecting software for this review, we applied three criteria. The software should

1. Support activities typically associated with marketing's role in the process. Thus, we exclude software tools that are used in physical product design such as computer-aided design (CAD) and/or computer-aided manufacturing (CAM).
2. Be commercially available for general purpose use rather than be proprietary or customized for a particular firm or industry.
3. Run on personal computers (PCs) and be available for our evaluation.

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Software Tools for New Product Development

New product development is a process with a start, an end, and various stages in-between. Typically, the process starts with the opportunity identification phase and continues through product launch and beyond. It is a process characterized by activities carried out by people from different functional areas of a firm. Because of the broad scope and complex nature of the processes associated with NPD, there is no single software package that supports all the NPD activities. Instead, there are several packages that are potentially useful for supporting specific stages and aspects of the process. Some of the available software are designed primarily for use by single users, whereas others are designed to be used by groups. Some require market research data from consumers; others require user judgment as inputs.

Software included in this review are listed in Figure 1 and fall into two broad, nonexclusive categories:

- Software designed to enhance *decision making* associated with NPD, including packages such as NamePro for selecting product names, Mindlink for generating new product ideas, conjoint analysis systems for product design, NewProd for strategic evaluation of new product projects, and GroupSystems for facilitating brainstorming in groups. These packages enhance decision making by enabling managers to use available information more effectively (e.g., Mindlink), encouraging the generation and evaluation of more decision options (e.g., conjoint analysis), or improving consistency of decision making (e.g., NewProd).
- Software designed to facilitate the *process* of NPD, including products such as GroupWorks for project management and Lotus Notes, a groupware product for managing workflow between project members. Such software is designed to improve project planning, coordinate communication between members, maintain a record of activities and discussions during the project, allocate project resources carefully, and provide tracking and analysis to evaluate project progress. The use of these software packages helps the firm meet such process objectives as speed to market, reducing costs of development, improving quality of the product, and minimizing rework.

SOFTWARE FOR ENHANCING NPD DECISION MAKING

Software for Idea Generation

Creativity in NPD requires both divergent thinking (lateral thinking) and convergent thinking. Divergent thinking results in the generation of a large number of ideas, whereas convergent thinking helps a person to converge toward the most promising ideas. Several commercial software packages have been introduced in recent years to support the creative process, with the basic premise that the interaction

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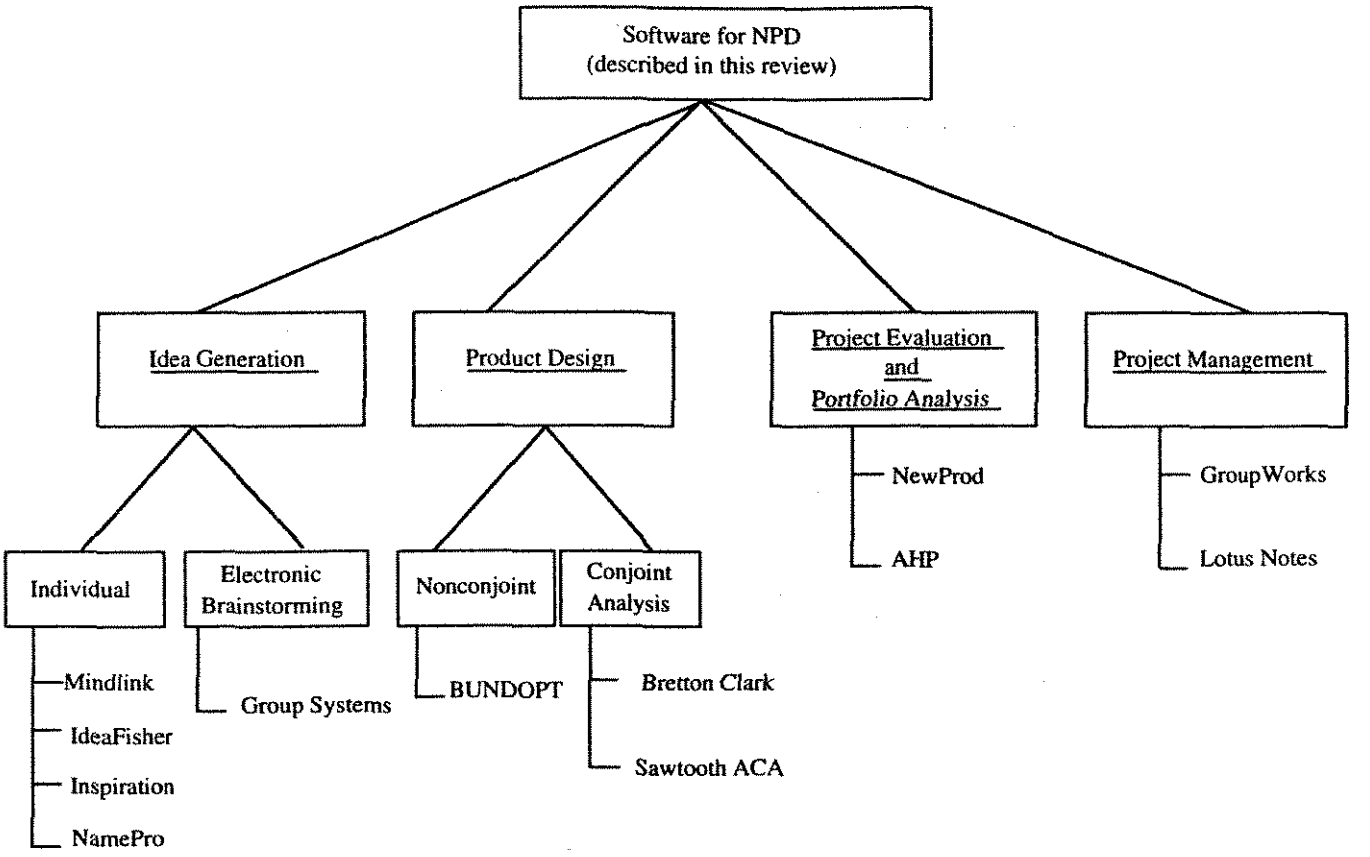
Figure 1
CLASSIFICATION OF SOFTWARE FOR NPD



between people and software leads to creativity enhancements. In Table 1, we summarize the benefits and limitations of a sample of creativity-enhancing software for NPD.

The software listed in Table 1 were all simple to install and easy to use, and some were stimulating. However, there is some danger in relying too heavily on these tools. Each software package takes a particular approach to creativity that is likely to be most useful only in specific contexts. They all promote a cookbook approach, thereby possibly undermining the very objective of encouraging experimentation and thinking "outside the box." Furthermore, they focus on idea generation and provide only minimal support for idea evaluation. One way to incorporate idea evaluation is through decision-aiding models such as the Analytical Hierarchy Process (AHP) described subsequently.

Although all the software in Table 1 could be used in group settings with a moderator running the software and projecting the results on a screen, other types of software are available for directly promoting group interactions in the generation of ideas. Software such as GroupSystems from Ventana Corporation may be used to set up electronic brainstorming with numerous participants. The system can be used to create agendas (e.g., problems to be resolved), allow for simultaneous and anonymous generation of ideas from participants, obtain votes on action items, produce reports summarizing the discussion, and maintain records for future use. Participants all may be present in the same room or log-in from remote locales to participate in the discussion. Although the system seems to be robust in the session in which we participated, it is complex and requires the presence of a technically competent moderator to facilitate its use.

Research suggests that in face-to-face brainstorming, noninteracting persons working separately generate more ideas and more creative ideas than an interactive group with the same number of persons (McGrath 1984). Also, Cooper and Gallupe (1993) and Nunamaker and colleagues (1991) find that, compared to face-to-face meetings, the use of an electronic brainstorming system improves both the efficiency of idea generation (e.g., number of ideas per participant) and the effectiveness of the ideas (e.g., range of ideas generated, successful implementation of ideas). Among those using electronic brainstorming, interacting groups generate more ideas and better-quality ideas than noninteracting groups (Valacich, Dennis, and Connolly 1994). Thus, overall, it appears that electronic brainstorming with interacting participants is an effective method of brainstorming.

Software for Product Design

Many products and services may be viewed as bundles of product attributes (i.e., products may be represented as combinations of levels of product attributes). For example, a Toyota Camry car could be described as SIZE = midsize,

Table 1
A SUMMARY OF SOFTWARE FOR IDEA GENERATION AND EVALUATION

Software	*Description*	*Potential Benefits*	*Limitations*
Mindlink	Software implements the well-known synectics process, combining structured problem solving with techniques for stimulating creative thinking. The user states a problem he or she is trying to resolve (e.g., increase battery life of notebook computers). The program encourages divergent thinking by using "wish-triggers" (I wish computers could store energy the way cacti store water) and "idea triggers" (ways to realize the wishes—e.g., a battery mechanism dispersed throughout the body of the notebook computer). To converge to an effective solution, it uses "option triggers" to structure the evaluation of possible solutions to the problem. The software also comes with exercises designed to help the user learn the process of creative thinking (e.g., forced juxtapositioning of unrelated thoughts), and a database to facilitate the triggering process.	Useful at several stages in NPD, particularly at the idea generation stage—use of software could result in more ideas generated on the problem, than if it is not used. After doing this two or three times, the user should be able to internalize the key elements of this process and therefore be able to use these concepts even without the software. The software is easy to use.	The Thought Warehouse is low in content.
IdeaFisher	Software combines two databases: one with 65,000 words and phrases, together with an extensive set of cross-referenced links between them, and the other with a question bank of about 700 questions (e.g., how would a child solve this problem?) that are organized by various categories. When the user provides a word or phrase, the software retrieves a number of associated words and phrases. For example, the word *new product* retrieves several associated words and phrases such as marketing, imagination, research experiments, and so on, and each of these (e.g., imagination), in turn, triggers other connections (e.g., imaginary people, places). This process may be continued iteratively.	It encourages divergent (lateral) thinking through free association. It appears to be particularly good for making nonobvious verbal connections. The software has an elegant design that simplifies use.	Seems to be more useful for areas such as advertising design that are word-rich than for generating new product ideas. Although the software enhances the generation of ideas, it provides no structured mechanism to narrow down the options. In some cases, the number of ideas generated is too large to be useful.
Inspiration	A software environment for visual thinking that is based on "mind mapping" techniques. Starting from a core concept, the user "spans outward" to develop links to other concepts that are relevant to the core concept. This is done using various visual aids, such as charts, maps, symbols, and outlines. For example, starting with the core idea of developing a notebook computer with a ten-hour battery life, the user can link this visually (with arrows) to other activities such as "check patent office for battery technology," "contact R&D in sister company," "initiate feasibility study within the company," and so on. Each of these can then be visually linked to other concepts. Once concepts are put on a computer screen, they may be easily rearranged as the idea generation process proceeds. The software contains an extensive database of symbols for generating visually useful representations.	A user-friendly system that is useful both for idea generation, and for project management. Enables users to see the "whole picture," which could help them see new connections or structures that may not be evident otherwise. The software keeps a record of the idea maps for future use and enables quick revisions, a feature that is useful when new information becomes available.	Unlike Mindlink or IdeaFisher, it has no specific tools to directly encourage creativity or problem solving. It is difficult to generate symbols that convey multiple things or have multiple meanings. The software imposes a task structure that may be unfamiliar or unnatural to some users.
NamePro	A set of databases and software tools for developing names of products and companies. The program allows (1) string searches of its database to identify names and potential conflicts with existing names and (2) a combining or partitioning of parts of names to generate new names. One of the databases is the name base consisting of over 30,000 names organized by category (e.g., computers), connotation (e.g., innovative), and trademark (i.e., whether a renewed or pending trademark registration is associated with a name). Another interesting database is the "profanity database" that contains common profane words in five European languages.	Useful to both end-user managers and attorneys involved in registering product names. Simple and straightforward to use.	Some program options (e.g., combining two name parts) generate large numbers of irrelevant names, whereas other options that generate names satisfying specific criteria (e.g., connotations) sometimes generate too few names. An enhancement that would be valuable is a module to assess the strategic value of a name, which is based not just on whether it is preempted by existing trademarks, but also on average market performance of names with similar characteristics.

TYPE = sedan, MPG (miles per gallon) = 30 in city, ENGINE = V-6 fuel-injection, OPTIONS = sunroof, and so on. In purchasing products, customers make trade-offs between the various attributes, for example, between a sunroof and a V-6 engine. Conjoint analysis is a formal technique for examining these trade-offs to determine an effective combination of attribute levels that will perform well in the marketplace. In short, conjoint analysis is an approach for customer-based new product design. In particular, conjoint analysis is useful for deciding which attribute levels

should be designed into a new product to maximize its expected market performance in the presence of existing competitors and to determine which market segments will find a particular product configuration to be most appealing. Many successful applications of this approach have been reported, including the design of the Courtyard by Marriott hotel (Wind et al. 1989; see also Wittink and Cattin 1989).

There are two major commercial packages for designing and conducting conjoint studies. A recent detailed review in *JMR* has evaluated these packages (Carmone and Schaffer 1995), namely, Bretton-Clark and the Adaptive Conjoint Analysis (ACA) package available from Sawtooth Software. The packages differ along several dimensions, including whether they use the full-profile method or an "adaptive" approach to the selection of the specific product sets evaluated by customers, whether they include built-in editors for generating and modifying questionnaires, and whether the questionnaires are administered to customers on a PC, as well as along such dimensions as the measurement scales on which customers evaluate the products presented to them, the algorithmic options (e.g., metric, nonmetric) for computing the utility function, the approach they use to collect and merge background information on customers for purposes of segmentation, the set of criteria they offer for simulating market performance, and the methods they use to calibrate the model to current market conditions and assess the predictive validity of the model. In addition to these products, knowledgeable analysts can conduct conjoint analysis using standard statistical packages such as SPSS and SAS. In SPSS, the ORTHOPLAN, PLANCARDS, and CONJOINT procedures are available under the Categories module. In SAS, the TRANSREG procedure may be used.

In contrast to software used for idea generation, there is some published literature in marketing to assess the value of conjoint analysis, including the documented success of the Courtyard by Marriott hotels. There are also several academic studies that have explored the predictive validity of alternate ways to implement conjoint analysis. The interplay of academic research with program enhancements made by the software designers has led to continuous improvements in these packages since they were introduced in the mid-1980s. More software enhancements may be expected, including the use of multimedia for presenting product stimuli (e.g., Sawtooth) and data collection using web pages on the Internet (e.g., study being done at the University of Pittsburgh). At the same time, new theoretical developments, such as the use of Bayesian analysis (Allenby, Arora, and Ginter 1995), foreshadow the availability of new types of software for conjoint studies.

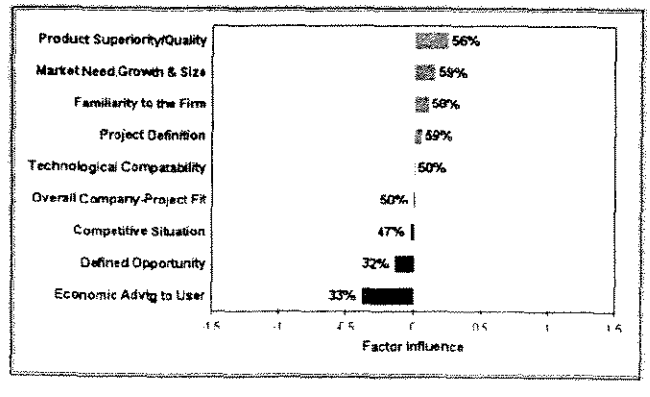
A different customer-based approach for designing new products is the BUNDOPT model described in Green and Kim's (1991) study and available from Intellicomm. This model is particularly appropriate for deciding the optimal combination of features to be offered in a new product. For example, in designing a car, the manufacturer could incorporate several features, such as cruise control, roof rack, hood air deflector, or trailer hitch. The number of available options could be well over 25, but most customers probably would not be willing to pay for more than 5 to 10 of these. Each customer, however, may have a different set of preferred features. An important question for the manufacturer is to decide which subset of the available features should be offered to ensure that the car will appeal to the maximum number of customers. The BUNDOPT model uses pick k/n data that are obtained from a sample of customers and employs an efficient heuristic algorithm to identify the best combination of features. Other issues addressed by this model are the identification of segments that most prefer a particular set of features and the desirability of a particular combination of features to a target segment.

Software for New Product Evaluation

NewProd. An important way to improve new product success rate is to conduct overall project evaluations for assessing the business risks and rewards of the new product and to determine the organizational resources that must be devoted to improving its chances of success if the company decides to go forward with the new product. NewProd is a software developed from Cooper's (1986, 1992) research, in which he analyzed the determinants of new product success from 195 projects using 80 independent variables. The database has been updated and enlarged since the original study, and the software is based on 30 of the 80 variables (reduced to nine orthogonal factors) that were most instrumental in explaining the degree of new product projects.

NewProd is used under the guidance of a trained facilitator. Project members independently provide data on the 30 variables identified in Cooper's research and then meet to discuss differences in their inputs—repeating the process until there is general agreement about the inputs. The NewProd program compares this input profile of the new product (summarized in nine factors) to its internal database of factor scores to determine the percentile position of the new product compared to the factor scores of products in the database. This evaluation may be customized by industry (e.g., consumer packaged goods, business markets, electronics). Several reports help to determine whether the new product score on each factor is consistent with that of a successful or unsuccessful product and to indicate what should be done to improve the new product's chances of success. This is shown in the screen display from the software (Figure 2). In addition to monadic evaluation, this software may be used to evaluate several products at different stages of development simultaneously, which thereby provides an assessment of a

Figure 2
SCREEN DISPLAY FROM NEWPROD



Higher percentile scores on factors with high influence suggest higher probability of success.

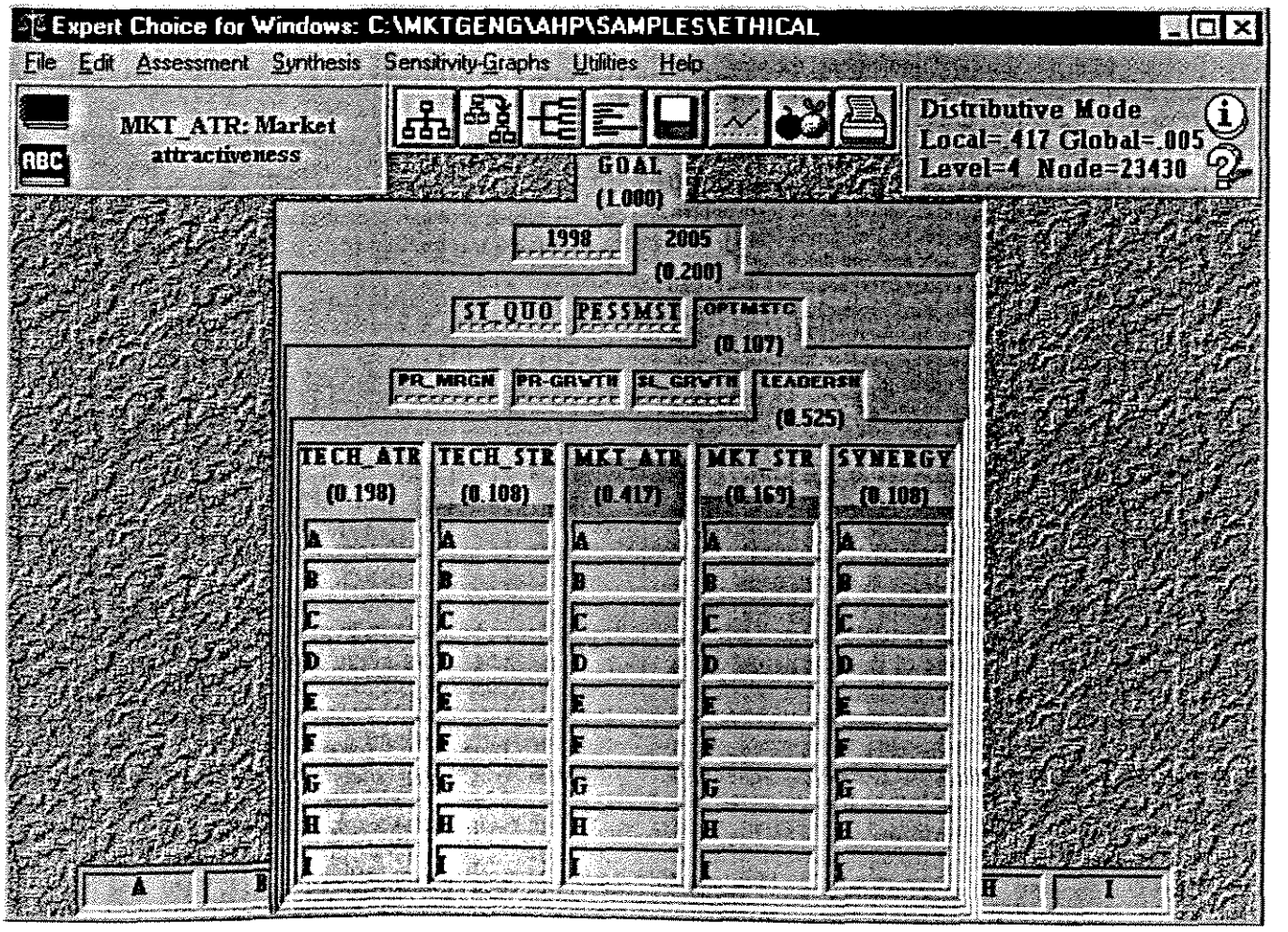
new product in the context of the entire portfolio of new products under development. This facilitates organization-wide resource allocation, as well as the identification of systemic problems in new product development projects.

NewProd is a simple, yet effective package for benchmarking new product projects. Further improvements to the model and software are bound to occur as more data become available about its impact on the NPD process.

Expert choice. General purpose decision-aiding software can also be used for limited types of new product evaluation. One that has seen wide application in industry and has received some attention in marketing is Expert Choice, which implements the AHP (Saaty 1980). This software is particularly useful for choosing between and/or prioritizing several different new product projects on the basis of user-proposed criteria and subcriteria. The user first establishes a hierarchical structure of criteria and sub-criteria on which the new product projects will be evaluated (see Figure 3). Next, the user provides pairwise evaluations of the alternatives at each level on the hierarchy. The software synthesizes these evaluations across the entire hierarchy to come up with overall numerical scores that indicate the relative importance of each criterion and subcriterion and the overall relative attractiveness of each of the product options. The most useful aspect of the software is its feature for visually conducting sensitivity analyses. In particular, it is easy to see how changes in the relative importance of a criterion would alter the relative attractiveness of each of the alternatives. AHP accommodates rank reversals.[1]

[1]A rank reversal occurs when alternative A is preferred to alternative B before (third) alternative C is included in the set of considered alternatives, but where B becomes preferred to A after C is introduced. Expert Choice offers two options: (1) the ideal mode, which preserves ranks with the addition of alternatives, and (2) the distributive mode, which allows ranks to change. To allow the weights to change consistently, criterion weights in the distributive mode depend on the degree to which each criterion differentiates between the alternatives included in the evaluation. This procedure assigns higher weights to alternatives that are both better than others on important criteria and differ markedly from the other alternatives under consideration.

Figure 3
HIERARCHICAL STRUCTURING OF CRITERIA: EXPERT CHOICE SOFTWARE



Hierarchy, showing goals, subgoals, scenarios, and criteria on which nine projects (A to I) are evaluated—based on a real application supplied by Professor Jerry Wind.

SOFTWARE FOR FACILITATING THE NPD PROCESS

There are primarily two types of software to support the NPD process. The first is project management software, which are designed to manage various aspects of project management, such as project scheduling (e.g., through use of PERT charts), time management, resource management, and task assignments. Microsoft Project is a good example of this type of software. The second is team management software, which is designed to operate over a network and assist people in working together. Falling under the category called groupware, these software packages support various aspects of team management, such as electronic messaging and document transfer between team members, electronic conference between team members, and work flow automation. Increasingly, project and team management software are merging in response to the growth of matrix organizations. To illustrate these software and their impact, we briefly examine two packages: GroupWorks and Lotus Notes.

GroupWorks is installed on the PC of all the team members, but the key files reside only on the PC of the "owner" (project leader) of the project. The PCs of the team members connect to the owner's PC as and when required. Each stage of a NPD may be set up as a separate project with its own owner. For example, the team that makes the business case for the new product may be a different team than the one that sets up the product specifications, which in turn, may be different from the team that tests and implements the new product. These separate teams may all be linked together using this software. GroupWorks is designed to support small groups, and it consists of four modules:

1. *Overview:* Provides top-level project overview and establishes a common vision for the product among the team members. This module helps set up project preliminaries (e.g., project members, project objectives, start and end dates).
2. *Activities:* Helps set up and manage the activities associated with a project, such as assigning tasks to individual members, setting task priorities, and tracking progress. This feature also enables users to attach documents and/or spreadsheets on which all members of a team can work.
3. *Discussions:* Enables members to initiate threaded (topic-specific) discussions with other project members.
4. *Contacts:* Helps maintain project-related contact information. This can be kept private or distributed to other members.

According to a senior executive of FTP Software, they do not yet have any clearly documented assessment of the impact of this software on NPD, because companies have just begun to use this software for this purpose. Early indications are that the quick access to project status information and the automatic triggering of documents indicating impending deadlines and project updates have been of considerable value to these early adopters. We were able to obtain some information about the general impact of groupware products on NPD from David Coleman, an industry consultant. He states that currently, though only a few organizations have implemented groupware for NPD, those that have implemented groupware to manage hardware and software development projects are realizing a 25 to 35% improvement in productivity.

Lotus Notes is different from GroupWorks in two important ways: (1) it allows for companywide implementation across different hardware platforms, which facilitates support for ad hoc teams, and (2) it supports work flow automation for routine processes, such as order fulfillment and billing. Since its introduction in 1989, Lotus Notes has become the premier groupware product. Several companies, such as Price Waterhouse, have installed thousands of copies of Lotus Notes to electronically link all employees. This helps them quickly put together ad hoc teams to address specific problems and opportunities. In Figure 4, we provide a screen display that illustrates how a Lotus database is structured to facilitate document access between team members.

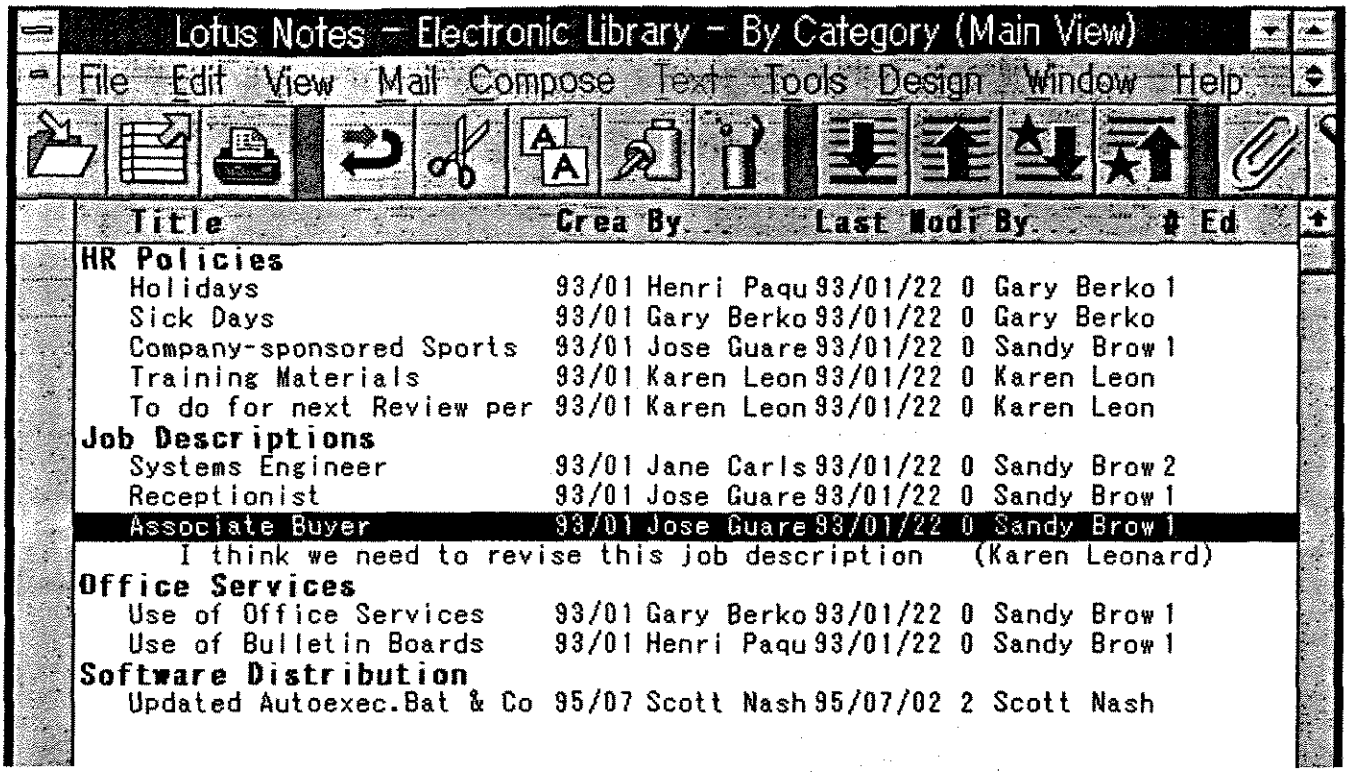
Two examples illustrate how companies are using Notes for NPD. Computer Language Research (CLR) is the leading firm in the tax software business—designing and marketing hundreds of different software packages for managing audits and taxes for customers such as banks, accounting firms, and corporate tax departments. Because of changing tax laws, the firm must be able to make enhancements quickly to existing products, as well as develop new products for new customers in other industries. The use of Lotus Notes has helped CLR improve both the speed and quality of its new products. For example, team members can make some decisions on-line without having to arrange face-to-face meetings, which helps compress product development time. Likewise, new product quality is improved by providing project teams with improved access to expertise available within the company and through improved coordination in reporting and fixing problems before the new product is shipped.

Bristol-Myers Squibb is another company that has benefited from using Notes for NPD. The development of a pharmaceutical product is a complex endeavor that requires collaboration among many different types of people—scientists, engineers, marketers, attorneys, and senior executives. Lotus Notes provides a central database to maintain all project-related information (e.g., market conditions, regulatory requirements, list of contractors and consultants, records of meetings), which is available to team members worldwide. This enhances the level of information sharing during the project. According to the director of research and development, "We're better informed about what's happening outside our knowledge base ... in some cases, information obtained through Notes has helped us change our assumptions and make better decisions."

Concluding Comments

In the immediate future, the Internet promises to have a significant impact on NPD. The most interesting possibilities are the ability to more readily identify lead user communities and involve them in the NPD process; conduct on-line marketing research, including concept testing and conjoint analysis; and establish an "Intranet" linking widely dispersed project members and corporate databases over private networks, but using Internet tools. Newsgroups and forums are now becoming part of the product development process. For example, the Microsoft Forum (available through on-line services such as CompuServe) provides the company with hundreds of ideas for enhancing their products. In some cases, forum members even post suggested solutions (patches) to enhance the company's software, which can then form the basis for product improvements. As another example, the educational division of Texas Instruments (TI) has used its Web site (www.ti.com/calc) to estab-

Figure 4
DOCUMENT MANAGEMENT FOR PROJECTS: LOTUS NOTES



Database organizes, archives, and makes accessible all project-related material—allows multilevel access, along with controls such as "Reader," "Author," and "Editor."

lish links with its customers in schools across the country. The development of the highly successful TI-92 calculator was significantly aided by the Internet. Texas Instruments posted the proposed specifications of the product and an on-line demonstration simulating its functionality on its Web site and invited feedback from members of various discussion groups devoted to education. The continuing feedback from the participants was instrumental in making many enhancements to the product. When the calculator was introduced, the final specifications also were put on the Web site. This offered a simple way for teachers to download documents to develop proposals to their school boards for purchase of these calculators.

There also is a newsgroup devoted solely to examining issues related to improving the NPD process (newprod@world.std.com). Likewise, on-line marketing research is increasing. Sample biases are likely to become less of a problem as this mode of research becomes more accepted, especially in business-to-business markets. Finally, the growth of the Intranet promises to bring more flexible and less expensive groupware for supporting NPD.

In spite of the wide range of software that are now available for NPD, we know little about whether, how, and why these software improve the process and outcomes associated with NPD. More careful measurements of their impact are needed, especially in evaluating the effectiveness, not just the efficiency, associated with the use of these software tools. A related question is whether some aspects of NPD (e.g., project management) are inherently more amenable to software support. These validation issues are important, because software reviews in traditional computer magazines and journals focus more on ease of use than on impact on NPD. We also need research done by unbiased sources to examine the comparative performance of software that perform similar functions. Addressing this need requires closer collaboration between academic researchers and the makers and users of these software. We echo the comment of Carroll and Green (1995) that more research is needed on these less-than-glamorous but important issues. Perhaps if we start viewing the real world as the laboratory and the software as a research instrument, there may be more interest in this type of research.

Finally, it is surprising that even after two or three decades after their introduction, there are no PC-based commercial software packages for such well-known models as the Bass model for new product forecasting and the Assessor model for pretest market forecasting. Although there have been several proprietary software implementations of these models within firms, there is a need for generic versions of these software. As a step in this direction, our book, entitled *Marketing Engineering* (1997), contains software for several new product models, including the Assessor and Bass models. One way to increase the impact of models developed by academic researchers is to start viewing software

as a technology transfer mechanism between academia and practice. Perhaps this view would lead to increased collaboration between academics and practitioners as well as more research on the effectiveness of marketing science methods.

REFERENCES

Allenby, Greg M., Neeraj Arora, and James L. Ginter (1995), "Incorporating Prior Knowledge into the Analysis of Conjoint Studies," *Journal of Marketing Research*, 32 (May), 152–62.

Carmone, Frank J. and Cathy M. Schaffer (1995), "New Books in Review," *Journal of Marketing Research*, 32 (February), 113–20.

Carroll, J. Douglas and Paul E. Green, (1995), "Psychometric Methods in Marketing Research: Part 1, Conjoint Analysis," *Journal of Marketing Research*, 32 (November), 385–91.

Cooper, Robert G. (1986), "An Investigation Into the New Product Process: Steps, Deficiencies, and Impact," *Journal of Product Innovation Management*, 3 (June), 71–85.

——— (1992), "The NewProd System: Industry Experience," *Journal of Product Innovation Management*, 9 (June), 113–27.

Cooper, William H. and Brent R. Gallupe (1993), "Brainstorming Electronically," *Sloan Management Review*, 35 (Fall), 27–36.

Green, Paul E. and Jonathan S. Kim (1991), "Beyond the Quadrant Chart: Designing Effective Benefit Bundle Strategies," *Journal of Advertising Research*, 31 (December), 57–63.

Griffin, Abbie (1993), "Metrics for Measuring Product Development Cycle Time," *Journal of Product Innovation Management*, 10 (September), 112–25.

Lilien, Gary L. and Arvind Rangaswamy (1997), *Marketing Engineering*. Reading, MA: Addison Wesley Longman.

McGrath, Joseph E. (1984), *Groups, Interaction, and Performance*. Englewood Cliffs, NJ: Prentice Hall.

Nunamaker, J. F., Jr., Alan R. Dennis, Joseph S. Valacich, and Douglas R. Vogel (1991), "Information Technology for Negotiating Groups: Generating Options for Mutual Gain," *Management Science*, 37 (October), 1325–45.

Saaty, Thomas L. (1980), *The Analytic Hierarchy Process*. New York: McGraw Hill.

Valacich, Joseph S., Alan R. Dennis, and Terry Connolly (1994), "Idea Generation in Computer-Based Groups: A New Ending to an Old Story," *Organizational Behavior and Human Decision Processes*, 57 (March), 448–67.

Wind, Jerry, Paul E. Green, Douglas Shifflet, and Marsha Scarbrough (1989), "The Courtyard by Marriott: Designing a Hotel Facility with Consumer-Based Marketing Models," *Interfaces*, 19 (January/February), 25–47.

Wittink, Dick and Philippe Cattin (1989), "Commercial Use of Conjoint Analysis," *Journal of Marketing*, 53 (July), 91–96.

Zangwill, Willard I. (1993), *Lightning Strategies for Innovation*. New York: Lexington Books.