# A Pilot Survey of Software Product Management
## Shirley Tessler and Avron Barr
## SCIP Software Industry Study
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Stanford University's Computer Industry Project (SCIP) is an interdisciplinary study of the worldwide computer industry. Funded in its initial years by the Alfred P. Sloan Foundation, this project's goals are to characterize the nature of the emerging industry, analyze trends and identify and monitor important industrial, educational and public policy issues. We are reporting here on the efforts of one area of the SCIP's research, the Software Industry Study.

Avron Barr and Shirley Tessler are co-directors of the SCIP Software Study. Mr. Barr was an early pioneer of expert systems technology and editor of the four-volume *Handbook of Artificial Intelligence.* He was a founder of a software start-up and has, since 1981, provided management and strategic consulting about advanced software technologies and applications. Ms. Tessler is a Wharton MBA with 15 years' experience in banking and corporate finance. She has also studied Computer Science at Carnegie Mellon and Stanford Universities. Her expertise is in software startup financing and management. She is an expert on the business implications of the Internet and the worldwide web.

Address:

Avron Barr and Shirley Tessler
Stanford Computer Industry Project
Littlefield Center, Room 14
Stanford, CA  94305-5013
415.725.3856  Fax: 415.725.5913
avron@aldo.com, tessler@aldo.com

# A Pilot Survey of Software Product Management

By Shirley Tessler & Avron Barr, Stanford Computer Industry Project

We surveyed managers of software projects at 11 software publishers in two segments of the software industry to investigate process, communication, technology and tradeoff issues in software development. Marketing product managers and engineering team leaders were surveyed independently. The results show clearly how muddled the situation is, and underscore the communications gap between the marketing and engineering groups on these projects. The study is currently being extended to include a wider range of software projects.[1]

One of the more significant and consistent concerns we've heard expressed in over two years of interviews with several dozen software industry insiders (executives, analysts, venture capitalists, and researchers) was that software development is still considered a craft; that development organizations cannot control or manage the process effectively, and too often cannot balance the demands of innovation, time to market, quality and cost. Even leading software publishers still cannot accurately predict the time and cost to produce a major new product or even a major revision.

Because of the prevalence of this issue in the minds of software executives and other software industry insiders, we decided to undertake a study of product development practices among software publishers. In the summer of 1995, we undertook to investigate the state of the art in software development among software product publishers. Our goal was to establish benchmarks, uncover best practices, and identify the key issues in software product management.

We asked about issues like team composition, formality of process, decision making style and tradeoffs. We then identified two segments of the industry which had several local publishers and which we thought might be quite different: relational database products and a new software category, call-center management products. The main results of our pilot survey of 19 respondents from 11 firms in 2 segments of the market are summarized as follows:

- In both segments (RDBMS and call center software), features, quality, and cost were consistently traded off to achieve time-to-market.

- No dominant software development methodology was identified. Only 50% of respondents described any formal methodology. Most were developed in-house.

- A majority of teams allowed features to be added or dropped very late in the development process, even after beta testing.

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- Product decisions in more than half the firms were dominated by Engineering. Less than 20% of respondents made decisions based on a consensus between Engineering and Marketing.

- Code re-use, from prior versions (91%), other company code (54%), and commercial products (27%) was very common.

- Project-level budgeting and cost tracking were low-priority activities. Headcount was the only budget control mentioned.

- Major differences in perception exist between the Marketing Product Manager and his or her counterpart in Engineering about such issues as how the requirements for the release were formulated, tradeoffs, the nature and source of development problems, etc.

- Project teams were organized in a variety of ways. Functions like Quality Assurance and Release/Project Management could be located in several different departments and at different levels within the department, and even Documentation and Tech Support held a variety of org-chart positions.

**Rationale and Design of the Survey**

Software product management is harder than the development of many other products expressly because of its extreme flexibility. All software product development is R&D, with no tooling or manufacturing component. Because of this ability to go from development lab to market almost literally overnight, aberrant development practices have arisen and survived tenaciously, regardless of the acknowledgment of most parties about their negative effects on quality, reliability, morale, and on the management of the process generally. These practices include adding or dropping of features in the days before product shipping; allowing requirements and planning documents to become outdated; widespread understaffing of product testing, documentation, and quality control; and severely limited planning and budgeting practices.

We created and tested a pair of survey instruments, through preliminary discussions and trial runs with volunteer product managers, and subsequently with a carefully selected focus group composed of people working directly in software development who represented different perspectives on the process: engineering, marketing, documentation, project management and tech support). These 1-hour questionnaires were to be completed with reference to a particular software release: one questionnaire for the engineering manager and one for the marketing product manager involved in that release. The questionnaire investigates the range of practices in areas such as requirements formulation, release management, team communication, bug management, planning and testing. In August of 1995, we administered the survey at 11 local companies, collecting 19 responses all together..

We targeted two segments of the software products industry: relational database products and call center management products. We chose these two segments for the

pilot survey partly because we had greater access to local companies in these segments, and partly because we believed that they had different company and market characteristics that might influence their software development practices. In general, the relational database segment is a larger, more mature market segment, with bigger companies dominating the field. We perceived the call center segment market as more rapidly changing, with many smaller players with fewer resources, that might therefore make different tradeoffs in the development process.

|  | RDBMS | Call Center | Total Firms |
|---|---|---|---|
| Very Small, < $10M | 1 | 1 | 2 |
| Small, $10-50M | 2 | 4 | 6 |
| Large, > $100M | 3 |  | 3 |
| Total Firms | 6 | 5 | 11 |

Our analysis of the results follows. Regarding best practices, it should be noted that we have not yet developed adequate metrics for quality, timeliness to market, or project "success." We did ask a number of questions related to testing, documentation, Quality Assurance department influence or involvement, schedules and time delays, and many other issues that we hope will eventually provide insights into best practices.

**Some Preliminary Results**

These results are based on a very small sample of projects in a very few companies in just two out of the hundreds of segments of the software products industry. The results are not statistically significant, but they are interesting. We are planning a broader survey this summer.

**Tradeoffs.** Software industry executives often discuss how the extremely rapid rate of change of their technologies and markets force them to make a conscious tradeoff among cost, quality, features, and time-to-market in the course of their software development. Our pilot survey probed this tradeoff process. We found that the marketing and engineering functions often favored different tradeoff strategies, based on their differing perceptions of both the market environment and end user expectations.

Marketing managers, for example, saw features and platform diversity to be the essence of the competitive edge. They were more willing to tradeoff the time it takes to do comprehensive testing in order to include additional features. They believed that their

success in the marketplace was tied to market factors such as features, price and company reputation. They expected bug fixes to come out in dot releases or to be replaced by new functional releases; thus they avoided talking about quality as a competitive factor. Engineering managers, on the other hand, although very feature-oriented as a group, were about as likely to decide to drop (postpone) features (or reduce feature functionality) as they were to forego testing, in order to get the product out to market. Both functional areas agreed, however, that time-to-market was the over-riding consideration.

One indicator of the tradeoff between time-to-market and quality might be inferred from the timing of feature additions and deletions from a release. Almost half of all of the respondents were willing to add or delete a feature in the last few days before the creation of the "Golden Master" (in preparation for duplication and shipping), obviously leaving little time for testing of additions or correcting user documentation.
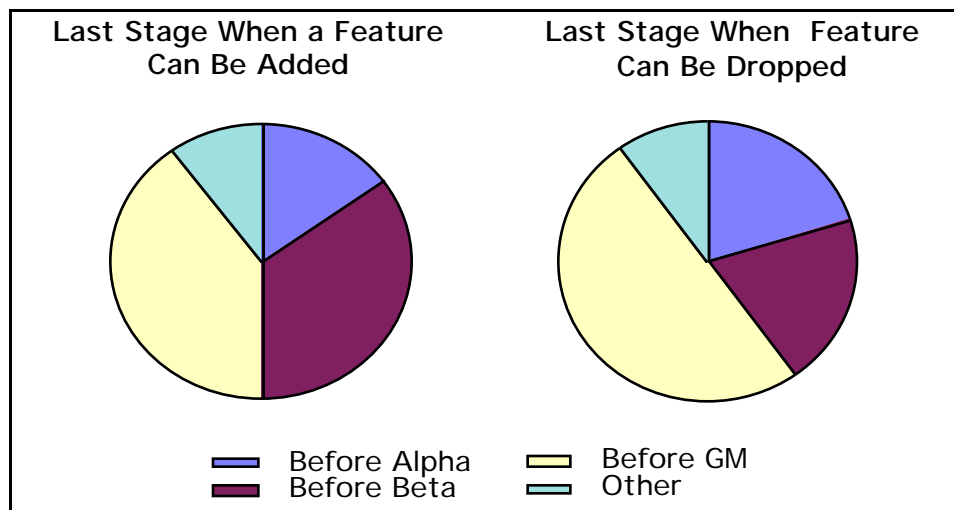


While we are still evaluating questions about the tradeoff process, we can already observe that for the companies included in the pilot survey:

- Time-to-market was the strongest consideration while budget and staffing considerations were always the lowest priorities.

- Within the time-to-market constraint, marketing managers opted for features over quality, while engineering managers saw their choices more evenly as a tradeoff of both features and quality against time-to-market.

**Quality.** Inadequacy of documentation and understaffing of the documentation function were the quality factors most frequently cited as a problem. A few teams outsourced the documentation task but still pointed to a lack of resources in that area. The quality assurance (QA) function was also sometimes outsourced. Both the documentation and QA areas were often consigned to a lower status than other members of the development team. For example, in several organizations, respondents said that QA had little influence on team activities, and that the QA manager reported to a lower level person than did the marketing or engineering manager.

Some companies charged their engineers with the primary responsibility for testing; QA was there only as a "sanity check" and to make sure that the product integrated with other products within and outside of the company. Other companies did not provide adequate testing time for the QA function (either by engineers or a separate QA group), in order to get products out to market quickly. A few companies believed that testing was not necessary at all because, for example, they were "only porting code to a new platform," not developing new functionality. While the majority of respondents expressed concern for the quality of their products, no companies described practices that could consistently produce the highest quality in their software.

**Planning.** We asked respondents to characterize the formality of the requirements planning process for their project in one of four ways:

1. This project was part of a long-term plan for the product.
2. There was a formal marketing requirements analysis and document.
3. A small group informally determined the requirements before the project started.
4. The requirements were revised continuously through the project.

Almost half of the respondents said that their requirements formulation process was relatively informal. Although we had expected the more mature segment to have more formal requirements formulation processes, there was little difference between the segments.
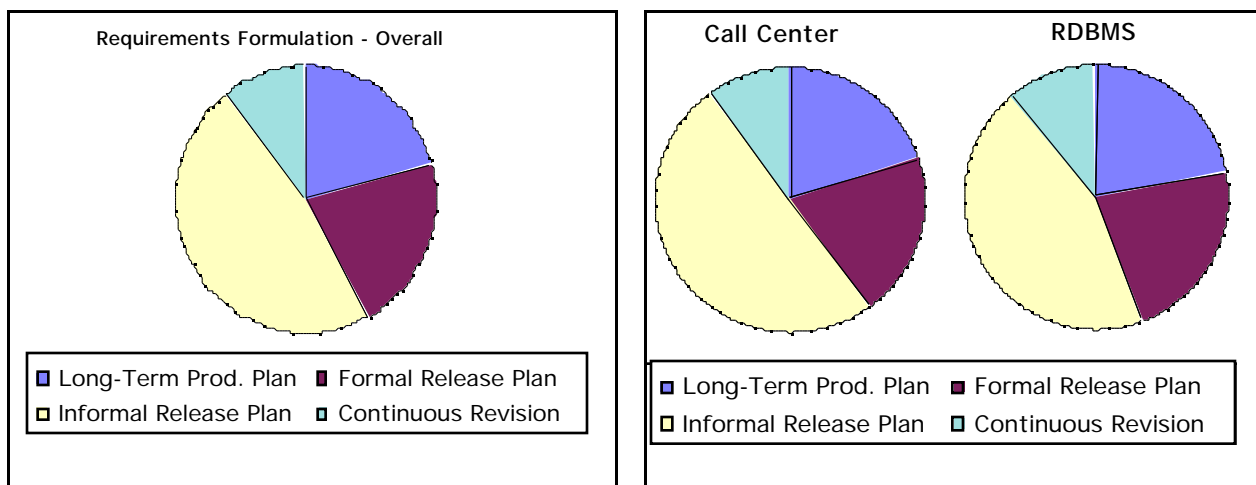


Most interesting, however, was the difference in perspective between the marketing product managers and their engineering team counterparts. Marketing was far more likely to have a long-term plan for a product than was engineering. Their vision, however, was not always communicated to (or accepted by) the Engineering Department. Engineering managers not only said that they did not prepare a plan themselves, but often maintained that no long term plan existed. Marketing was also more likely to believe that a formal document outlining their plans existed.
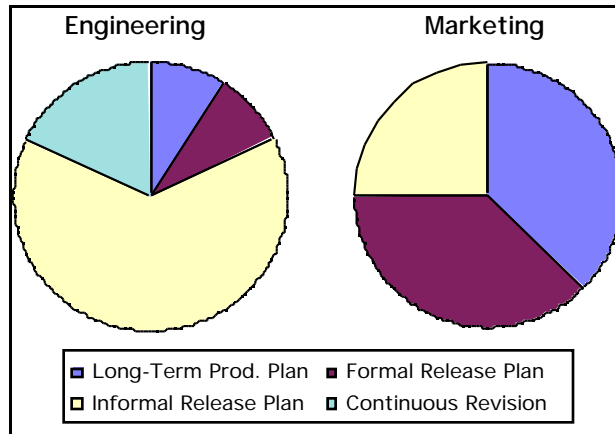
Engineering typically had some formal written plans, such as milestone objectives, but few had comprehensive specifications covering all aspects of the development process. Even among the companies that had formal engineering plans, more than 60% had so many changes by mid-way through the project that plans were abandoned rather than updated. We have found some preliminary evidence that the more out-of-date plans became relative to actual activities, the more likely companies were to have noticeable schedule slippage. Without plan documents to refer to, project/process changes were hard to disseminate to all parties as was monitoring progress toward the changed goals.

Planning horizons varied markedly from three months to 2 years. We found that no one in the pilot had a long-term vision beyond two years (although a more clearly stated question might have had a different response). However, those with a longer-term perspective were more likely to plan releases more carefully and, within a plan specifying multiple releases, were also somewhat more likely to have considered such long-term issues as software reuse. From the engineering side, companies with long-term outlooks were also more likely to have someone they identified as a chief architect who was (at least partially) responsible for the long-term vision along with marketing.

We looked at what percentage of the total project time was spent in planning, development and testing. For the majority of companies in the pilot, companies that spent more time on planning spent relatively less time on testing. However, their ability to meet their own market introduction schedules did not necessarily correlate with how much planning they did on that release.

We thought that perhaps larger companies with more resources to devote to planning would do more planning, but we found little evidence that they did any more planning than their smaller counterparts. There was also surprisingly little correlation between the amount of planning and the relative complexity of the project.

One aspect of planning is creating a formal project budget. Only 18% of companies had a formal project budget or staffing plan. They also usually did not have any idea of whether their project expenditures had been reasonable or in line with their original plans. A few companies, however, said that each department had a budget within which they worked across all product development projects.

**Teams.** Decision-making and conflict resolution styles differed substantially among companies. For example, we looked at teams to see who dominated meetings and decision-making. We found that 55% of the companies surveyed were engineering-dominated, 27% were senior management-dominated, and 18% were consensus-driven. Companies complaining of low morale or problems with delays or product quality were more likely to characterize themselves as teams in which senior management resolved conflicts and made the most important decisions, or in which engineering dominated all aspects of the process.

We are just beginning to formulate the characteristics of a team that might be judged to be a better functioning group: "democratic" teams with high morale, who value the contribution of the marketing function, and who are more likely to seek a consensus between marketing and engineering for important decisions. Future studies will investigate this issue further. A "democratic" team, as we are currently defining it, was one in which representatives for all departments participated at most/all stages of the development process (including representatives from senior management, engineering, marketing, QA, release management, technical communications and technical support), and in which influence, decision-making and conflict resolution were handled at the team level rather than by senior management.

**Correlations.** We have begun to try to correlate survey results with salient characteristics of the company. So far we have not found an obvious correlation between product development practices at firms of any particular size. The complexity of the development process has also not been a meaningful indicator yet of such factors as the team composition or carefulness of planning. All companies surveyed believed that their product was adequately successful, and without more research to verify their true success, we have not yet been able to show that any particular practices lead absolutely to more success in the marketplace.

Case studies (Eisenhardt and Tabrizi) have already shown that companies can correctly identify their market window, and that those that manage to get a product to market within that window enjoy a 33% greater return over 5 years than those who miss the window that they identified. Thus, our results might end up being construed as a confirmation that companies that trade off everything against time-to-market are likely to be employing the optimal strategy. We still need to investigate further, however, whether companies that can make marginal improvements in their development process might enjoy other benefits, such as higher quality, with no additional delays in getting their products to market.

### Future Research

We are currently in the process of developing a larger survey of the product development practices of software publishers, to extend the data to many more segments of the software products market. We will then take the same issues, with a revised questionnaire, software services firms, IS developers and embedded software projects. We expect to find major differences in project management practices. We also hope to compare practices across regional boundaries.