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MARKET POTENTIAL ANALYSIS:

A METHODOLOGY FOR ESTIMATING THE MARKET POTENTIAL FOR COMPUTERS AND OTHER INFORMATION TECHNOLOGIES

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ABSTRACT

This paper describes a methodology for estimating the market potential for computers and other information technologies. Market potential analysis is not market forecasting, although forecasting when the potential of a market might be realized can be part of the analysis. At base, market potential analysis sizes markets based upon a sequential and increasingly refined process from global or regional to national markets and business, consumer and other segments within national markets.

Market potential analysis is a strategic tool to identify market opportunities and invest resources where they will have the greatest return in the long run. Market potential analysis can help to target markets with high growth potential in the future. Market potential analysis enables companies to:

- Categorize countries as lead markets, break-out markets or emerging markets.
- Quantify market potential for a given product by country, region or globally, now and in the future.
- Identify growth drivers and barriers in those markets.
- Understand how to exploit growth markets by tailoring marketing, product development and production strategies to meet customer demands and overcome market barriers.

MARKET POTENTIAL ANALYSIS

INTRODUCTION

India is reported to have a growing middle class of 200 million people, while China's middle class is estimated to be as high as 300 million people. Faced with anemic economic growth in much of the industrial world, many companies are looking to the so-called big emerging markets (BEMs) as new growth markets for their products and services. Everyone from the U.S. Commerce Department to individual market analysts touts the huge market potential in BEMs. Yet at the same time, we see a sudden 70% increase in PC sales in Japan in one year (1995) and wonder if there isn't considerable untapped potential in the industrialized countries. Still, what happened to the economic boom that was supposed to be set off by the creation of a single European market? Clearly, the available concepts and methods for estimating market potential are limited.

This paper develops and systematizes new concepts and methods of market potential analysis. It is intended for executives and strategists concerned with developing approaches to expanding existing markets, entering new markets, or creating new markets on a global, regional and/or country basis.

Defining Market Potential Analysis

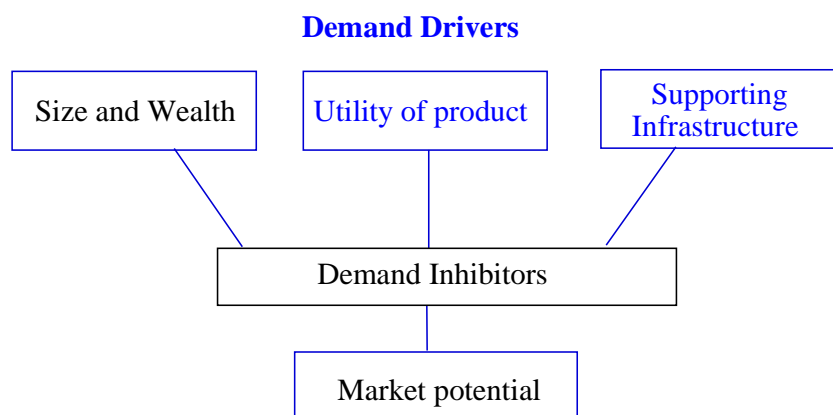
Market potential analysis is a strategic tool to identify market opportunities and invest resources where they will have the greatest return in the long run. Market potential analysis is not used for short-term forecasting, but can help to target markets with high growth potential in the future. Market potential analysis enables companies to:

- Categorize countries as lead markets, break-out markets or emerging markets.
- Quantify market potential for a given product by country, region or globally, now and in the future.
- Identify growth drivers and barriers in those markets.
- Understand how to exploit growth markets by tailoring marketing, product development and production strategies to meet customer demands and overcome market barriers.

MARKET POTENTIAL INFLUENCERS

Many forces influence market potential, but there are two broad sets of factors that are key: demand drivers and inhibitors (Figure 1).

Figure 1. Demand drivers for IT



Demand Drivers

Demand drivers are the factors that affect the size, readiness or exploitability of markets. Three are especially important.

- The first is the **size and wealth** of a market. This determines the number of households, companies, government agencies and other organizations that can actually afford to buy a product. This is not a simple calculation, and average figures such as total population and GDP per capita offer only a starting point. Other factors include household income distribution and the structure of the business sector. Much of the value of market potential analysis comes in calculating accurately the number of potential customers there are for a given product.
- The second is the **utility** of a product in a particular market. This varies according to the nature of the product and the characteristics of the market. For instance, if you are selling an English-only online service, the number of people who speak English in a given market will determine the value of the service. Similarly, if you are selling PCs for small businesses, the value of the systems will depend on how easily they can be networked and communicate internally.
- The third demand driver is the **supporting infrastructure** for a product. Frozen foods require refrigerators, and refrigerators require electricity, so the demand for frozen foods is dependent on the presence of reliable, affordable electrical power. For information and communication products, the necessary infrastructure can include telephone lines, satellite uplinks, and human resources such as skilled programmers, technicians and users. The quality of infrastructure generally corresponds to national wealth, but

there are significant differences among countries at similar levels of wealth.

Demand Inhibitors

Market potential in a given country can appear to be high, but actual demand remains low. This is usually due to the presence of demand inhibitors that either raise the cost or lower the utility of a product. An obvious example is a tax or tariff, which increases the price to final customers. Quotas and other trade barriers have the same effect. Some inhibitors such as tariffs are explicit and can be quantified, while others are less visible and can only be identified through in-depth knowledge of a country. For example, the business model of companies, management culture, and labor environment (e.g., lifetime employment, strong unions) can inhibit demand.

Steps in Market Potential Analysis

We begin by employing a top-down model driven by a country's wealth to measure market potential size. In doing so, we use an extensive database of international and national statistics. Then, we look at market penetration in a large number of countries to understand historical trends and identify which countries are leaders and laggards in adopting new technologies. This approach enabled us to identify Japan as a break-out market for personal computers in 1992, three years before the boom in PC sales that began there in 1995. Next, we break down national markets by segment into household, business, government and education markets. Each of these markets has its own growth drivers and must be analyzed according to a different set of criteria. International strategy must take into account not just what countries have the greatest potential, but what market segments within each country. Finally, we integrate the results of these previous

steps with qualitative understanding of individual countries to provide an interpretative portrait of market potential.

Thus a full analysis of market potential involves four steps:

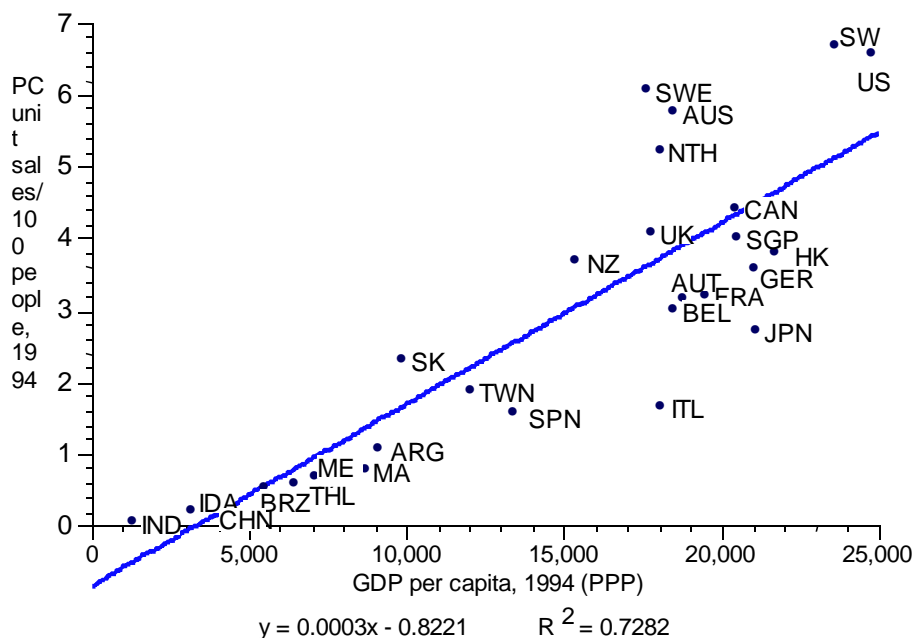
1. Top down estimation of market potential size
2. Elaboration of market types
3. Analysis of market segments
4. Integration and interpretation

Each of these steps is discussed and illustrated in the following four sections.

1. TOP-DOWN ESTIMATION OF MARKET POTENTIAL SIZE

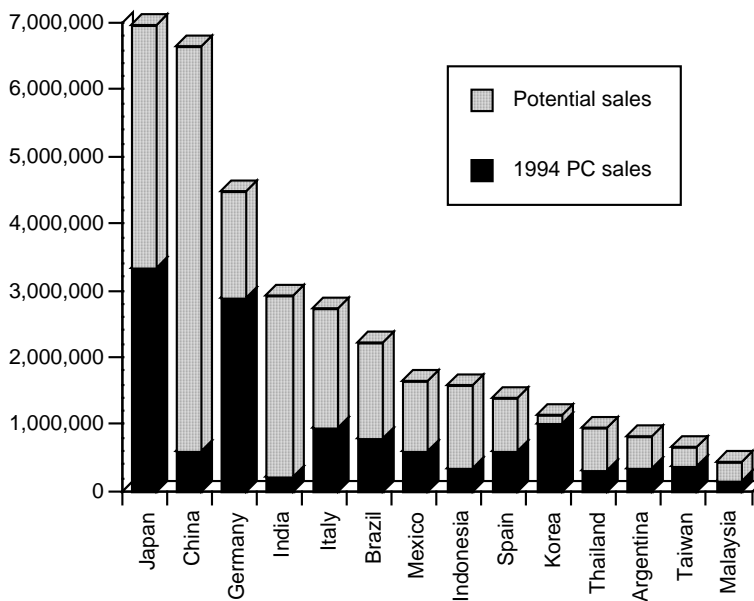
The top-down model starts with the premise, supported by evidence from a large number of countries, that IT market opportunities are closely related to a country's wealth, and to growth in that wealth. It looks across countries to identify leaders and laggards in consumption or penetration of a given product as illustrated in Figure 2.

Figure 2. PC sales and national wealth, 1994

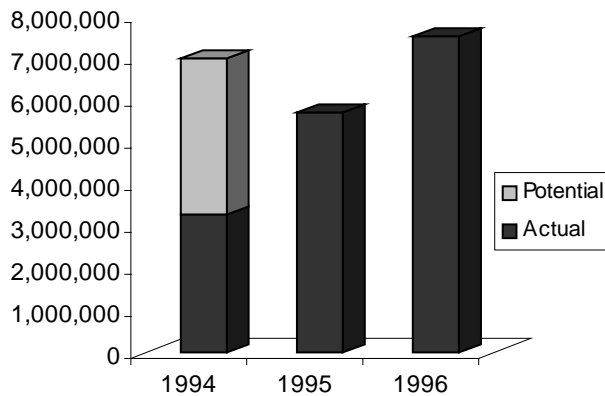


Using the top-down model, we identified in 1994 which countries were lead markets, likely break-out markets, and longer-term emerging markets. The lead markets were the U.S., Switzerland, Sweden, Australia, New Zealand and the Netherlands. The most likely break-out markets were Japan and Italy. We calculated market potential for a number of countries based on how many PCs these countries would have to purchase to match the U.S. level, *relative to their income*, with the results shown in Figure 3. The figure shows that Japan's PC sales in 1994 were about 3.3 million units, while its untapped potential was another 3.7 million units, meaning Japan's total sales would have been about 7 million units to reach the U.S. level.

Figure 3. PC markets, actual and potential, in 1994



Japan was what we refer to as a *break-out market*, which had the wealth to support a larger PC market, but was being suppressed by a set of demand inhibitors. Once these barriers were surmounted, demand leaped to 5.7 million units in 1995, and hit 7.5 million in 1996 as Japan moved to catch up to the U.S.



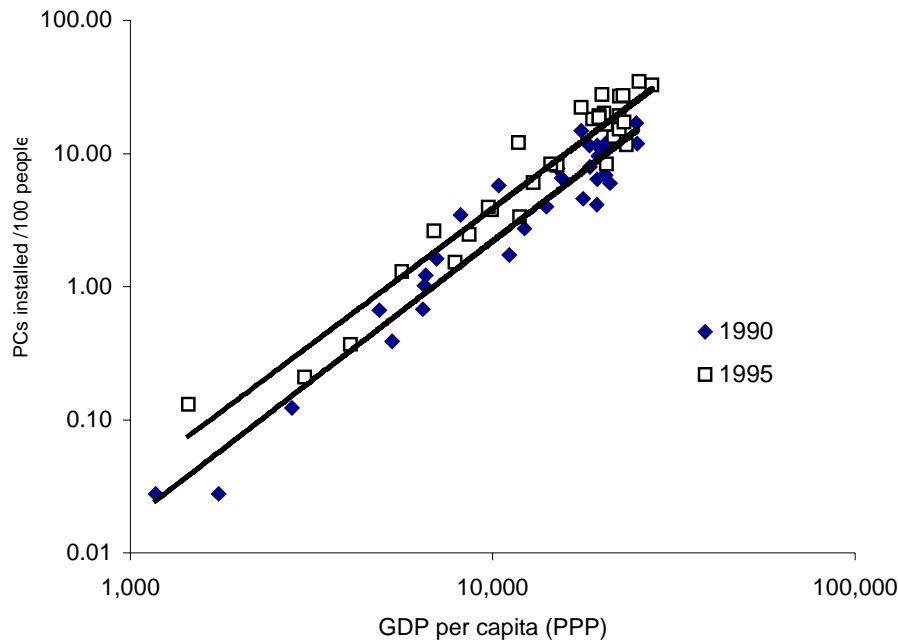
(Figure 4).

Figure 4. Japan's 1994 market potential compared with subsequent market growth

What about the huge potential shown for China and India in Figure 3? While they have large potential, these countries are not break-out markets like Japan because they lack the necessary infrastructure to support large-scale PC use and retain demand inhibitors that will take years of sustained effort to overcome. This is not to say that China and India will not reach their potential, but as *big emerging markets*, they require more patience to develop.

The top-down estimate of market potential as presented here is essentially static, but the underlying model can be applied to analyze trends over time as well. Figure 5 shows that, between 1990 and 1995, the trend line for PCs installed shifted upward as PC use expanded globally. Individual markets reflected this trend, even when their national economic growth was slow.

Figure 5. PC penetration, 1990 and 1995



2. ELABORATION OF MARKET TYPES

The quantitative estimates of market potential derived from the top down model must be further identified by the type of market – lead, break-out or big emerging market. The type of market provides important clues to how its potential can be exploited.

Lead Markets

Lead markets are the first markets to adopt new technologies on a significant scale. New products are developed to meet the needs of lead markets and standards are set in these markets—standards that are often adopted around the world. If a company is developing new products or services, it is critical to identify which countries are likely to be the lead markets. These markets provide critical feedback from sophisticated users to guide product development and

marketing efforts. They also provide the opportunity to shape technical standards, or at least to monitor which technologies are winning the standards battle.

Lead markets vary from product to product. For early consumer electronics products such as the television, it was the U.S. In later years, Japan became the lead market for products such as VCRs, fax machines and numerous consumer electronics gadgets. For the personal computer, leadership returned to the U.S., as it did for cable TV and the Internet. For mobile communications such as cellular phones, the lead markets have been places like Hong Kong and the Scandinavian countries.

The location of a lead market can be driven by many different factors. Japan's small living spaces led its electronics companies to focus on products that were "small, thin, light and low-power." These products were aimed at meeting the specific needs of a large, relatively wealthy market, and ended up being valued around the world. U.S. leadership in PC adoption was driven in part by the desire of a community of computer nerds who wanted their own computers, followed by the demand of individual workers and small businesses to have their own affordable productivity tool. Cellular phones became as much a status symbol as a business tool for Hong Kong's ambitious and style-conscious business community.

In each of these cases, local firms have benefited greatly from their proximity to the lead market, whether it was Sony in Japan, Microsoft in the U.S. or Nokia in Finland. However, these opportunities are not closed to shrewd outsiders who identify market opportunities early and participate in them or monitor them closely from within the lead market. Companies such as Toshiba, Acer and SAP have become leaders in the U.S. computer and software market, while Motorola is a strong competitor in Hong Kong's cellular phone market. If a

company is competing in a leading-edge technology industry, it can't afford to be left out of the lead markets, as second hand information is no substitute for being where the action is.

Break-Out Markets

Break-out markets are countries (or sectors within countries) that lag below the trend line in usage of a product. These countries have the necessary wealth and infrastructure to support much higher investment, yet are far behind the lead markets in both spending levels and market penetration. The cause for their lag is usually one or more demand inhibitors that either raises the price or lowers the value of the product or service. When these barriers are surmounted, the result can be a dramatic growth in demand. The case of Japan's PC industry is an excellent example of a break-out market that lagged for many years and finally broke out in 1995. Japan's PC market was being stifled by several factors:

- High prices, due to the unwillingness of domestic companies to compete on price, NEC's dominance of the market, and lack of serious foreign competition.
- A fragmented market, with several Japanese versions of the DOS operating system, none of which was compatible with each other or with the standard international version.
- Difficulty handling Japanese characters led users to choose dedicated word processors over PCs.

The environment changed dramatically starting in 1992, however. IBM introduced DOS-V, a Japanese version of DOS that was compatible with the international version. Microsoft followed with Windows 3.1J, which ran on both the DOS-V and NEC PC98 platforms, thus unifying the fragmented Japanese software market. Also, in 1992, Compaq launched a price war, which eventually brought Japanese PC prices close to U.S. levels. The effect of these events culminated in 1995, when the introduction of Windows 95, Internet fever, and

Fujitsu's price cutting led to an explosion of the market, with growth rates of 70% in 1995 and nearly 40% in 1996.

We have seen similar cases to this in New Zealand in 1984, Korea in 1988, Mexico in 1991 and Brazil in 1995. In each case, a lowering of tariffs or import quotas on computer hardware led to a large surge in spending to satisfy pent-up demand that lasted for several years and created a whole new level of IT use.

Big Emerging Markets (BEMs)

The U.S. Department of Commerce has identified a number of countries as big emerging markets, based on market size and potential, as well as their role as regional economic drivers. Although the status of some of these countries might be affected by the on-going financial crisis in the Asia-Pacific region, the following countries are among those identified.

- Argentina
- Brazil
- The Chinese Economic Area
(China, Hong Kong, Taiwan)
- India
- Indonesia
- South Korea
- Turkey
- South Africa
- Mexico
- Poland.

The Commerce Department has focused much of its market development effort on the BEMs, helping U.S. companies win contracts and surmount market barriers in those countries. This focus on BEMs has coincided with a growing awareness in the business community that these countries are not only large, but are wealthier than statistics such as average GDP per capita would indicate. Also, as the developing world moves toward more market-oriented economic policies, many of the BEMs have been liberalizing their trade and investment policies, privatizing state-owned enterprises, and looking for opportunities to participate in the global production networks that mark more and more

industries. These changes in government policy and business culture have spurred economic growth and created opportunities for foreign companies to participate in that growth.

One problem with the broad focus on BEMs is the lack of differentiation among those markets. The China market is far different from the Argentina market, both in size (China has over 35 times the population of Argentina), wealth (Argentina's average income is over four times that of China), government policy and business culture. Since resources are limited, deciding which offers a better market opportunity requires a way of measuring the market potential of a particular product. The answer will be different depending on whether a company is selling toothpaste or computers. Market potential analysis offers a way of quantifying the potential of widely diverse markets without having to conduct costly primary research on each market.

3. ANALYSIS OF MARKET SEGMENTS

Analyzing market potential at a more detailed level requires breaking down the market according to target segments. Some products focus on the household, business, government or education market, while others target all of those markets. Whatever the target market, it is necessary to consider the resources available to potential customers, the utility of a product to them, the infrastructure necessary to support the product's use, and the types of market barriers that might exist (Figure 6).

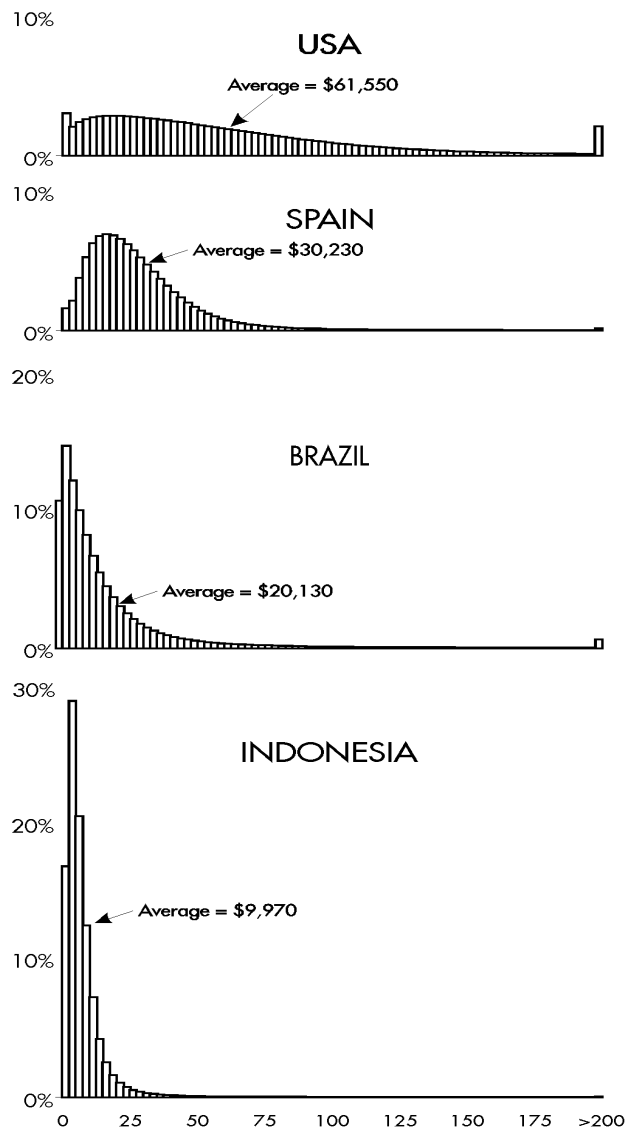
Figure 6. Framework for sector analysis of market potential

Market Sectors	Wealth	Utility	Infrastructure	Barriers
Business	Company size, profitability, access to credit.	Sectoral distribution, especially size of financial sector, wage rates, occupational distribution.	Education level of workers, availability of IT skills, telecoms quality and cost.	Corporate culture, business models, attitude of managers toward technology, barriers to replacing labor, such as lifetime employment.
Household	Household income distribution adjusted for purchasing power (PPP).	Work at home, computers needed for school work, entertainment value.	User experience, telecommunications, Internet access.	Difficulty of use, lack of support, language.

Household market

Quantifying wealth or resources in a country's household market requires moving beyond average income to look at the *distribution of income* and consumption for all households. Some countries have very high-income inequality, with a few wealthy households and many very poor ones, while others have a more even income distribution. Looking at a few countries in Figure 7, we can see that most of Brazil's households are at very low-income levels, while Spain has a much larger middle class. The two might have similar consumption patterns at the higher income levels, but the Brazilian market will be saturated much faster. Also, the effects of economic growth will be spread more broadly among Spanish households, expanding and enriching the middle class. Meanwhile, the U.S. market has a large number of households in higher and middle income levels, while Indonesia's households mostly remain at very low levels, in spite of recent economic growth.

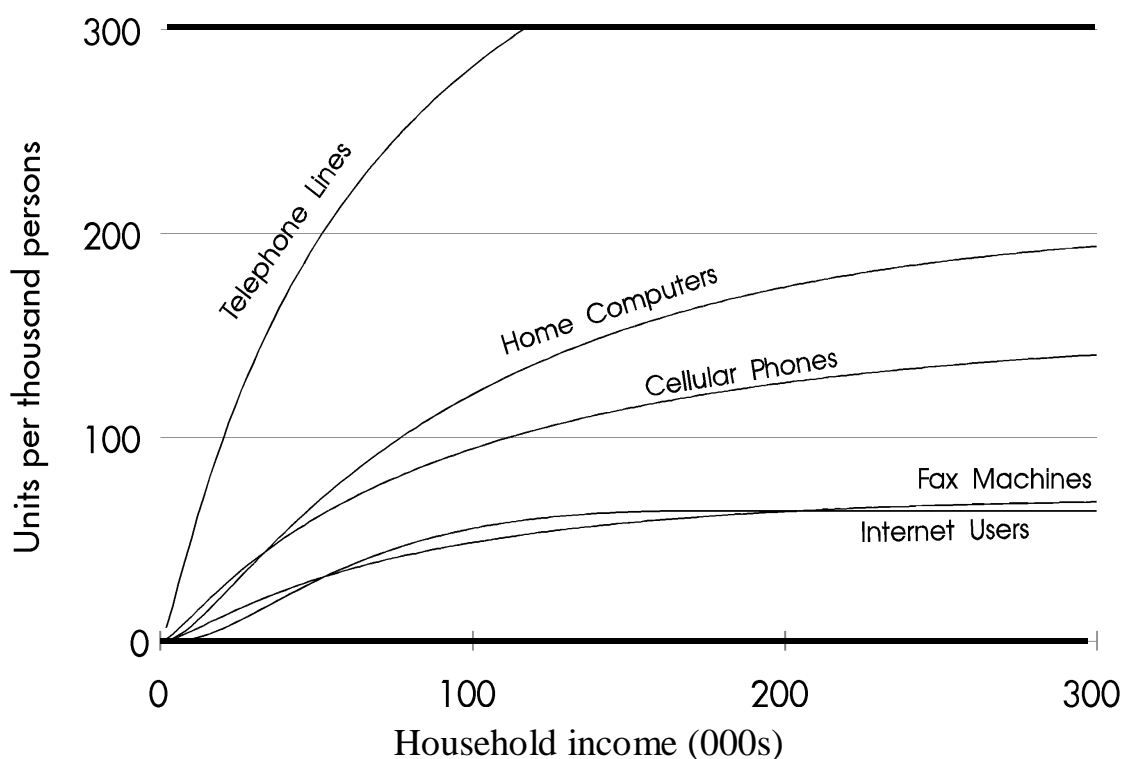
Figure 7. Household income distributions in four countries



In order to measure the potential household market for a product, we use data on household usage at different income levels. This includes data on average spending and penetration from a large number of countries at different income levels, as well as data from the U.S. market (and others if available) on spending by different income groups. This enables one to develop a market potential curve. Each product will have its own

curve, depending on its cost, value to users and market maturity. Figure 8 shows the household product potential curves for VCRs, cellular phones, PCs and Internet service. The curve takes off faster for a lower cost item such as VCRs, while for PCs, demand doesn't kick in until higher income levels are reached. The demand for Internet service is still concentrated on higher income users, partly because of cost but also because the Internet is a new technology for household use and is at an earlier stage of market penetration.

Figure 8. Product penetration curves



Combining the product curve for a given product with a country's income distribution curve, we get a clear picture of market potential for that product by country, shown by product-country profiles (Figure 9). Using the data in the two distributions, we can calculate household market potential as illustrated in Table 2.

Figure 9. Product-Country Profiles

PRODUCT- COUNTRY PROFILES

Horizontal scale: Percentile of households ranked by total annual consumption
Vertical scale: Units per thousand persons

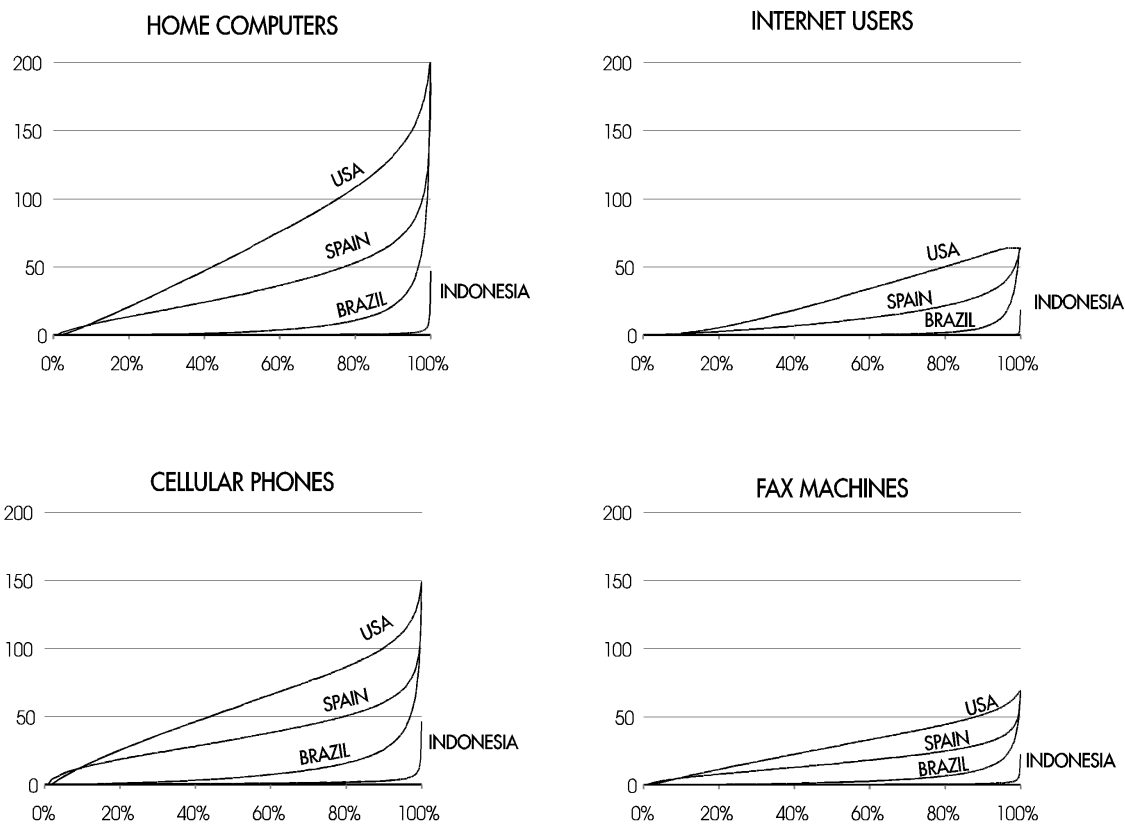


Table 2. Illustrative household PC market potential for one country

Income bands	# of households	U.S. penetration (% of households)	# of potential households
0-10,000	3,000,000	7%	210,000
10,000-19,999	5,000,000	12%	600,000
20,000-29,999	6,000,000	25%	1,500,000
30,000-39,999	5,000,000	40%	2,000,000
40,000-49,999	4,000,000	50%	2,000,000
50,000-59,999	3,000,000	55%	1,650,000
60,000-69,999	3,000,000	60%	1,800,000
70,000-79,999	2,000,000	65%	1,300,000
80,000-89,999	1,000,000	65%	650,000
90,000-99,999	500,000	70%	350,000
Over 100,000	1,000,000	75%	750,000
Total market potential			12,810,000
- <u>Actual penetration</u>			<u>7,000,000</u>
Growth potential			5,810,000

Note: U.S. penetration numbers are for illustration only. Also, actual household distribution can be refined to narrower income bands, as can potential penetration.

The value of a product to users in a given country will depend not only on its wealth, but also on its status as an advanced, break-out or emerging market. In an advanced or break-out market, households are likely to already own most of the more mature products that they are interested in. Consumers in the U.S., Japan and Europe have had color TV since the 1960s, microwave ovens since the 1970s, CD players and VCRs since the 1980s, and are now buying PCs in large numbers. In emerging markets, however, even people who are seeing rapid income growth have not had the resources to buy many of these products, and new household products will be in direct competition with those products. In an emerging market, producers need to be patient until consumers become aware of their products, and must compete for mind-share to make them aware of its value.

Business markets

In the past, household and business markets were largely separate in terms of the types of products and services they purchased. Businesses bought machinery and equipment, while households bought durable and non-durable consumer goods. Among IT buyers, however, the division has become blurred, as both businesses and consumers spend large amounts on PCs, cellular phones, pagers, fax machines, copiers, software and Internet services. Business and household markets remain different in the sense that businesses treat IT as an investment, which must earn a satisfactory return, while households spend mainly to provide personal or family utility. Even this distinction is being blurred by the rapid growth of home-offices and telecommuting, but these trends have yet to catch on outside the U.S. and a few other lead markets.

Because of its different nature, the business market has its own set of demand drivers. We measure wealth in output or value added per worker, rather than income per household. We calculate this value for the economy as a whole and by economic sector as a way of estimating the resources available for IT investment.

To estimate the value of IT in a country, we consider several factors. One is the prevailing wage rate, which helps indicate the benefits of replacing labor with technology. We also consider the sectoral and occupational distribution of the work force, since some industries and occupations have much higher levels of IT investment than others. As an example, we have developed a penetration curve based on U.S. data that shows the number of PCs per 100 workers for each major sector of the economy. We map the sectoral distribution of different countries' workforces on the same chart to see whether most of its workers are in high or low penetration sectors.

As Figure 10 illustrates, the U.S. economy has a large number of workers in manufacturing and community services (government, education, health care), which are

relatively high users of PCs, and a substantial number of workers are in finance and business services which has by far the highest PC penetration rate. By contrast, most of Indonesia's workers are in the very low penetration agricultural sector, so the market potential is very limited, especially considering that Indonesia's farms are much smaller and less automated than American farms. Brazil is in-between, with large numbers of community service and manufacturing workers, but also many agricultural and trades workers.

Figure 10. Business sector profiles and PC market potential

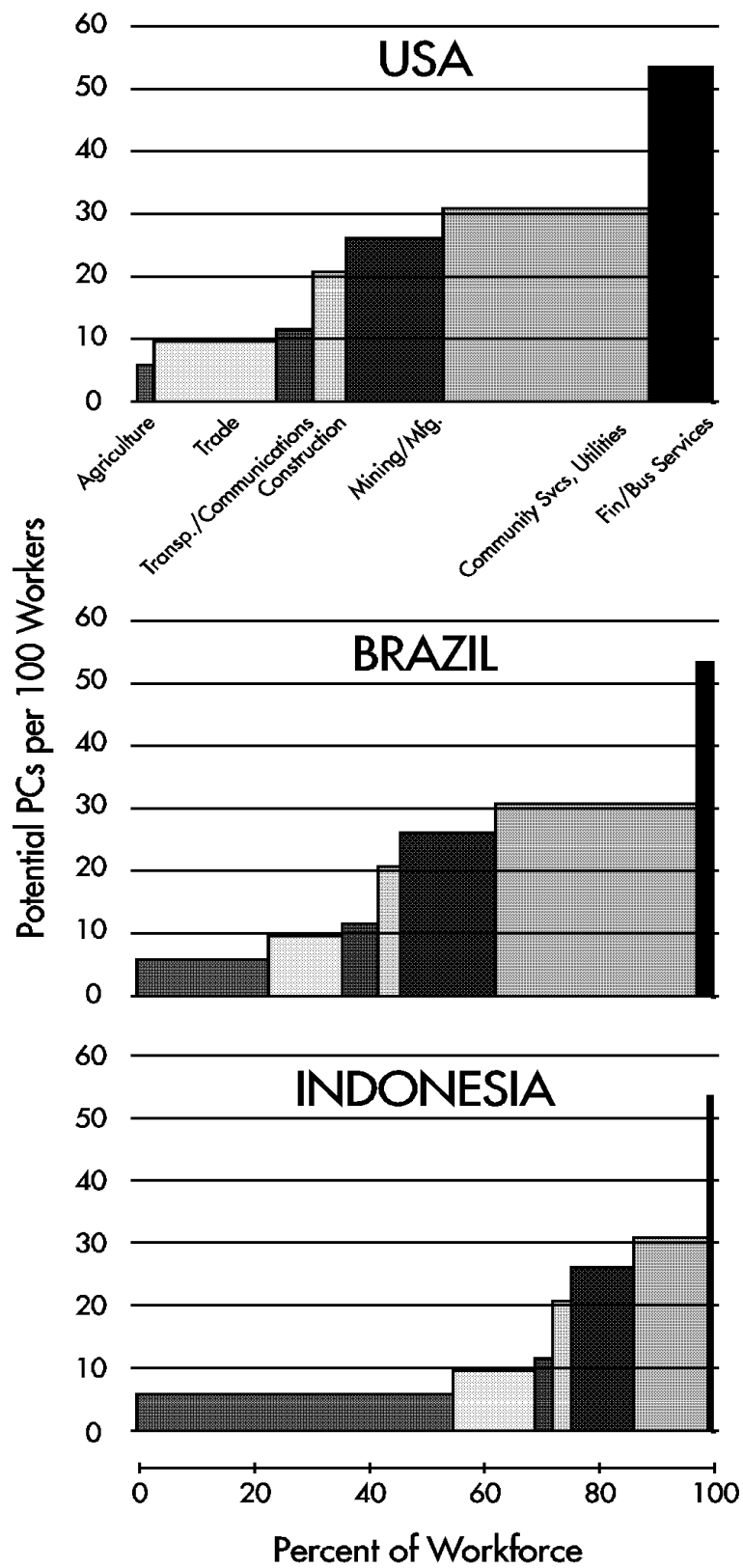


Table 2 illustrates how the sectoral penetration approach can be used as an initial calculation of business market potential. In an actual calculation of market potential, it is necessary to adjust the data to include a measure of wealth, which is normally the value added in each sector.

Business use of IT also has its own set of infrastructure requirements. Some technologies, such as fax and Internet depend on the quality and cost of the telecommunications infrastructure. Others, such as LANs, WANs and other sophisticated information systems require skilled human resources to implement and manage. To measure these infrastructure variables, we use indicators of telecommunications costs and availability, and the number of skilled programmers, systems analysts, software engineers and other IT professionals. Using data on the wealth of a country's business market, the sectoral profile of its economy and the quality of its information infrastructure, one can develop refined estimates of business market potential.

Table 2. Illustrative business market potential for PCs in one country

Industry sector	# of workers	U.S. penetration (PCs/100 workers)	Market potential
Agriculture	5,000,000	7	350,000
Trade	8,000,000	10	800,000
Trans/Comm	2,000,000	12	240,000
Construction	1,000,000	20	200,000
Mining/Manufacturing	4,000,000	25	1,000,000
Community svcs.	12,000,000	30	3,600,000
Finance, business svcs.	<u>3,000,000</u>	55	1,650,000
Total all sectors	35,000,000		
Average PC penetration across all sectors		10	
Total market potential			7,840,000
- Actual penetration			<u>3,500,000</u>
Growth potential			4,340,000

Note: Numbers are for illustration only.

4. INTEGRATION AND INTERPRETATION

The foregoing steps lead to tables and figures, which help to understand the size, market types, and market segments of target markets. These quantitative indicators need to be supplemented by consideration of qualitative factors that might be important moderating influences. Language, culture, religion, business practices and business networks are examples of qualitative factors that must be considered and interpreted for their influence on the overall analysis. Figure 11 is a summary example of such considerations for selected countries.

Figure 11. Qualitative considerations in market potential estimates

Factors speeding up diffusion	Barriers to diffusion
Japan	
<p><i>Market potential:</i> 37.0 M market 21.8 M PPP</p> <p><i>Economic:</i> Recession ending</p> <p><i>Policy:</i> Cost of telecoms might be reduced in exchange for no breakup</p> <p><i>PC market</i> Enterprise integration w/client-server in large firms Intranet, Internet & Nipponnet growth in high tech firms and universities Catch-up mentality Global firms going “Wintel”, trickle down to local firms</p> <p><i>Summary</i> Market potential will be realized in 4-5 years, especially if telecoms costs are reduced. Demand will continue to be strong in future.</p>	<p><i>Policy:</i> NTT breakup unlikely High cost of telecoms & Internet use Preference for proprietary on-line services, e.g., Internet has about 300K users and “Nipponnet” (our name) has 1M users Low government & education IT spending</p> <p><i>PC market:</i> Japanese language</p>
Australia	
<p><i>Market potential:</i> 23.6 K market 192.5 K PPP</p> <p><i>Economic</i> Strong government policies of economic liberalization and outsourcing are shifting resources from the public to the private sector.</p> <p><i>Policy:</i></p> <p><i>PC market:</i> Australia already has a very high penetration of PCs given its relative wealth; penetration is higher than that of the U.S.</p> <p><i>Summary</i> PPP potential probably already achieved. There will be market growth years despite reductions in government spending.</p>	<p>\$1 billion reduction in government IT spending over the next three years</p>
Malaysia	
<p><i>Market potential:</i> 342.4K market 1.6M PPP</p> <p><i>Economic:</i> Strong economic growth 7-8%+ annually</p> <p><i>Policy:</i> \$1billion new government IT spending 1995-1998; \$350 million for government; \$650 million for schools Large public construction projects with high IT components Putrajaya - new capital city New multimedia corridor New “intelligent” international airport “Information society” month</p> <p><i>PC market:</i> 60% of government IT hardware resources in PCs vs. mainframes/minis</p> <p><i>Summary:</i> Malaysia is likely to reach its potential based on market rates in 2-3 years and its PPP potential in 5-6 years.</p>	<p>Malay language Low Internet use & few hosts</p>

CONCLUSIONS

We have developed concepts and systematic methods for estimating market potential for computers and other information technologies. Conceptually, we have identified market drivers and barriers which must be taken into account in doing market potential analysis. We have distinguished between lead, break-out and big emerging markets, identified their characteristics, given examples, and argued that market strategies will need to be different for each. The methods presented are based on empirical analysis of global trends in IT demand and on empirically derived models of market potential. We have found it important to distinguish between the household and business sectors within countries, using different data and models within the same general conceptual framework. That framework uses the U.S. market as the benchmark for market potential, measuring what individual country and global markets would be if they reached U.S. levels of penetration, given their relative income levels. Analysis of household markets focuses on income distribution, rather than just average income levels in order to more accurately estimate market potential. Analysis of business markets focuses on distribution of output and employment among major industry sectors. Both analyses also take into account the availability of infrastructure in a country. The value of market potential analysis is that it aids in development of market strategy by focusing on hidden opportunities that can be exploited for new revenue growth. Market potential analysis goes beyond typical trend-driven forecasting approaches, yet it can be used in conjunction with long-term forecasting models to estimate how quickly different countries are likely to reach their potential. Most importantly, market potential analysis can be augmented by the judgments of country experts to determine what conditions are needed for a country to reach its potential, what strategies a company can employ to help create those conditions,

and what the potential payoffs are if those conditions can be created. As such, it is highly valuable in guiding national and multinational companies in deciding where to invest resources in order to achieve the highest returns in markets for computers and other information technologies.