May 15, 2001

Emerging Classes of Mobile Personal Computers

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Giga Position

During the current market downturn, the laptop segment is showing surprising strength, particularly in the smallest and lightest designs. This would seem to suggest that the market is getting ready to move to a new class of small, light and power-efficient products. Supporting this conclusion is the fact that much of today's growth in the mobile market appears targeted at three non-**Intel** designs: (1) the **Transmeta**-based ultralight, (2) the **Apple** desktop replacement and (3) the **Research In Motion** (RIM) handheld wireless computer. This builds on the argument that the historical belief that "power is king" is now obsolete, and design, carry weight, battery life and wireless connectivity have taken center stage to help redefine the mobile market. If current trends hold, the laptop designs forming the core of the market in 24 months will be dramatically smaller, lighter and more capable than the mainstream designs on the market today.

Proof/Notes

The buyers of technology, mobile and desktop, are not particularly satisfied with the solutions being provided by the WinTel market leaders. The existing class of products seems to have become mired in the past while the buyers of technology have moved to anticipate a future that does not yet exist and, apparently, many are refusing to buy until it does. To address the changing needs of this market, a new taxonomy is required. For the purpose of this Planning Assumption, we will focus on the mobile market, since that is where most of the interest is today.

The mobile market breaks down into five classes of user: (1) power/custom, (2) general productivity, (3) e-mail/presentations, (4) communications and (5) consumer/entertainment. Products are distinct at each end of the class and can blur between user groups in the middle.

We will provide a brief overview of each class and then rank the key criteria from one (low) to four (high) that would be used to evaluate the systems in each category. Scores are all relative — in other words, a product advantage in a high-weighted category may overcome several disadvantages in low-weighted categories. The key criteria are as follows:

- Price: How much the product, needed service and anticipated accessories cost relative to other offerings.
- Power: This is not the rating of the chip but the performance as perceived by the user and is more a reflection of the system than any one component. However, if buyers relate the power of the chip to their experience, then that relationship will affect the related score. For instance, when comparing two Intel systems, the MHz of the chip can be used; however, when comparing an Apple and a WinTel machine, a more subjective measure needs to be used.
- Battery life: How long the product can be used away from an external power source. Creative ways to deal with this issue could also be considered in scoring a product.
- Weight: Carry weight with required accessories, not just the weight of the core component
- Migration cost: How much it costs in time and effort to move your custom settings and applications from one device to another
- Stability: How often does the core technology change? This is important for those that use imaging

to deploy new technology.

- Design: How well the product's industrial design maps to the wants and needs of the related user
- Upgradability: How easy it is to upgrade the product to current technology. This generally relates to hardware components.
- Screen size/resolution: As screen size decreases, resolution requirements increase. This represents both the size and the quality of the display.
- Configuration flexibility: How much the system can be modified internally to match up with standards or mission requirements
- Modular capability/accessories: How much the system can be modified externally to match up with standards or mission requirements
- Connectivity: How complete is the wired, and particularly now, the wireless capability built into the product?
- Security: How well the product can be secured against unauthorized access or use.

As with all benchmarking efforts, to score equipment against this benchmark, remember that you need to score consistently and against an actual benchmark product rather than a hypothetical one (otherwise, you will collapse the scores, and make it more difficult to choose one product against another).

You'll note we didn't list software compatibility as a feature to be measured. That is because it is our experience that this is a "yes or no" question. If you can accept Apple or Linux products, you are relatively unique in this market, and you will likely favor them and go down a different selection path. However, with the improvement to **Microsoft**'s Mac version of Office and the soon-to-be-released Mac client for Exchange, this product is more acceptable now than it has been in the previous decade. In some cases, it may actually be the preferred product, but that preference will have more to do with the other applications you might want to run on the platform and your affinity for that platform than any group of hardware features. If you can't take an Apple, but tend to favor Apple designs, then **Sony** would be the vendor that will likely come closest to your needs in the WinTel segment.

Overall, this reflects a maturing of this market that benefits weight-saving designs over absolute performance as well as a preference for designs that no longer have floppy drives built into them. In the smallest sizes, the market is experimenting with attachments (like cameras, Linux capability, and entertainment) and in the larger forms, new screen sizes (like the 19:9 Apple notebook display). In all classes, component price reductions are removing some of the market barriers to adoption; however, these trends appear to benefit the smallest designs most since they bring those products closer to the ideal price that customers expect.

Power/Custom

This class accounts for about 1 percent to 5 percent of the mobile market, but it is the most lucrative (from the vendor's perspective) segment. The class is largely made up of engineers, programmers, professional analysts (doing heavy number-crunching) and the sciences. In this class, performance is the leading selection criterion, and products that will only work when plugged into AC power (by companies like **Dolche**) exist at the high end of this class. On the consumer side, power gamers will buy at the low end of this class, and in all cases, battery life, weight and price are typically well behind system performance and screen size as key differentiators between products. This group drives not only high-margin products but also high product cycle rates that approach and, on occasion, exceed a one-year replacement cycle. This group aggressively chases new technology, which suggests that the need for both a modular solution that can more easily be used to keep technology current and a transition offering is likely strongest here.

The poster child system for this group, consumer or business, has been the **Dell** Inspiron 8000, which can

price out at around $4,000 fully loaded. This system can be configured with an UXGA 15-inch screen, 1GHz processor, DVD/CD/R/W and weighs around 8 pounds. There could be a dramatic change in what chip technology dominates this market in the second half of 2001. **AMD** has announced its Athlon 4 that fills the demand gap created by **Intel**'s Pentium 4 campaign in this segment. (The Pentium 4 mobile part is not due out until 2002 and is expected to be inferior to the Athlon 4 in terms of power use and heat output until it is refreshed in mid 2002.) AMD has traditionally had channel problems; however, this segment, because of the focus on performance above all else, should be relatively eager to try this part if AMD executes well.

For comparing systems, the key qualities are weighted as follows using a one-to-four scale with four being the most important:

- Price: 2
- Power: 4
- Battery Life: 2
- Weight: 2
- Migration Cost: 4
- Stability: 1
- Design: 3
- Upgradability: 3
- Screen Size/Resolution: 4
- Configuration Flexibility: 3
- Modular Capability/Accessories: 4*
- Connectivity: 2
- Security: 3

* Unique requirement for upgrade capability and specialized accessories due to mission

General Productivity

This used to be called desktop replacement, and it is the largest of the three classes. Price is very important to this class, and weight and screen resolution are also increasing in importance. This buyer represents the largest single segment, accounting for nearly 60 percent of the market opportunity today, and this segment remains solidly dominated by Intel technology. Because of the numbers, reliability and stability rank very high in terms of needs; however, there are indications that design and battery life are growing in importance. One of the changes in this class this year is the loss of the need for a floppy drive, which appears to have evaporated and is currently being replaced by a CD-RW drive in most instances (something that likely should have happened years ago).

Stability is critical for the large business segment but becomes less important as we move into the midmarket. Design is becoming more important as those that influence the buying decision become more aware of the connection between how a machine looks and how well it is cared for by the user. In addition, things like rounded corners and scratch-resistant finishes are easier on laptop luggage and allow the laptop to remain in service for longer periods of time without sending the unintended message that the company can't afford timely equipment cycles. This segment is currently on a two- to three-year replacement cycle, with most opting for two years. We have been transitioning away from power as a primary selection criterion for some time in this class, and customers currently tell us they actually think they had enough power at 366MHz. This is not to say that power isn't important, only that currently the power being supplied is greater than the apparent market needs. Dell, which focuses on this class of user, has actually been losing some highly visible sales opportunities in mobile because its products are seen as too large and heavy, even though it generally leads the market in performance.

The traditional poster child for this class was the **IBM** 600 series; now the IBM T series has slipped into that position. Interesting enough, however, with the introduction of the Apple Titanium laptop, we are seeing a strong desire for a new form factor with a wide aspect 15-inch screen and a cleaner industrial design than what currently exists in the WinTel market. This change could result in some dramatic market share moves if one of the WinTel vendors can get a product like the Apple Titanium notebook to market on time. The size limitations of this product currently favor **Motorola** and Transmeta designs because of the need for a relatively cool processor. Current feedback from OEMs indicates that the first P4s will not work in the configurations that customers want, suggesting that we could see some erosion in Intel-branded products in this segment, should the market move to this new form before Intel is ready with a viable response.

Very often, these machines are equipped with a large number of custom applications that often take some time to install and configure. Therefore, platforms that assist imaging efforts or otherwise reduce the migration cost for these high-volume products could easily shift demand from one vendor to another. The criteria weightings are as follows:

- Price: 4
- Power: 2
- Battery Life: 3
- Weight: 3
- Migration Cost: 4
- Stability: 4
- Design: 3
- Upgradability: 1
- Screen Size/Resolution: 3
- Configuration Flexibility: 2
- Modular Capability/Accessories: 2
- Connectivity: 2
- Security: 3

E-Mail/Presentations

This class, heavily populated by executives and sales representatives, represents between 20 percent and 25 percent of the mobile market today. Their most important criterion is portability; however, they also seem to heavily favor design, and Sony and **Toshiba** have traditionally been strongest in this category. IBM was one of the first hardware innovators in the class with the Butterfly keyboard that provided a full-sized keyboard in a very small notebook form factor. Unfortunately, the price and performance of the system were not in line with each other, and this product failed; however, it did identify the class, which has grown strongly since the release of that product. Currently, the strongest segment for this class of computer is Japan where it makes up a much higher percentage of the market then it does in the rest of the world. We believe, based on customer feedback, that Japan is currently acting as a market-leading geography for both notebook and cell phone design at this time, suggesting that what Japan is doing now will migrate to Europe and the United States during the following 12 to 18 months.

The users in this class primarily use their computers as e-mail engines; however, from time to time, they have to review documents and/or do presentations. Power requirements are very low, since users in this class appear to favor portability, design and battery life over everything else. This occasional breadth prevented them from moving to the Windows CE platform because that platform did poorly with attachments and presentations, even though it was incredibly strong in the areas of reliability, instant on/off, weight and

battery life. The Windows CE Professional product still represents, in concept, the ultimate in those key attributes. Unfortunately, it did not live up to that promise in practice due to a lack of flexibility.

Given the required flexibility, however, Transmeta has emerged as the lead core technology supplier for the class and has captured the majority of hardware manufacturers that focus on it. Initial feedback from the Japanese market has been strong, and many of the products have been limited more by the lack of critical ports and brand identity than any problems with the underlying architecture. Currently, there is only one Transmeta-based product widely availably in the US, the Sony CV1. Even though that product is not configured properly for the corporate market, because it lacks built-in networking, and Sony typically ranks toward the bottom in terms of service and support to corporations, this product remains one of the best examples of its class today. During the last few months, the CV1 has been the most widely requested product for evaluations in this segment due largely to its size and battery life. This, too, suggests that there is substantial unmet market potential for a device that can best meet the needs of this class outside of Japan where this class of device thrives.

One of the early requirements for this class is a pervasive wireless connection, and once this connection, which is widely available in Japan and bundled with products like the Sony GT1, is available in Europe and North America, we expect this class to catch fire and accelerate to potential market leadership. Until then, it will grow strongly but will be limited by the lack of a pervasive broadband wireless connection.

The criteria weightings for this class are as follows:

- Price: 3
- Power: 2
- Battery Life: 4
- Weight: 4
- Migration Cost: 3
- Stability: 1
- Design: 4
- Upgradability: 1
- Screen Size/Resolution: 2
- Configuration Flexibility: 2
- Modular Capability/Accessories: 3
- Connectivity: 3
- Security: 4

Communications

This class is made up of people that live and breathe on e-mail or the network and have such a low need for reviewing longer documents and doing presentations that their primary PC remains a desktop machine. Currently, the company leading this class is RIM with its Blackberry device. Studies from Europe have indicated that the use of this device has cut the use of more generic laptop computers by as much as 40 percent, and even Intel has deployed them for this use. While small in terms of volumes and revenues, at this time, it is clearly the fastest growing segment with high double-digit forecasts tied to the rollout of advanced wireless networks. These wireless networks will allow the device to grow from data-only into voice, and we expect that this will force a convergence with the high end of the cell phone segment at that time.

Talking about the mobile device alone would create an inaccurate picture of this class, since their solution today is a blended solution with a mobile device synchronized with a desktop, or laptop, machine in the

office. This suggests that a design solution that better integrated these two forms would likely be preferred by the market, particularly if the synchronization experience is good, since these solutions require strong synchronization capabilities to meet the related customer expectations.

This class is clearly in its infancy, and we expect the largest amount of change in the next 24 months as a result. Right now, this is a nested device, typically requiring either a desktop system or a laptop system for full functionality. However, as this device matures, it will gain more capability, and it may eventually displace laptops; of course, it may actually look more like one by that time. For now, it is more of an accessory that provides additional mobility. The current weightings, which are a bit misleading because we are only addressing the handheld component of the class, are as follows:

- Price: 4
- Power: 2
- Battery Life: 4
- Weight: 4
- Migration Cost: 4
- Stability: 1
- Design: 4
- Upgradability: 1
- Screen Size/Resolution: 2
- Configuration Flexibility: 1
- Modular Capability/Accessories: 4
- Connectivity: 4
- Security: 2

Consumer/Entertainment

This market is still being defined and represents about 15 percent overall today. Historically, the products that are presented to the consumer have been stripped-down or cost-reduced versions of business products. Increasingly, these systems will become better targeted to the buying wants and needs of individuals who tend to favor design and consumer-oriented features more than IT buyers do. Sony and Apple traditionally target this base most effectively in most of the world. Japan, however, clearly represents the market that leads the industry in terms of availability and acceptance of new products targeted at this group. While the other geographies seem to still be focused on providing a low-cost desktop replacement offering for this class of buyer, Japan has moved to ultralight platforms with unique designs and features like built-in DVD players, cameras and wireless capability. We expect these features to move across Europe and into the US as prices drop and the cost delta between portable DVD players and small form-factor PCs with DVD becomes more comparable. Battery life, screen cost and wireless capability appear to be the gating factors.

Because of the nature of the buyer, playing music, watching movies and playing games are valid activities and all are much more power intensive than doing e-mail. Screen quality adds to the experience, and the cost of that screen currently makes many of these products unattractive. Finally, this is a group that appears poised to move to wireless connectivity primarily because they like to buy ahead of the technology curve and often do not have access to corporate connectivity options, particularly when engaging in entertainment activities. The success of the new Apple iBook suggests that this segment is maturing and may not be distinguishable as a stand-alone segment at some future date. The emergence of an increasing education requirement for mobile computers that have unique attributes may replace this segment with one that is both more stable and easier to define in that same period.

Consumers are price constrained and prefer prices under the $1,000, $500 and $300 pricing thresholds, suggesting a modular or subsidized solution would work best here. This group has shown a tendency to accessorize and does so with cameras, game systems and personal electronics today. The current weightings are as follows:

- Price: 4
- Power: 2
- Battery Life: 4
- Weight: 3
- Migration Cost: 3
- Stability: 1
- Design: 4
- Upgradability: 3
- Screen Size/Resolution: 2
- Configuration Flexibility: 1
- Modular Capability/Accessories: 4
- Connectivity: 3
- Security: 2

Over time, it will be increasingly hard to differentiate, on needs, the consumer and the business buyer since both, ulitmatly, need to perform the same core tasks. More important, we believe that the market is trying to move to a model where employees purchase their mobile equipment, and in the case of handheld computers, that is the current market condition.

However this market evolves, whether you build computers for others, or buy them for your company, it will be increasingly important that you understand the core values of the end user of the product to ensure your project is successful.

Alternative View

A modular design could collapse the product class for all but the performance category into one product line with a wide variety of modules. **Casio** has released a laptop in Japan that will boot on Linux or Windows and effectively collapses the communications and e-mail/presentation users into one product group. This suggests that these categories are in transition, and the number will likely decrease over time as systems become more flexible and buyers become more experienced. Given the current market slowdown and price war, the vendor that can effectively span several classes with one product line should enjoy better margins, stronger market share and a higher potential for short-term growth. These benefits should drive vendors to shift to more modular solutions over time and to further experiment with combining capabilities core to several buying groups to grow their respective market shares. Eventually, the desktop platform should give way to the mobile platform as dominant; the faster vendors realize that this is the trend and reverse the current methodology, which favors desktop designs over mobile designs, the quicker we will likely see margin recovery for the segment and stability in the product line.

Findings & Recommendations

The current market appears to be divided into five usage models; these models are best defined by the key user needs and not the more traditional notebook form factor. We define these categories as follows:

Power/custom: The smallest and potentially most lucrative segment in terms of margin. This group tends to value performance highly and is willing to trade off substantial cost to get that performance.

General productivity: The largest class today, but declining. This class represents where IT buys most machines today. While the Apple Titanium box seems to come closest to most of the hardware needs, the IBM T series, by virtue of IBM's brand and Windows compatibility, is the best selling. This is the mobile equivalent of a general-use computer.

E-mail/presentations: Favored today by executives and sales organizations, this platform seems most likely to become the next general-use platform in the near term. On specifications, Casio appears to have the most tightly targeted offering. For e-mail and presentations, you need a good video subsystem but are more concerned about battery life, cost and weight than performance.

Communications: These are folks that just want messaging. They value portability and battery life over almost all other categories other than cost. Ideally, they would like battery life in terms of days, not hours, and while they may need more capability when in the office, they seldom or never need that capability while on the road.

Consumer/entertainment: This is a buyer that is being best addressed by Sony and Apple now. Their values are much more personal, and they often like, and are willing to pay for, a certain degree of exclusivity or personalization in their products. If prices continue to drop, the majority of machines in the distant future could be bought by individuals and be closely matched to their unique needs. This could cause the collapse of all but the power/custom class into a single general-use category that would have modular offerings addressing a broad range of consumer needs depending on how they were positioned and accessorized.

Overall, the trend is toward smaller, lighter, more power efficient laptops — a trend we are seeing in desktop systems as well, thanks to space constraints and power shortages. This trend, should it continue, appears to favor vendors that can respond quickly to the changing user needs and can demonstrate a sustainable advantage in the related market segments.

Vendor Recommendations

Hardware OEMs need to move from targeting and talking about features to targeting usage models and talking about benefits. Future market share swings will likely go to those that can better target the core customer sets, anticipate changes in the needs of these communities and message benefits that resonate with the related buyers. The market is maturing; the vendors that don't mature with it will suffer in favor of those that do.

IT Recommendations

Survey your users, and get a good idea of their usage models and related needs. A notebook computer that is never mobile is a doorstop, a dissatisfied executive is career limiting, and mismatched tools never reflect well on the person who selected them. Overall, the trend is toward smaller and lighter, and most of you have indicated that performance is toward the bottom of your selection criteria. We think you'll find that more and more of your people fit the profile of the e-mail/presentations class, and that you likely have a large number of folks in the communications class that you could better equip with lower-cost hardware.

In the long term, laptops are becoming more and more personal. You may want to anticipate a time when you give an employee an incentive to buy their own and then hook them up to back-end services and a laptop vendor that will be responsible for his or her day-to-day problems. This would tend to further accelerate the reliance on server and Web-based application development over time, as well as further accelerate the move to high-speed wireless connections both in, and out, of the office, so you should adjust accordingly.

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