

understand the technology and that their lists ask for outrageous things. In turn, marketing may feel that the engineers don't understand the needs of the customers, that they simply want to build neat gadgets, regardless of true market needs. The company is slowly maturing, but at a cost of internal tension.

But what happens when the product hits the mainstream, when even the conservative customers are starting to buy? Here is where the mass market is, here is where the most demanding customers are. And here is where the old style of doing business simply does not work anymore. The company must change the product, change the way things are done. The transformation is not easy. All the old skills are wrong for the new marketplace. The tensions between marketing and engineering were the early signs of trouble, but now that even greater changes are required, war can erupt.

As the marketplace matures, other pressures build. In the early days, there was little competition, and in any event, it was often difficult for a company to keep up with the demand. Profit margins were high. In the mature phases, there are multiple competitors, each of which is capable of satisfying the customer's technical requirements. Products can no longer differentiate themselves by features; other means are required. Now comes the importance of style, ease of use, reliability, convenience. Cost becomes a major factor in purchase decisions. With the advent of multiple competitors, often international, and with the advent of cost-sensitive buyers, profit margins drop rapidly. The financial market, which once thought of the company as the daring, pioneering leader, growing at a rapid pace and bringing in high returns, suddenly turns hostile; market share is dropping, and although sales may be rising, profits are often declining, sometimes out of existence. The financial community blames the company and lowers its predictions of future earnings; the stock prices crumble.

At the very time when a company needs to step back and take a new look at itself, when it needs to reorganize and restructure, the financial story puts severe pressures on its ability to do this. Time is the one thing it does not have. Suddenly, it has to meet market requirements, but the old guard wants to do it by adding yet more new technology, bringing out new products at an ever-faster rate, and fighting the falling revenues by cutting back on the size of the company. It is a tumultuous time. Geoffrey Moore called it a "tornado."<sup>3</sup>

### ***Toward a Human-Centered Product Development***

In the beginning stages of a technology, products are driven by the needs of technically sophisticated consumers. When technologies mature, however, everything changes. Now, the technology is no longer exalted; it has long since passed the stage of being "good enough" for most consumers. Moreover, the technology is commonplace enough that many competitors can produce roughly equivalent performance. As a result of the increased competition,

prices drop. In the mature market, new classes of customers emerge: the mass market. These are the pragmatic, conservative customers who wait until the technology settles down, who wait until they can get value for their money with a minimum of fuss and bother. They want results. The new customers are less technically sophisticated than the old. The same product that satisfied the early adopters now creates confusion. They require assistance, hand-holding. Companies must build up elaborate service organizations to handle the customer needs. Yet this service is so expensive and the profit margins so low that a single call to the service desk can be costly enough to wipe out the entire profit from the item.

The computer industry has responded to these pressures by doing more of the same, only more forcefully. After all, their most successful strategies in the past were to increase the number of functions and features of each product. This is only natural human behavior. But it is the wrong behavior in these circumstances.

Changing times require changing behavior. The entire product development process must change. The strategy of the industry must change. No longer can sheer engineering suffice. Now, for the first time, not only must the company take marketing seriously, it must entertain yet a third partner to the development process: user experience. Moreover, the entire development process has to be turned around so that it starts with user needs and ends with engineering.

Why is everything so difficult to use? The real problem lies in product development, in the emphasis on the technology rather than on the user, the person for whom the device is intended. To improve products, companies need a development philosophy that targets the human user, not the technology. Companies need a human-centered development.

### ***The Three Legs of Human-Centered Product Development: Technology, Marketing, and User Experience***

Many skills are required to build successful products. Obviously, there must be an appropriate technology, one capable of delivering the required functions and performance at reasonable cost. For a product to sell, marketing experts must ensure that the product provides the features that customers require and that the product attributes are highlighted in advertisements, product literature, and product appearance. An enjoyable and effective user experience does not come about accidentally; it requires considerable focus and attention to the needs, abilities, and thought processes of the users. Finally, if the company is to remain profitable, the product must be built upon a solid economic foundation, providing the required attributes for a price that is acceptable to the consumers but that still yields a profit to the company.

Human-centered development requires three equal partners, three legs to the triad of product development: technology, marketing, and user experience. All three legs provide necessary and complementary strengths. Weaken one leg and the product falls. The three legs stand upon the foundation of the business case and support the product itself. Weaken the foundation of sound business practices and the company may not succeed. And finally, the product must be appropriate for its position in the technology life cycle. An emphasis on technology is inappropriate for products in the consumer cycle of a technology.



**Figure 2.5**  
**The three legs of product development in the mature, customer-centered phase of a product.** □When the technology matures, customers seek convenience, high-quality experience, low cost, and reliable technology. A successful product sits on the foundation of a solid business case with three supporting legs: technology, marketing, and user experience. Weaken the foundation or any of the legs and the product fails.

Early in life, the stool does not have to be balanced. Early adopters care most about the technology, so this is the leg that must carry the weight. User experience and marketing simply have to be "good enough." As the product matures, marketing plays a more important role, tracking the technological needs of the customers and ensuring that the product is differentiated from the competition. User experience starts to increase in importance, but it does not drive the product requirements.

Things change dramatically during the mature phase of a product when it has crossed the chasm and is being marketed and sold to late adopters, those practical and conservative members of the market who seek convenience, a positive user experience, efficiency, reliability, and prestige. Here, a product fails if it is easy to use and understand but has deficient technology so that it is too slow and limited in ability. Here, a product fails if it has wonderful technology but is too difficult to use. And here a product fails if it has wonderful technology, accomplishes wonderful things, and is easy to use but is too expensive. All three legs must be in balance.

The Xerox Star is a case in point, a product that failed despite superb

user experience; it had insufficient technology and marketing. This was the world's first commercially available computer with a graphical user interface. It was brilliantly designed, so much so that it set the standard for the entire second generation of the PC. It developed the high-level design principles that motivated the development of the Apple Lisa and Macintosh hardware and software and the Microsoft Windows operating system. In some ways it still surpasses current systems. The Xerox Star had ease-of-use features and a philosophy that has not been equaled since. Many of the developers of systems in the marketplace today would do well to study the Star.<sup>4</sup>

Despite all its virtues, the Xerox Star suffered a number of faults. It was ahead of its time<sup>5</sup>--it was a consumer product in an era of technology-driven ones; it was designed for late adopters before the market was ready. The sales force didn't know how to sell it. At first, they targeted the information technology professionals, technology addicts all. This customer segment failed to understand why ease of use should matter. Although the Star was intended for the late adopters, the end-users of a technology who care about convenience and use, it was premature for them; they weren't yet ready to adopt such new technology. And because the Star was a product category that was still early in the technology life cycle, the technology itself wasn't quite ready. The Star was slow, painfully slow. It had hardly any software, so it didn't really do much. Most important of all, it lacked a spreadsheet. And it was expensive. Brilliant design, but so what; it failed in the marketplace. The same, by the way, holds for the Apple Lisa: Brilliantly designed with features that have still not been equaled. And a failure in the marketplace.

The Apple II and the IBM PC illustrate another case in point: products that succeeded despite limited technology and poor user experience. They had great marketing, but more important, they handled tasks of sufficient value that their users were willing to tolerate the deficiencies. In many respects both the IBM PC and the Apple II were miserable machines. They were clumsy and, by today's standards, difficult to use. But they had a piece of software--the spreadsheet--that made it all worthwhile: Visicalc for the Apple II and Lotus 1-2-3 for the IBM PC. The spreadsheet didn't exist prior to its invention as Visicalc for the Apple II computer. It became possible to do accounting and budget projections in ways that simply could not be done before. A large number of people purchased the Apple II or the IBM PC solely so that they could use the spreadsheet. Gertrude was not alone.

These were machines for the early adopters, for those who were willing to overlook the deficiencies because of the great benefits. Superb functionality can conquer, can make for a viable business, but without full support for all three legs of the tripod, it will never stand as a business for the everyday consumer. There is a vast difference between the product that sells to the early adopters and the one that attracts a loyal following among the many. The sophisticated, easy to use, easy to understand Xerox Star and Apple Lisa were wrong for the early adopters. These people were quite happy with the clumsy, awkward Apple II and IBM PC. In turn, today, now that the market has

reached maturity, ease of use and customer features are required; for today's customers, the philosophy that underlay the Lisa and Star are completely appropriate, whereas that of the Apple II and IBM PC is completely wrong. The entire design philosophy and development process changes once technologies mature.

In a mature market, a human-centered development process is not only appropriate, it is required.

Human centered development requires three different skill sets, three legs of product development: technology, marketing, and user experience. Let me now review the properties of each.

### ***Technology***

For the high-technology, information-based products that are the focus of this book, it hardly seems necessary to justify the role of the technologist, for that role is well understood. It is technology that allows it all to happen, that drives the product by making possible new functions, better quality, and lower costs. As we saw from the story of the Xerox Star, the lack of sufficient technology can be a factor in a product's downfall. When the Star came out, the technology was still too expensive and limited. As a result, the machine was far too slow to be useful.

My students and I conducted some early studies of the Xerox Star at a company near my university that was one of the early large adopters of the Star. We found that despite the users' acceptance of the concepts and the principles of operation, the universal complaint was about the limited functions available and, above all, the slowness. The Star's help function, brilliantly conceived and excellently implemented from the user's point of view, was so slow as to be worthless. One user complained that after requesting help, you could leave and go get a cup of coffee, brewing a new pot if necessary, and after you leisurely returned to your desk, the help function might be ready. An exaggeration perhaps, but the story well illustrates the level of frustration.

One of the factors mitigating against the Apple Lisa was the high cost of the technology. The Lisa required a lot of memory for those days (an amount that today would be considered pitifully small), and this drove up the costs more than most people were willing to pay, especially as the early Lisa had very few applications of value to the user.

In the mature days of a technology, ease of use and convenience are key, but that is because the technology is taken for granted. The Xerox Star and the Apple Lisa came out in the early days of the industry. They didn't yet have the technology, neither the appropriate speed nor a sufficiently powerful set of applications. First things first: first technology and proper functions, then reliability and cost, then ease of use.

Even the Apple Macintosh was thought to be too expensive in price

and too limited in capability. It, too, almost failed. It was saved by the development of yet another new technology, the laser printer and page description languages (Adobe Postscript, in this case), that made desktop publishing possible. The Macintosh had its "killer application," an ability to produce high-quality publications literally "on the desktop." Prior to the Macintosh and its associated laser printer, it took a highly skilled technical crew to produce quality publications.

Without proper technology, even the best of ideas fail. It is the technologists who determine what is and is not possible, how much time it will take, and what it will cost. All are critical determinants of product success. Without the technology there is nothing. With the technology? Well, there may still be nothing without the other two legs of marketing and user experience.

### ***Marketing***

The marketing organization fulfills many roles within a company, but the one of most concern during the development process is expertise in understanding the pulse of the customer. Marketing, of course, is not a single concept, it covers a wide range of activities, requiring a wide range of skills. But above all, it is the role of marketing to provide expert information on the customers themselves: who they are, what they buy, and how much they will pay.

In many cases, when customers first encounter a particular product at the store, they have no way of distinguishing among competing manufacturers except by what is visible in front of them, by what the sales literature and salespeople tell them, and by their perceptions of the product based on the reputation of the brand. One of the more important tasks of the marketing organization is to ensure that the product be presented in the best possible light; the visual appearance, the capabilities of the product, the reliability, and the brand reputation all play a critical role. Nothing should be left to chance, not the design, not the packaging, not the appearance, not even the training of the salespeople.

It is important to distinguish between users and customers; they are not necessarily the same. A good marketing organization understands and exploits these differences. Customers are those who purchase the products, users are those who use them. In many situations, products are bought by purchasing agents or managers, often choosing on the sole basis of initial cost. Wholesalers and channel distributors determine what retail stores will be given to sell, based on their particular beliefs of what people will buy. Contractors purchase kitchen appliances for the houses they are building, usually on the basis of price and perceived prestige, which may have little to do with the desires of the home purchasers. And even when the customer will be the actual user, the criteria that are used at the time of purchase often have little to do with those that matter when the product is actually in use.

Customers buy products for many reasons, not necessarily the ones the product developers care about or that companies would prefer.

Exciting technology? Yawn. Great ease of use? Yawn. Great visual design? Well, this usually gets their attention, but not necessarily their purchase. They choose on the basis of features that may have little or nothing to do with how they will actually use the product. Moreover, the reasons for purchase vary with the nature of the industry and the type of purchaser.

One critical aspect of marketing is the positioning of the product in the marketplace.<sup>6</sup> Positioning is the act of establishing what the customer thinks about the company and the product. It determines how the customer perceives the products of the company. Customers buy on perceptions, not on reality; unless they have used the product themselves or have referred to friends or consumer testing organizations that have experience with the differences among the products, all they have is perception. That's one reason the concept of positioning is so important in marketing.

It's essential to position the company, the brand, and the product so that it has desirable connotations. Positioning determines the customer's perception of quality, prestige, value, reliability, and desirability. In high technology, there are many positioning options. Some computer manufacturers aim to position themselves as the quality leaders, enabling them to charge a slight premium in price. Some try to position themselves as broad industry leaders, providing much more than mere technology: "the document company," "the solutions company," "the information company," the "imaging company," all in the guise of establishing the perception that this is a company that you can trust for all of your needs. "Buy everything from us and you can be assured that it will all work together harmoniously." This argument relies on the customer's perception that a company is a single entity, and anything under its brand name comes from the same group of people.

The reality is that companies often consist of independent, warring divisions whose members do not cooperate with one another. Different divisions in the same company can be in active competition with one another. Sometimes companies have more harmonious relationships with their partners from other companies than with divisions of the same company. Many products are made by one company, but carry the label and brand of another. The internal parts of a product may be made by a different company than the one who made the exterior, and whose brand name appears on the faceplate. No matter what the real story is, the customer's perceptions are what determine the sale, and the customer's perceptions are determined by how the company has positioned itself.

Marketing plays an essential role in creating products that people will buy. Good marketing ensures that the product meets market expectations, that it is priced properly, and that it has features that appeal to users at the point of sale. The tools of the marketing organization are many, from market surveys, analyses of customer segments with attention to their purchasing power and habits, and the collection and analyses of actual retail sales from leading stores and

distributors, to continual interaction with customers through visits, focus groups, questionnaires, and other sampling methods. Marketing is a critical leg in the tripod of product development.

Edison failed at marketing. Recall that his analysis of musicians indicated that there was little or no difference between the world's most famous musicians and those just below them. He may have been right. Edison also believed he had the superior technology. He may have been right. But he failed at understanding just why people buy specific products; he failed at marketing.

It is not enough to be first. It isn't enough to be best. It isn't even enough to be right. In the ideal situation a company should be all of those, but in addition, it is essential to understand why customers buy products, what they are looking for, and how their needs and perceptions drive sales. Having the best product means nothing if people won't buy it.

### ***User Experience***

The user experience group (UE) deals with all aspects of the user's interactions with the product: how it is perceived, learned, and used. It includes ease of use and, most important of all, the needs that the product fulfills.

Note the contrast with marketing and technology. Marketing is concerned with whether the customer--who is not always the same person who uses the device--will actually purchase the product. Marketing's primary emphasis is on those characteristics that affect the purchase of the item. UE's primary emphasis is on the usage phases of the product, from taking it home, unwrapping, assembling, and initial learning, through continued daily use to maintenance, service, and upgrading, where required. UE affects point of sale primarily through appearance, the graphical and industrial design, and the brand reputation for ease of use, convenience, and quality.

Ease of use has many benefits for a company. Not only are customers more likely to be satisfied with the product, but the need for service desks should decrease. In most high-technology companies, and especially in the computer industry, each manufacturer spends a huge amount of effort and money providing help services, large numbers of experts who sit at their telephones all day (and night), trying to aid the frustrated users who call with problems and complaints. Each call can be time consuming, a frustrating experience for caller and helper both. In the mature marketplace, where there is fierce competition, relatively low prices, and low profit margins, a single call from a customer can often cost the company enough to wipe out any profit from the sale of the item. Here is where one of the largest economic impacts of good product development can be measured.

Companies are concerned about the cost of their help-line services. They put much time and effort into improving the efficiency and usefulness of the telephone calls handled by the service. But this is

treating the symptom, not the cause. Why not put the effort into revising the product so the calls would be unnecessary in the first place? That's the role of user experience: to develop products that fit the needs of their users, that satisfy their needs, both in terms of function and aesthetics, and to ensure that the products are easy to understand and to use. In addition, satisfied users become repeat purchasers, likely to recommend both the product and the company to friends and colleagues, enhancing the overall reputation.

User experience covers a wide range of attributes of the product. Some are technical, such as developing a conceptual model for the user that guides the developers in their design decisions and even the choice of technology, the better to ensure that the entire product development presents a cohesive, understandable face to the user. Some come from the experimental, social, and behavioral sciences, using field and observational methods to observe potential users to understand their real needs and to determine just what products might be of value. Experimental procedures and controlled observation can be used to test the initial product concept and prototypes to ensure that they are indeed usable and understandable, and that they deliver on their promise.

Some parts of user experience concentrate upon the aesthetics, ensuring that the perceptual properties are attractive and enticing: appearance, feel, sound, size, and weight. These require the skills of the graphical and industrial designers, whose contributions can transform products into "objects of desire." <sup>7</sup> Elegant, aesthetic, visually pleasing products not only sell better, they even appear to work better. Whether it be a fountain pen, a watch, or a computer, appearances matter.

Alas, a full-fledged UE group is rare in today's technology companies. Most companies have a few people scattered here and there who work on the user interface (variously called *human interface groups* or *human factors*). There are technical writers and industrial designers, perhaps a few graphical designers. But these people are seldom in one organization, seldom given much power. They are usually relegated to the junior, minor ranks, called upon at the tail end of product development to "make it easy to use," "make it pretty," "explain how to use it." This is not the way to deliver quality user experience. I return to this topic in chapter 9.