Chapter 4

User Organizations of Cloud Computing

4.1 Potential Customers of Cloud Technology

According to the broad definition of a user organization, anyone who so far has been benefiting from enterprise technology, not just IT, is a potential user of the cloud. This includes traditional data processing, office automation, computer-aided design (CAD),* productivity tools, social networking, scheduling, procurement, sales and marketing, applications software platforms, or other means employed to promote innovation, greater competitiveness, and profitability.

The better-focused definition looks individually at types of users, their sophistication and size, past experience with IT, as well as likelihood to use cloud computing facilities. This is the perspective taken by cloud computing vendors, and it is therefore marketing oriented. It also allows us to proceed in a more methodological sense than a general, all-inclusive definition.

Companies interested or potentially interested in being cloud computing users fall into two broad classes. The one is composed of large- to medium-size corporations with a long history in data processing, which have installed and been using the IT

* It was a deliberate choice not to include scientific computing in this list but to emphasize activities like CAD that benefit in a supply chain relationship.

vendors' wares—both tactical and strategic products—for many decades. These are much more likely to adopt the solution of private clouds (Chapter 2) and hybrids.*

By contrast, medium-size and small companies may be tempted to give up their IT operations (and head count) in favor of cloud computing, though it is still too early to have a clear opinion on this matter. Cost alone should not be used as the criterion for cloud decisions, as Chapter 3 has explained.

The way to bet is that large enterprises contemplating cloud computing will be guided in that direction by their current hardware vendors, and they will be getting a big quantity of it rather than cherry-picking cloud services as smaller companies now do (and should do). This will be a slow-going process for two reasons:

- inertia coupled with the longer time necessary for reengineering, and
- cloud computing will upset their IT organizations (Chapter 5), creating considerable resistance to change.

Therefore, according to at least some of the experts, in the near future wise vendors of cloud computing services should seek the best market for them, which is made up of *small and medium enterprises* (SMEs; Section 4.6). These have a major incentive in using onDemand products and services, because of their ongoing effort to change capex into opex. In addition, their applications are not as complex as those of big enterprises, which means that the necessary reengineering work (Chapter 6) will be easier to accomplish.

Next to the SMEs an interesting population of potential users may be that of *virtual companies* (Section 4.3). A virtual company typically outsources most of its products and services. It may have only a small head office combined with a sales office, letting third parties produce and deliver everything else—all the way from accounting records to manufacturing.

Still another population of potential cloud computing users will be consumers communicating through social networking (Section 4.7). Cloud vendors addressing the members of that group of users may offer scaled-down products appealing to the other classes of user organizations, as it happened with Facebook.

No matter in which of the aforementioned populations of computer users one belongs, the effect of the strategic inflection point described in Chapter 3 will not take long to be felt. As for the vendors, they will be confronted not only by a shift in demand for products and services they have been classically providing but also by novel risks and opportunities:

- the cloud presents both *promises* and *threats* for which they must be adequately prepared, and
- though their future course of action cannot be planned, as Peter Drucker once said, events can often be foreseen.

* Which in no way implies that they can skip reengineering (Chapter 6).

One of the foreseeable events to characterize the better-run enterprises in the next ten years is whether or not information is managed as a product. User organizations that have been active in IT and its evolution for more than five decades know that among financial and industrial organizations, let alone among governments and other state authorities:

- for the most part, information is not well managed;
- it is available in overabundance or not at all;
- it is seldom accurate, timely, and complete; and
- it is provided at a cost that cannot be determined with assurance.

What is more, to a very substantial extent today's approach to information management is based on yesterday's concept and technologies. In the majority of cases, the image of what can be done with present-day media steadily dates back to three or four decades ago and sometimes more. Watch the surprising popularity of Cobol, which is obsolete, cumbersome, inefficient, and of very low productivity—yet widely used.

This attitude that one pays for novelty but does not collect its fruits is widespread. General David Jones, former chairman of the Joint Chiefs of Staff and currently advisor to President Obama, has candidly acknowledged: "Although most history books glorify our military accomplishments, a closer examination reveals a disconcerting pattern: unpreparedness at the start of a war; initial failures; reorganizing while fighting; cranking up our industrial base; and ultimately prevailing by wearing down the enemy—by being bigger, not smarter."*

It is as if Jones had in mind the way IT has been (and continues being) used by most organizations. Optimists say that for those who employ it, the cloud will act as catalyst for abandoning their traditional, muddling-through approach to information technology. This is not at all sure, but it may happen in those firms that engage in reengineering (Chapter 6), provided that they understand the need for fast cycle times.

Much can be learned from Japanese companies who, in their heyday, achieved an enormous advantage in product development and in innovation through a process of steady, incremental improvements that kept them at least a step ahead of their competitors. Leadership is important, but leadership alone will not develop a system that gets and keeps ahead of the curve. This requires:

- a decision to change,
- superb organization, and
- able, uninhibited use of high technology.

* *Forbes*, December 9, 1991.

New business models are needed to capture the pulse of the market, and these cannot be served through programming languages that are more than fifty years old. The language we use forms our mind, and something similar could be said of software. This is good news for vendors of onDemand applications who appreciate that capturing business opportunity requires:

- rapid identification of customer needs,
- swift product evaluation and brokering,
- on-time negotiation and confirmation of commitments, and
- a first-class after-sales product service (not just help desks).

Organizations choosing cloud computing will also be well advised to remember that in the coming competitive environment, dynamic markets, supply chains, and interactive distribution channels will obey the law of *volatility in returns*. Uncertainty about increasing or diminishing appeal of their products from one year to the next:

- will create a world of instability, not equilibrium, and
- will penalize those staying behind to the point of going bust.

One of the interesting statistics from the first years of onDemand software is that the top vendors in one year were not the same as those of the preceding and following years. The law, if there were one, would be that more successful companies were distinguished by their ability to keep on being on the run but not necessarily in first or second place year after year. This means that market leadership is still up for grabs.

After a strategic inflection point the doors of risk and return are adjacent and indistinguishable. Able management is anticipating change and identifying new opportunities. Still, if it wants to be one of the first exploiting and conquering a new commercial territory, it cannot wait for large amounts of evidence. By the time that is available, the market would have been de-creamed by someone else; hence the wisdom of distinguishing between strategic and tactical products (Chapter 1).

4.2 The Cloud Interests Small and Medium Enterprises

Companies can be generally classified as very large and usually global, medium to large, small and medium, and very small. The SMEs are typically those employing from ten to less than five hundred people and making roughly less than $160 million (110 million euros) per year.* In the New York stock market,

* According to a different classification, the mid-market features companies with one hundred to one thousand employees and small enterprises less than one hundred employees. There are no universal standards in regard to dichotomies.

there are three Russell indexes: for medium-sized companies, for small, and for very small.

I mention these indices because a better dichotomy than employment is to follow the Russell midcap, Russell 2000, and Russell microcap stock market indices, which divide the SMEs and very small firms not into two but three groups, each with its own characteristics, taking as a basis their capitalization. (Not all small to medium enterprises are quoted in exchanges, many being family companies. Those that are quoted constitute a better reference in the sense that their financial reporting permits us to know more about them.)

Not everybody realizes that the medium to small enterprises (and not the very big ones) are those that make the economy kick. They provide most of employment,* are faster to hire in an upturn, and (on average) are by far the best users of Internet services—and therefore also the best prospects for cloud computing.

Forrester Research says that in the coming years SMEs will drive 48 percent of the managed services market and will also be the most important insourcers/outcourcers. Specifically, in regard to the cloud, small and medium enterprises will require services for:

- developing and advertising new products;
- marketing B2B, B2C, C2B, and C2C†; and
- searching for means to reach their clients online.

This means great opportunities for onDemand software for B2B, B2C, C2B, and C2C, as well as to support online reporting services. Apart from external communications with business partners, many SMEs already use intranets for internal company communications, provide an information backbone and interactive staff support, care for interactive training chores, and are great believers in using technology for cost reduction.

Several vendors have been sensitive to these requirements. For example, Microsoft's Office Live Small Business (OLSB) offers SMEs a simple means for creating and managing websites, administering e-mail, handling accounts, implementing marketing campaigns, and managing documents and contacts with business partners.‡

Just as important is the fact that OLSB's cost is low. At $15 per year, its services provide a feature website; free web hosting with 500 MB of storage, expand-

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* In the United States the Census Bureau estimates that mid-sized firms account for 23 million employees (20 percent of total) and one hundred thousand employers. Also, there are 6 million small firms accounting for 42 million employees. These represent 36 percent of employees and an impressive 98 percent of employers.

† Business to business, business to consumers, etc.

‡ Office Live Small Business is not a small-scale MS Office, and some of its tools come from traditional MS Office wares.

able to 5 GB for an additional fee; domain name registration with custom web address; up to a hundred e-mail accounts that match the domain name; online document storage and sharing; and contract management for sales, personnel, and customers.

A fairly sophisticated support is featured by Sun's Project Caroline, which is built around the development and deployment of Internet services. This is a utility computing initiative that acts as a portal for users, developers, and partners to enable building various application services.

Applications like sales force management, marketing, advertising, customer handholding, customer support, and public relations do not call for complex linkages to accounting systems. Therefore, they are a good market for platform usage by medium-size firms. They can also be enriched with standardized processes such as payroll, accounting, and the like. Other applications, by contrast, are rather customized. They include:

- financial settlement,
- order fulfillment,
- supply chain management, and
- the wider area of logistics, scheduling, and inventory control (Chapter 12).

While the attraction of cloud computing to the SMEs will most likely vary by the industry sector in which they operate, it is reasonable to expect that greater differences will be presented in terms of style of management rather than by product line. Alert managers push for client-oriented web applications that handle:

- the majority of transactions,
- content management,
- customer support,
- sales analysis, and
- campaign management.

Knowing the pattern of the SMEs' use of the web is important for cloud vendors because usually companies that have already adopted the Internet are more prone to go for cloud computing services, because their culture will not stand in the way when doing that transition, and the market these user organizations represent may be impressive as their numbers continue to grow.

For instance, not long ago the regional Chamber of Commerce and Industry of Provence-Côte d'Azur made a study among SMEs that involved 2,200 CEOs and their companies. Of these, 61 percent were found to be active on the Internet, and 39.6 percent confirmed having found new clients through the web.

Even more interesting has been the finding that the Internet-active population of SMEs might welcome enabling services. Many said that they lacked experience

in maximizing their Internet exploits.* That is precisely where the opportunity for cross-sales lies: onDemand software, platforms, and enabling.

Indeed, at both sides of the Atlantic the potential size for onDemand software during the next few years can be impressive if current statistics are kept in perspective. In the United States, these statistics suggest that:

- roughly 30 percent of total software spending is for off-the-shelf onPremises commodity offerings, and
- the balance, 70 percent, is custom applications developed in-house or outsourced to contractors and system integrators.

Anecdotal evidence suggests that in Europe average figures (they vary by country) stand, respectively, at 26 and 74 percent. By contrast, in emerging markets, where there is less of an attachment to legacy code, the split tends to be even: 50-50.

There is really no reason why the United States and Europe should lag behind developing countries. If cloud computing providers bring the U.S. 30 percent to 70 percent distribution to a more even 50-50 by taking up 20 percent of new or thoroughly revamped applications through onDemand offerings, they will make for themselves a brilliant future. This will be tough but doable if vendors use their imagination.

The best example that comes to mind is the *bargain basement* idea. Its inventor, Edward A. Filene, was a department store owner from Boston who made his fortune in the early twentieth century by putting his idea into practice. As founder of the Good Will Fund and the International Management Institute, Filene's sensibilities had been attuned both to:

- the needs of consumers and
- sound inventory management.

Based on these two considerations he created the department store's famous Automatic Bargain Basement, whose prices dropped each week on unsold goods until the last unwanted shoes, shorts, and dresses were given to local charities. While manufacturers and industrial engineers worried about the cost of production, Filene focused on the cost of distribution of goods. Unsold inventories see to it that these costs skyrocket.

Some vendors may say (not without reason) that it is different with software, because once one copy has passed the tests, a million can be made from it. But Filene's concept can still be epoch making; it suffices to find the way to put it into practice in the cloud.

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* The region established a budget of 18 million euros ($26 million) to close this gap, emphasizing five economic sectors: services, artisans, tourism, transport, and commerce.

4.3 Virtual Companies and the Cloud

A *virtual company** is a temporary consortium of independent member firms coming together, often on a limited time frame, to quickly exploit fast-changing national or worldwide business opportunities. Virtual enterprises share with their suppliers costs, skills, and core competencies that collectively enable them to:

- access global markets and
- provide world-class solutions each of them could not deliver individually.†

These are the basic concepts on which rest a virtual organization. At the same time, however, the notion underpinning a virtual organization is in flux, as the term tends to be interpreted in different ways by different people. Hence, it lacks a universally accepted definition (though in this book we will stick to the aforementioned concept).

Important in regard to cloud computing is the fact that the *temporary network* of independent business partners—customers, suppliers, even erstwhile rivals—is linked by information technology that enables its members to share data, management skills, R&D expertise, manufacturing capacity, marketing thrust, and costs. As such, it constitutes an excellent client base for vendors active in the cloud:

- The virtual company possesses *virtual resources* where and when they are needed.
- The result of ephemeral partnerships among firms is to effectively access one another's customer base in a way that is profitable to all of them.

Critics say that the usage of facilities that are not in-house—hence controlled—does not permit market exclusivity. This argument forgets that today no company has all the resources it needs at its fingertips in order to lead human, financial, products, and marketing. Furthermore, one of the consequences of virtual corporation alliances is psychological. Markets react to impressions.

In that sense, ephemeral alliances are made to satisfy requirements in a compressed time frame and to overtake other, similar virtual company efforts. In order to produce results quickly, such alliances depend to a very large degree on immediately available applications (hence onDemand software), platforms for added-value developments, broadband telecommunications, as well as fully distributed databases and effective any-to-any workstation connections—in short, the stuff cloud computing can offer.

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* The term virtual company derives from a computing practice in the late 1960s when virtual storage described a way of making the machine act as if it had more central memory than it really possessed (see also Chapter 2 on virtualization). Likewise, the virtual company possesses more capabilities than its actual resources suggest.

† A challenge faced by virtual companies is taxation, because of conflicting international, federal, state, and local tax regulations, which vary significantly by jurisdiction.

What might be seen as common ground of virtual companies is a set of principles for metamanaging industrial and financial activities. These are undertaken by virtual teams—or groups of individuals that collectively possesses certain necessary skills but need to effectively communicate with one another in a way involving no misunderstanding or loss of time.

The resources virtual companies possess are left in place but are integrated to support a particular product effort for the way determined in advance or as long as this is viable. Such resources are selectively allocated to specific tasks, which becomes practicable because computers and communications provide the infrastructure, while optimizers make it possible to minimize the cost of switching among real companies as required by different activities.

For this purpose, virtual companies must be supported by virtual office systems, such as offered by several vendors on the cloud, to help expand the boundaries of each organization by providing a common ground. They do so by facilitating interactions with a broader business range than is possible under traditional approaches.

Because in a dynamic market intra- and intercompany resource availability can change almost minute to minute, advantages are accruing to parties able to rapidly arbitrage their resources. In addition, virtual organizations use information technology to supplement their cognitive capabilities, thereby providing themselves with an advantage given tight time constraints.

As the reader will detect between the lines of the preceding paragraphs, in the background of the advent of virtual companies lie both technological breakthroughs and the change of concepts about organization and structure. Culture, too, plays a crucial role.

To serve the virtual company, the virtual office cannot depend on a retrograde mainframe, the tyrannosaurus of the 1960s to 1980s, which found a way to survive with client-servers in at least the case of naïve communications protocols and obsolete Cobol programs. Totally new solutions are needed, and these started years ago. An example from the 1990s is the *Virtual Lab Notebook* (VILAN), which utilizes two types of software agents*:

- data source wrapper agents, encapsulating various heterogeneous data sources, and
- broker agents, which intermediate requests from users through knowledge about and transactions with data source agents.

The wrapper agents enable plug-and-play third-party software, making it possible that one agent communicates on some higher level with other agents while still being able to fully exploit domain-specific software. The broker agents find information that could enable the answering of user requests. Brokers accommodate

* Mobile knowledge engineering artifacts.

single-occurrence requests and service recurring behavioral objectives; they also react dynamically to changes in goals.

Virtual companies would not have been possible without knowledge-assisted artifacts. Technology has made them available since the mid-1980s, though only the best-managed firms have been effectively using them. Moreover, the synergy of deeper market changes and knowledge engineering made it possible to rethink many of the organizational principles of an entity, the majority of which date back to the 1920s.

For instance, as expert systems* replaced whole layers of middle management, the notion of the corporation as a structured hierarchical organization changed. The company, which in the past looked like an impressive monolith of sorts, has started to break into smaller pieces: the independent business units. More importantly, today new organizational theories advise that only a core of competencies should remain at the trimmed-down corporate center. The rest should be farmed out or performed through alliances, thus creating the *virtual company* we have been talking about.

Even huge office buildings, those citadels of the post–World War II era, are no longer considered impregnable. If anything, the concept that brought them to life started falling apart in the late 1990s, being replaced by the virtual office, to which reference was made in the preceding paragraphs.

Furthermore, the fall of General Motors, which sought protection from bankruptcy under Chapter 11, may well be the beginning of the end of the permanent and inflexible hierarchy that spreads fifteen layers down the line. Its place will probably be taken by a new, evolving corporate model that is purposely kept *fluid* and *flexible*, based on a group of collaborators who:

- quickly unite to exploit a specific opportunity and
- then disband once that opportunity has been seized.

When the virtual company restructures, this is often done in a different form and with other partners in order to meet new challenges. Alternatively, it has some old and some new business partners—even some who, a short while ago, were fierce competitors. This is the sense of shifting alliances that is becoming more and more prevalent in a modern economy—and a reason why onPremises software and proprietary IT establishments lose their appeal. The goal of a virtual company may be

- complementarity in a range of products and services,
- rapid engineering and development,
- unbeatable low-cost production and sales conditions,
- marketing muscle (to smash a market leader's hold),

* D. N. Chorafas, *Knowledge Engineering* (New York: Van Nostrand Reinhold, 1990); D. N. Chorafas and Heinrich Steinmann, *Expert Systems in Banking* (London: Macmillan, 1991).

- a level of quality competitors cannot emulate, or
- truly leading-edge technology.

An example on the first bullet is Google's alliance with Salesforce.com and other firms, creating the nearest thing to a virtual corporation with fairly well-defined core competencies. To be successful, this virtual company should concentrate on what it does best, leaving to its parent firms their sphere of competence.

Such multipartnerships will become current currency on the cloud, and they may be successful if each organization and its professionals know the strengths and weaknesses of their current skills—and appreciate their complementarity with the skills of business partners. The strength may be in design or marketing or in another function necessary to bring a successful product to market. The proper identification of the weaknesses is more important than that of strengths, because a basic aim of the virtual company is to use the strength of its members to swamp their weaknesses.

Last but not least, a major challenge for virtual companies, and for e-commerce at large, is the notion of *stable establishment*. The term comes from the time of brick and mortar but is still present. Is the server in a cloud's infrastructure a stable establishment? The answer is both yes and no at the same time. Online transborder trade changes the concept underpinning this term. A company (any firm, not just a virtual one) may have a stable establishment in one country, not in others, but:

- it trades over the Internet in many countries, and
- it uses a cloud computing infrastructure based in a far-away jurisdiction.

The stable establishments identification becomes even more complex with virtual companies, because they may have no brick and mortar at all. Nomadic computing adds another layer of uncertainty and there are, as well, other challenges. Bilateral agreements protect from double taxation. But there is no way to apply double-taxation agreements on the Internet. Hence, who should be taxing Internet commerce? And who will be taxing the cloud's infrastructure?

4.4 Virtual Networked Objects

Some years ago, in *The Real-Time Enterprise*,* I wrote that what we have available today, technology-wise, is only a forerunner of things to come. One of the premises was that computation will become freely available, accessible from something like power sockets and entering the everyday world at home and in business. This is happening with cloud computing, aided by imaginative projects run by major universities.

* D. N. Chorafas, *The Real-Time Enterprise* (New York: Auerbach, 2005).

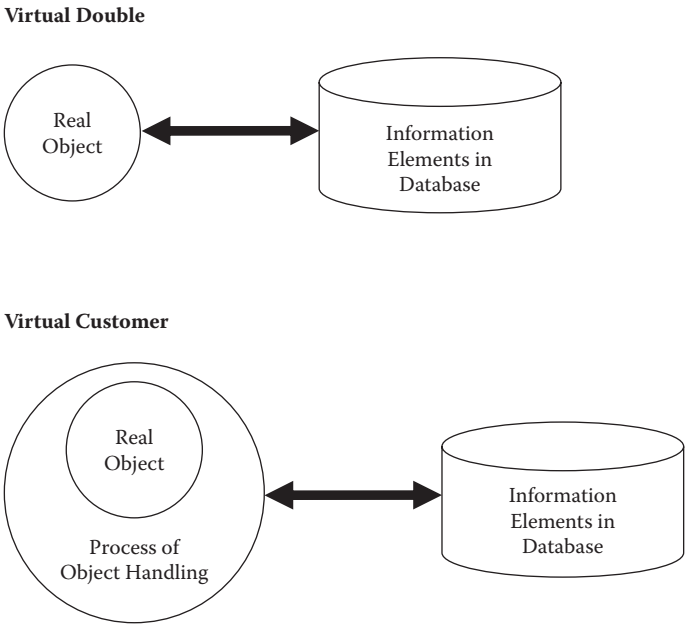

Figure 4.1 From the concept of virtual double to virtual customer identification.

A project that contributed a great deal to shaping up some basic aspects of new technology has been MIT's *virtual customer* (VC) Initiative,* a multidisciplinary approach that targeted significant improvements in speed, accuracy, and usability of customer input to a supplier's product design process. One of its deliverables was the *virtual double* (VD), which can be briefly defined as an information element:

- mapping a real object and
- open to qualification through a function (which may be another VD).

VDs are stored and retrieved as objects that are dynamically and seamlessly upgraded, updated, massaged, and reported to produce personalized ad hoc reports in real time. Figure 4.1 shows how easily a virtual double can create a virtual customer identification that becomes available at no time.

This virtual double may be the double of a customer, with the specific mission to instruct on execution of certain functions. As such, it will gather vital information over the life of the relationship and (if this is part of its objective) it will come up with a proposal. Dynamic insurance policies provide an example.

* MIT, "Innovation in the New Millennium," a conference program, March 2002.

Networked sensors can serve as online input devices to the virtual double. For instance, smart dust embedded into cars can help in tracking both the driver and the vehicle. Auto intelligence will be informing the driver "you crossed the speed threshold" but will also transmit to a control center that "this driver":

- goes too fast,
- talks on the handheld, and
- does not respect pedestrian crossings.

This is not daydreaming, it has already been happening for some time. Since the early 1990s Volkswagen's Audi and BMW cars have been equipped with fuzzy engineering chips that learn the driver and his or her habits to optimize gas consumption. More recently, Audi integrated the fuzzy chip into the car key, and as each driver has a key, the function of optimization is better focused.

In addition, with GPS becoming increasingly popular, there is no problem in supporting two-way transmission. Nor is there any challenge in keeping driver profiles on a virtual double. The technical solution, too, is far from being demanding. To be useful, data streaming from sensors requires:

- registration,
- integration,
- filtering, and
- analysis for insight.

Each of these steps can lead to messaging. Because of being an intelligent artifact, the VD of a real object has qualities the original object and its classical file are lacking. This greater sophistication helps to manage complexity. ABB, the big Swiss-Swedish engineering company, has been using virtual doubles for years, with every machine having its VD, which can provide information about the physical world that was not previously available.

South African Railways has a system with container intelligence tags. *If* a container is not tagged, *then* the system takes a photo of it and signals its existence. Executives from a major insurance company based in Trieste who were involved in this project* said that the system works well with one exception: too many containers coming into South Africa from neighboring Mozambique are not tagged. Therefore, this creates a bottleneck, and it also shows that:

- with globalization technological advances must be coordinated cross-border, and
- short of this, desired benefits will be limited and cost-effectiveness reduced.

* And participated in a seminar on high tech I was giving in Rome.

When the application is well planned, return on investment (ROI) can be impressive. In Britain, Marks & Spencer refitted all containers with sensors and got payback in twelve months. These sensors are tracking everything, everywhere:

- increasing accuracy and
- reducing handling time.

An American company planted sensors at the electricity distribution network coast to coast, and then it integrated and analyzed their inputs. The VDs created a pattern of electrical distribution that no electricity company had available prior to this implementation, and the pattern helped to optimize the company's power distribution operations.

Quite similarly, virtual doubles can be used to track customer profitability; analyze customer balances, loans, interest paid, and trading transactions; establish whether a person or company is profitable enough to qualify for waivers and white-glove treatment; and establish which profits stream (to the bank), which gives customers greater negotiating power. This information helps the bank's officers make decisions on fees and rates.*

Such information can be particularly valuable in strategic decisions, in repositioning the bank, and in marketing campaigns. Without the benefit of hindsight, sales programs fail to measure the potential value of a customer. Institutions that limit themselves to statistics from past transactions are usually very poorly informed about their depositors, borrowers, and investment partners.

The concept underpinning the use of virtual doubles is well suited to a cloud computing environment, particularly so as vendors must get to know their clients in a more fundamental way than through statistics—and onDemand software can handle the chores discussed in the preceding examples. There are, however, problems lying ahead and requiring able answers. Outstanding among them are security and reliability/availability.

Chapter 9 brings to the reader's attention the many concerns around *security*, particularly associated with the transfer of information elements in a global landscape not only their static access. Virtual customer files, indeed all virtual doubles, have significant privacy requirements, but cloud computing infrastructures currently provide a less transparent mechanism of storing and processing data than proprietary installations.

This makes many companies uncomfortable with their sensitive information being located somewhere in the cloud, outside of their direct control, particularly so because cloud computing services are multitenant. Beyond this, the regulatory environment

* Typically the top 20 percent of customers at a commercial bank generate up to six times as much revenue as they cost, while the bottom 20 percent cost three to four times more than they contribute to the bank's profit figures.

obliges companies to be very cautious with their data, as violations of the law can have serious legal, financial, and reputational consequences to the user organization.

Reliability, too, should be looked at in a most serious way, as Chapter 10 documents. There exist no reliability norms with cloud computing solutions. Theoretically service level agreements (SLAs) can be structured to meet reliability and availability objectives; practical SLAs printed by the vendor leave the door open to all sorts of failures. User organizations, therefore, should write their own contracts when negotiating infrastructural and other services (Chapter 5).

4.5 Consumer Technologies and the Cloud

Originally developed to capitalize on the web, consumer technologies brought along a revolution in information technology and, when successful, they morphed into business technologies. As such, consumer technologies replaced the federal government's large military handouts as number one supporter of the IT industry. One example is provided by Facebook, another by Google's New Services, which are

- offering corporate products free of cost,
- prodding a switch from traditional software to onDemand, and
- migrating applications, files, and service accounts on cloud servers.

As Figure 4.2 suggests, today business technologies and consumer technologies share a rapidly growing common ground, with the former benefiting from the latter. Therefore, information systems departments that reject consumer technologies as being beneath them increasingly find out that they made a big mistake.

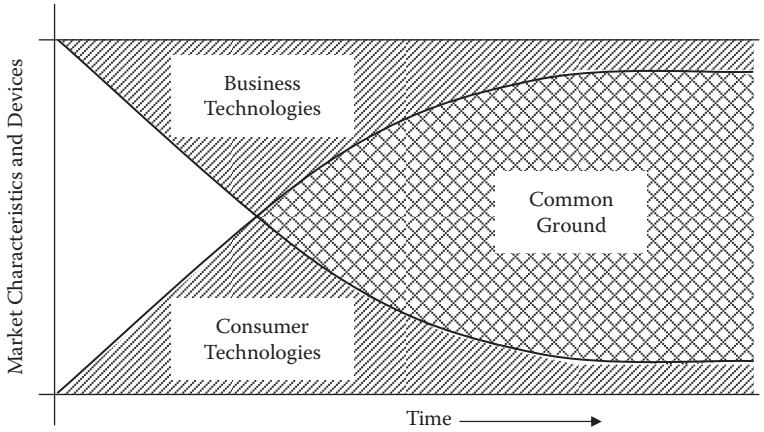

Figure 4.2 Business technologies and consumer technologies share a growing common ground.

This error or rejection took place first in the 1980s, when many corporate IT operations stuck to mainframes and dumb terminals, refusing personal computers as toys (and by consequence client-server solutions); continued programming in Cobol rather than by painting on video; and looked at knowledge engineering artifacts as academia's hobbies.

Companies that refused innovation in IT eventually found out the hard way that they lost a couple of decades in terms of competitiveness, along with the opportunity to cut their information technology costs with a sharp knife. What was intended to be another display of "professionals know best" turned into a major failure in judgment.

In a similar way today, companies that do not examine how they can benefit from consumer technologies are missing several potential benefits. One of them is resource flexibility, as the larger cloud computing providers can shift resource allocation among their servers, enabling customers to scale up capacity (subject to the constraints already discussed). Another is the cloud's pay-as-you-do pricing, which:

- helps in eliminating up-front expenditures and
- permits the converting of fixed costs into variable costs.

Besides dollars and cents, another after effect of capitalizing on consumer technologies is *empowering*. The biggest benefit of the Internet has been to empower the user, and this has shifted contractual power from the *sell side* to the *buy side*. It has also been an eye-opener for IT service providers who sensed a new business in the making.

Until recently most computers and communications companies typically considered as a market worthy of their attention the one that could be expressed in massive statistical terms. The Internet turned this argument on its head, by pricing emphasis to personalization—and cloud computing will, most probably, do even more in this direction. In the aftermath:

- technology leveled the playing field, giving consumers the means to be in control, and
- the Internet enabled them to get together and tell companies what to do in their product offerings.

This is not exactly in the interest of companies who would rather tell the consumer what "he needs" to buy. But as Walter Wriston, a former CEO of Citibank, once observed: "The information revolution has changed our perception of wealth. We originally said that land was wealth. Then we thought it was industrial production. Now we realize it's intellectual capital." One of the best expressions of intellectual capital is flexibility and adaptability.

Hands-on adaptability can capitalize on a mass market with global dimensions, exploiting a previously unthinkable number of possibilities to make a profit

through the right product at the right time. The Internet, and by extension cloud computing, lowers the barriers to entry, promoting innovation and competition directly in the consumer landscape.

Computer capacity, including databases and telecoms, can be rented as needed—and novel products may become hotcakes. Chapter 1 made reference to consumer technologies by excellence: Apple's iTunes (for music and video), the iPhone (moving to business after having swept the consumer market), AppStore (for mobile applications), and MobileMe (a suite of online services).

Apple employed the Internet in the most intelligent manner to sell its hardware by means of value-added services. It also capitalized on the consumer market to reconquer the business market, after its hold of the 1980s waned.

Therefore, one of the surprises in my research has been the finding that not everybody is fully appreciating the fact that the Internet is a revolutionary technology, one of the three or four main forces driving the global business transformation.* The dynamics of global growth have changed as profoundly as they did with the advent of railroads, electricity, and auto transport. The evolution of an Internet-based supply chain meant that the two traditional factors of production and distribution—capital and skilled labor—are no longer sole determinants of an economy's power, because economic potential is increasingly likened to the ability to use information in an effective way. That's precisely where cloud computing is expected to make its mark among companies best prepared to catch the opportunity. (Only time will tell if they succeed by capitalizing on the fact that competitiveness is closely linked to the able use of information and knowledge.)

The Internet has promoted a better use of information by providing a framework for integrated distribution of products, services, and business support functions—with timely feedback. This permitted economies of scale traditionally associated with massive production, while supporting personalization made necessary by coexistence of multiple user communities.

The cloud has the potential to add to this transformation by supporting onDemand applications with diverse characteristics and quality of service requirements, as well as by providing multiple classes of service to user communities with a variety of underlying topology. The user communities in reference include end users, network services, applications, and their interfaces, which are providing:

- data services,
- voice services,
- image services, and
- video services.

* The others are innovation, globalization, and the switch to virtual assets, which has been friend and foe at the same time. See D. N. Chorafas, *Capitalism without Capital* (London: Palgrave/Macmillan, 2009).

One may look at the Internet as a consumer technology that is primarily a transport layer but should not miss the fact that this provides common application interfaces for reliable end-to-end multimedia transfers. One of the advantages is that it is shielding applications, applications making interfaces and protocols seamless to the users—a feat that, ironically, major computer vendors took years to materialize.

Because of such advantages, this consumer technology made feasible a diverse set of traffic characteristics and also offered potential solutions to other standing problems, permitting fairly well-defined service offerings and operational procedures. Based on the strength of these developments, cloud providers can say that the wares they offer are sufficiently flexible to support interconnection of components across heterogeneous user organizations while ensuring end-to-end connectivity.

Another little appreciated after effect of the development of Internet-based consumer technology is migration capabilities through a path, making feasible phased implementation of the next generation of applications. The net accommodates disparities in terminal equipment and software, thereby ensuring an evolutionary deployment characterized by:

- an adaptable flexible framework as applications evolve,
- enhancement of quality of service at an affordable cost,
- expansion of network transport services and features as applications warrant, and
- a balance between near-term pragmatic implementation realities and longer-term development goals.

This has become possible because consumer technologies developed on the Internet can be leveraged by all businesses and consumers. Applications interact with other applications across the network, as well as with external networks and applications in a dynamic environment that supports a wide range of service facilities.

While the passage from consumer technologies to a professional IT implementation brings up the need for certain improvements like configuration management, these are well within the range of a service structure based on components that are shared, like access gateways, value-added processes, and so on. Nevertheless, a global management view is necessary to directly control system functionality. (This is relatively small fries compared to the avoidance of having to reinvent the wheel.)

What the reader should retain from these references is that consumer technologies, and therefore the consumer market, have opened huge perspectives in business applications—rather than the other way around. Cloud providers plan to further capitalize on this fact, which, however, does not mean that there are no limitations. In technology, as in daily life, somewhere hidden are the constraints.

The most important constraint for business that I perceive today comes from the ever-growing *data center demand*, which becomes increasingly difficult to satisfy.

Global demand for data centers is projected to grow at an average of 12 to 15 percent per year over the next four years, surpassing supply growth by 300 percent.* (See also the discussion in Chapter 5 on this issue.)

Supply has lagged for several reasons. Data center construction is highly capital intensive and lead times are generally a year to year and a half. Data center building processes require design expertise and procurement of materials such as generators that are in short supply, and the 2007–2009 economic crisis has further reduced supply by:

- limiting access to capital and
- promoting demand, as SMEs chose to outsource their data center needs.

Another major factor limiting the supply of storage facilities comes from the fact that after having grown in an impressive way, the density of recording has stagnated. Counted in *bits per gram*, in antiquity the storage potential of cuneiform was 10^{-2}; that of paper, 10^3; microfilm, 10^5; and mag tape, 10^6. This grew with optical disks to 10^8. The difference from cuneiform to optical disks is ten orders of magnitude, but that's about where we are. Many research projects are promising but so far only on paper.†

4.6 Social Networks and Multimedia Messaging‡

Social networking is a label that, at least in some countries, has produced a high degree of excitement. Its definition is, however, ambiguous, as well as elastic. It can expand from chatting between members of social groups to the usage of the Internet by companies to help themselves in microtargeting consumer clusters.

Online social networks serve not just as ways of wasting time chatting but also as a communications tool for business purposes. Marketing people are eager to use fast-growing social networks to promote their products. For instance, Dell has made $3 million in sales from Twitter.§ Several experts now suggest that the social networking paradigm:

- is turning into a sought-out catalyst and
- permits us to take advantage to influence trends through self-help.

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* Bank of America/Merrill Lynch, "U.S. REIT's," August 20, 2009.

† There is a double race toward higher density and longer record life cycle (Chapter 5). One way is through carbon nanotubes. Researchers at the University of California, Berkeley, have devised a method that will, they reckon, let people store information electronically for a billion years. By that time we shall see if they have been right or wrong.

‡ The Epilog further elaborates on social networking, its invasion of privacy, and contribution to the consumerization of IT.

§ *The Economist*, September 19, 2009.

Plenty of companies are harnessing the knowledge garnered from social networking. They are as well capitalizing on demographic change whereby a younger generation is more likely to use the web for service issues rather than the classical telephone. As an example, the integration with Facebook and Twitter by Salesforce.com helps companies to quickly research, anticipate, and resolve customer issues proactively.

There is a widely held belief that as social networking becomes more pragmatic its impact will increase, helped by the fact that its population of fans grows. In mid-September 2009 Facebook reported that 50 million people had joined its service since July, taking the total number of users to 300 million.*

Under these conditions, the reason justifying continuing use of the label *social networking* is that the social media is where it is happening. Another, more theoretical, reason is its characteristically easy accessibility, informality, and wider reach, mainly by bloggers who aim to chatter, make fun, provoke, inform, and engage in a way that cannot be effectively replicated offline—and buy goods and services. All this is another demonstration of consumer technology's impact.

To the opinion of many sociologists, the social and even ideological implications of social networking can be enormous. That may be true, but one can also exaggerate, as happened a few decades ago, when an opinion consistently heard was that man-made systems were less than thirty years away from giving managers, workers, bureaucrats, secretaries, shopkeepers, and farmers the opportunity of a new, direct stake in an economic welfare "propelled by intelligent machines."†

Three decades have passed by and these projections are still awaiting their (doubtful) fulfillment. On the other hand, as a service industry with wide appeal, IT stands to gain from social networking—if for no other reason because some of its wares:

- are designed to facilitate proximity of the participants to the social network, and
- as such, they find themselves in the mainstream of the information systems market.

Everything counted, the proximity brought by social networking has been unparalleled. Compared to it, the telephone is a limited way of taking our ears to another place, while what is called "presence" has become necessary to truly achieve interaction and understanding.

Social networking is in its formative years and has plenty of space to grow. Eventually, it will find its limits, as other events that preceded it suggest. Air travel

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* Facebook also became cashflow positive, with plenty of revenue to cover its capex and opex.

† Another headline catcher from the 1980s has put it this way: "Experts agree that 'thinking' computers almost certainly will replace people in millions of jobs in many industries and offices. Currently, around 25 to 28 million people are employed in manufacturing in America … to go down to less than 3 million by the year 2010." Ironically, this projection was validated not because of thinking computers but because of the deep economic crisis of 2007–2009, which hit not only manufacturing but also the service industries, leisure, research, and white-collar work.

brought us together physically but with great expenditure of natural resources and side effects of carbon dioxide and other pollutants. Even in the realm of travel, however, networking provides us with the ability to negotiate lower prices for airfares, hotel rooms, rental cars, and other items.

It is not without reason that people with broadband stay on the Internet four times longer than dial-up users—to an average of twenty-two hours per week vs. five hours for TV. They also tend to use networking during the day as opposed to evening hours.

An interesting contribution of social networking is that it has opened a market for group activities, family participation programs, and the chance to reinvent entertainment—beyond information, and communications formats necessary for multimedia messaging services (MMSs). Mobile operators had put a great deal of their hopes, and strategic plans, on market penetration and subsequent boom of multimedia messaging, though they are still struggling to position MMSs to users, as limited camera phone penetration, lack of interoperability, and other reasons have inhibited a take-off.

Costs matter. The expense associated with multimedia messaging services is turning off many potential users, forcing mobile operators to develop new business models around pricing and value-added services. MMS vendors have invested heavily in infrastructure to handle peak usage of thousands of messages a second, but so far they haven't found return on their money. Critics of cloud computing say that its vendors, particularly those spending hundreds of millions on infrastructure, may find themselves in similar situations.

There are as well other lessons to be learned from the fact that multimedia messaging did not take off as expected. A key point is lack of interoperability, which led operators to develop and promote content-based rather than interpersonal MMSs. This makes mobile operators nervous because it is very difficult to build a multimedia messaging business starting with content. And there are too many handsets on the market that cannot speak to each other because of lack of common standards.

The pros say that this standards snarl will not be repeated with cloud computing because of *netbooks*, the basic very low-cost laptops that have been selling like hotcakes. One of the problems, however, is that the more classical netbooks are being supplanted by myriad new gadgets, including tablets and increasingly computer-like mobile phones.

All these devices share a common idea: that a near-permanent connection to the Internet permits simpler technology and is more cost-effective. No wonder that this is the market also targeted by mobile Internet devices, which fit between smart phones and netbooks, like *net-tops* and *all-in-ones* with touchscreens instead of keyboards.*

* Something like tiny desktops. Several vendors now throw in free notebooks if subscribers sign up for a mobile broadband contract, putting further pressure on prices but also opening a larger new distribution channel for computer manufacturers—weakening some of them and strengthening others.

It is very good to have different alternatives, but the situation can get out of hand when there are too many with overlapping capabilities and incompatible standards. There are as well some technical issues that should have been solved long ago. An example is mobile number portability (MNP), which in Europe is still wanting, ten years after it was first introduced in some countries.

Other problems include high porting charges, cumbersome application procedures, and handset subsidies given by operators to tie in their customers. (These have impaired the success of MNP in many jurisdictions.) The fact that portability levels are low works against both social networking and the transfer of applications from a consumer to a business environment.

On the other hand, technology has its own dynamics. According to experts, the combination of the Internet, low-cost portable devices, and cloud computing will oblige mobile network operators to change their strategies toward consumers, and by so doing, it will give a big boost to social networking, which will benefit from converging technologies. However, as the Epilog documents, not everything is positive with social networking.