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Bringing Non-Ado THE CHALLENGE FA

*Until holdout buyers are convinced a PC
will operate like a workhorse home appliance,
PC sales will continue to stall.*

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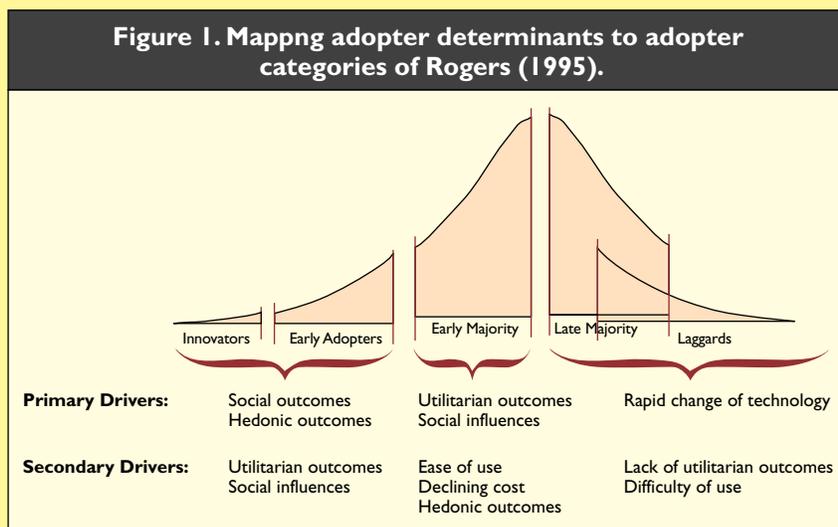## CING THE PC INDUSTRY

In 1998, PaineWebber predicted personal computer market penetration could rise to 70% by the year 2000 due largely to the mass marketing of low-end, fairly inexpensive machines. Their prediction did not come true; recent census data indicates only half of all U.S. households own a PC [4]. Currently, PC industry players including Dell, Gateway, Apple, and AMD are experiencing lower than expected profits, indicating a significant slowdown in the diffusion of PCs. These marketers assumed households that could afford the technology would purchase it despite indicators in the late 1990s that manufacturers were reporting tepid results. They assumed the increasing availability of the sub-$1,000 PC would draw out the holdouts. It did not.

What they failed to consider is whether or not price is the most important barrier to household adoption, and whether other barriers exist that are currently being ignored. Vendors, along with researchers and practitioners have a very preliminary understanding of the non-adopter phenomenon due to the lack of research in this area. Given the size of the potential market, and the ultimate socioeconomic goal of overcoming the digital divide, it is imperative that we thoroughly understand the non-adoption phenomenon. While some might attribute the PC sales slowdown solely to the slowing economy, in this article we propose instead a micro-

level explanation of barriers to adoption. We extend findings from our previous nationwide household survey on PC adoption and usage [7] by analyzing them in light of Rogers' [5] adopter categories.

Rogers' research, dating back to the 1960s, defines five adopter categories: innovators, early adopters, early majority, late majority, and laggards. These categories, derived by partitioning a continuum of innovativeness, illustrate variability about the mean, when half of the population has adopted an innovation. For any innovation, the innovators and early adopters

Figure 1. Mappng adopter determinants to adopter categories of Rogers (1995).

	Innovators	Early Adopters	Early Majority	Late Majority	Laggards
Primary Drivers:		Social outcomes Hedonic outcomes	Utilitarian outcomes Social influences		Rapid change of technology
Secondary Drivers:		Utilitarian outcomes Social influences	Ease of use Declining cost Hedonic outcomes		Lack of utilitarian outcomes Difficulty of use

Mapping adopter determinants to adopter categories [5].

together generally represent 16% of all adopters. The early majority represents 34% of the population, followed by the 34% called the late majority. The final 16% of all adopters are laggards. This categorization does not include non-adopters since there is an implicit assumption that everyone will eventually adopt. The current 50% rate

of home PC ownership thus includes innovators, early adopters, and the early majority.

Research on PC adoption has tended to assume the same set of innovation characteristics influences adoption across all adopter categories [1, 6], yet in reality, systematic differences exist across adopter categories [2, 5]. Rogers describes innovators as venturesome risk-takers who serve as gatekeepers for those who follow. Early adopters are the opinion leaders, receiving social esteem by being the first of their group to adopt, and maintaining their position by judiciously evaluating innovations for others. Members of the early majority are deliberate in their adop-

Factor	Definition	Detailed Factor
Hedonic Outcomes	The pleasure derived from PC use	Applications for fun (e.g., games)
Utilitarian Outcomes	The extent to which using a PC enhances the effectiveness of household activities	Applications for personal use (e.g., Quicken)
		Utility for children (e.g., Encyclopedia)
		Utilitiy for work-related use (e.g., Spreadsheet)
		Reduced utility due to obsolescence of current PC
Social Outcomes	The change in status that coincides with a purchase decision	Status gains from possessing current technology (e.g., people look to you for advice)
		Status losses due to obsolete technology at home (e.g., people do not look to you for advice)
Social Influences	The extent to which members of a social network influence one another's behavior	Influences from friends and family
		Influence of information from secondary sources (e.g., news on TV, newspaper, etc.)
Barriers	Factors inhibiting adoption	Rapid change in technology, and/or fear of obsolescence
		Declining cost
		High cost
		Ease/difficulty of use
		Requisite knowledge for PC use

Table 1. Factors influencing PC adoption in homes.

tion decisions, waiting until others have evaluated the innovation, but not wanting to be the last to change. The late majority is skeptical and prefers to wait until most others have adopted an innovation. The last to adopt are the laggards, who base their decisions on the past, rather than the future. Given these differences, we should expect different factors, not simply higher or lower evaluations of the same factors, to be salient for the different groups.

Moore extends Rogers' work by referring to differences across categories as "cracks in the bell curve" [2]. His research suggests innovations that succeed among innovators or early adopters may fail among the early majority or late majority, if the innovation lacks characteristics that appeal to these groups. Following, we describe our assumptions of how the major factors we uncovered in our research [7], described in greater detail in Table 1, will map onto Rogers' adopter categories. Later in the article, we will discuss how our assumptions were generally correct.

Utilitarian and Hedonic Outcomes. Given the propensity of innovators and early adopters to adopt for pleasure, we expect earlier adopters to be influenced by hedonic outcomes. In contrast, the more skeptical later adopters need to understand how a particular innovation will benefit them. Thus, we expect later adopters to be influenced by utilitarian outcomes.

Social Outcomes. Innovation literature suggests that the desire to gain status is an important motivation for early adoption [5]. Later adopters are unlikely to place much emphasis on the social rewards of adopting, since the status value of adopting diminishes as more people adopt. As such, we expect early adopters to be influenced by the desire to achieve social outcomes, while later and non-adopters will not be similarly influencial.

Social Influences. Given that early adopters are among the first to adopt, and have fewer relevant others to influence them, we expect social influences are not significant in their adoption decisions. However, later adopters, being followers, can be expected to wait for PCs to be well established in the marketplace and supported by positive word of mouth from their peers.

Barriers to Adoption. Earlier adopters are generally considered more educated and affluent, and more likely to be computer literate than later adopters. Thus, we expect earlier adopters will not see knowledge as a significant barrier to adoption, but later adopters and non-adopters will be significantly constrained by these barriers. Similarly, cost will be less consequential to affluent early adopters but will be a significant barrier for later adopters, and almost prohibitive for non-adopters.

A Discovery of Fear of Obsolescence
We conducted a nationwide household telephone survey with open-ended questions to identify influential factors in PC non-adoption. Of the 988 randomly selected households we contacted, 743 (75%) agreed to participate in the study, and 733 completed the entire survey and provided usable responses, for an overall response rate of 74.2%. The full methodological details of this research study are available in [7].

Of the 733 households surveyed, 20 households were found to be innovators, and 97 were early adopters. In the early majority group we included 128 households that owned a PC, plus 114 households that expressed intent to buy a PC, yielding a total of 242 households. The 304 households expressing no intent to buy a PC were placed in the late majority and laggard category. (A clear separation of the late majority from the laggards was not possible.) The remaining 70 households were unsure regarding future PC purchase and were excluded from further analysis.

When we mapped our results onto Rogers' categories (see Table 2), we found all innovators in our study sample and most early adopters indicated hedonic outcomes and status gains as primary drivers of PC adoption. For both of these groups, utilitarian outcomes and social influences were secondary. For the early majority, utilitarian outcomes and social influences were the primary drivers, while hedonic outcomes and status gains were relevant to only 30 out of the 242 households, and their role was significant only among the very early portion of this category, suggesting this segment shared factors salient to early adopters.

Nearly 90% of the remaining 304 households with no intention of buying a PC expressed a strong barrier to adoption—they expressed concern about rapid technology changes, and a consequent fear of obsolescence. Of the factors influencing the earlier adopter categories, the only factor relevant to the non-adopters was a lack of utilitarian outcomes; that is, non-adopters tended to believe PC adoption would not benefit them. The figure appearingon page 77 presents a summary of the mapping of our results onto Rogers' adopter categories.

A glance at the evolution of PC computing over the last decade suggests the non-adopter's fear of obsolescence—which can be thought of as a compound variable combining an individual's perception of the relative cost of the product with its useful life and utility—is perfectly valid. In the past 10 years, we have seen at least five different processors; RAM requirements have risen from under 640KB to over 100MB simply to run the operating system; software will not run on the earliest (or even mid-term) processors; and media, such as CDs often are incompatible with earlier computers.

This performance is rather poor when compared to other durable household goods such as washing machines and televisions. Washing machines range in cost from about $300 to $1,000, and have an average useful life 10 years. Since we must wash laundry on a regular basis, and since the alternative to owning a washing machine is to travel to a laundromat and pay for individual wash loads, the price seems quite reasonable. And even when newer washing machines with new technology are developed, our old machine can still wash our laundry.

Costs of televisions range more widely than washing machines, when one considers all the sizes, models, and varieties, but like washing machines, their average useful life is upwards of 10 years. Given the average American spends four hours per day watching television, and the average household consists of about 3.5 people, an argument can be made that a family will get its money's worth from a television. Again, if the technology changes, we can still use our existing equipment to view television programs.

Now consider the economical sub-$1,000 PC flooding the market in recent years. Perhaps this appliance costs roughly the same as a washing

Table 2. Factors influencing PC purchase decision.					
			Early Majority		**Late Majority & Laggards**
	Innovators (n=20)	**Early Adopters (n=97)**	**Households that already own a PC (n=97)**	**Households that intend to buy a PC (n=14)**	**Households not intending to buy a PC (n=304)**
Hedonic Outcomes Applications for fun	20 100.00%	60 61.86%	30 23.44%		
Utilitarian Outcomes Applications for personal use Utility for children Utility for work-related use	3 15.00%	9 9.28%	25 19.53% 4 3.13% 2 1.56%	100 87.72% 5 4.39% 4 3.51%	43 14.14%
Social Outcomes Status gain from possessing current technology	20 100.00%	97 100.00%	29 22.66%		
Social Influences Influences from friends and family Influence of informatin from secondary sources		12 12.37%	50 39.06% 5 3.91%	68 59.65%	 5 1.64%
Barriers to adoption Rapid change in technology (fear of obsolescence) Declining cost Ease/difficulty of use				 47 41.23% 51 44.74%	270 88.82% 37 12.17%

Notes:
1. The numbers above represent number of households. The total in each column will be greater than the number of households participating because many respondents report more than one factor as having affected their decision.
2. For innovators, early adopters, and part of the early majority (i.e., those who already own a PC), we report the factors that affected their current PC purchase decision. For part of the early majority (i.e., those who intend to buy a PC) and late majority/laggards, we report the factors affecting their future PC purchase decision.
3. Seventy of the 374 late adopter and laggard households are not included here because they did not report any factors related to their decision - they were uncertain about their future behavior

Table 2. Factors influencing PC purchase decision.

machine or TV, but what is its useful life? Although its physically useful lifetime, after which it can no longer be repaired, is approximately 10 years, the practical answer is about three years. This duration is based not on breakage as with other appliances, but rather on capability. Thus, it is not surprising some consumers doubt they will get their money's worth from a PC before it becomes a paperweight.

Implications for the PC Industry

These findings are important for the future marketing of PCs and other high-tech innovations. Efforts aimed to sell any innovation should focus on the factors most salient to the target adoption category, rather than relying simply on characteristics deemed important to innovators and early adopters. While the present work focused on Rogers' adoption categories, future work is needed to examine the cracks/gaps in the bell curve between those categories. This understanding is crucial to helping resellers bridge gaps and foster product demand.

What resellers generally need to keep in mind is that a smooth, seamless transition from one adopter category to the next does not exist [2]. Instead early adopters want better and faster, while those who follow are more concerned with cheaper and long lasting. The late majority, or conservatives, "wants high-tech products to be like refrigerators" [2]. In other words, individuals in this group want a product that performs predictably. Conservatives are much less willing to become technologically competent, and since they tend to associate with other conservatives, they are not exposed to the benefits of innovations from peers. Thus, products for this market need to be easy to adopt, easy to use, and long lasting. Furthermore, compelling reasons for purchasing a PC must be clearly communicated to them.

Adoption among later adopters is inhibited in the current environment. PC vendors and retailers have unveiled multiple programs to attract consumers, including attractive bundling and sizable rebates. But these programs are focused on reducing product price rather than obsolescence. Advertising campaigns geared toward the latter half of households should be tailored to overcoming the obsolescence barrier, although this is likely to be a challenge with the continuing trend of rapid innovation pervading the PC industry.

One approach to overcoming obsolescence fears is to offer "obsolescence insurance." Gateway had something like this in mind when, in 1998 it initiated a program called Your:)Ware, which allowed consumers to trade in their Gateway computer for its blue book value during the second through fourth years of own-

ership. The option of trading in a PC had existed in some form previously, but primarily for off-brand equipment. But how much security a program like this actually provides is still uncertain. If processing power doubles in 18 months, and again in 36 months, how much of an allowance can consumers expect to receive when they trade in their machines? For now, obsolescence insurance appears interesting and may help the PC industry capture another market segment. But such security may be perceived rather than actual, and the savvy consumer will recognize the value of a computer in two years is mere pennies on the dollar, more or less necessitating another full-price purchase down the road.

Conclusion

The decline in PC sales makes sense once we examine the preferences of different adopter categories. Our research findings illustrate the folly of assuming current non-adopters care about the same things as innovators and early adopters, or assuming that all they care about is PC cost. While cost may be a factor for those still holding out, it is neither the only nor the most important factor. Instead, later adopters want long-lasting products that have yet to appear on the horizon. Until the PC industry convinces this group of potential consumers that their PC will operate like a refrigerator, PC sales are likely to continue in their current stalled state. **C**

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