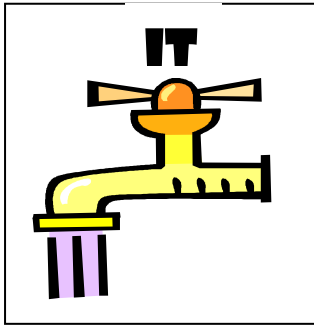


# IT as the new utility: hype or help?

Sukhendu Pal and Jon Fuller

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**S**ome leading hardware manufacturers and outsource service providers continue to market the idea of "utility computing," which would allow customers to avoid having to buy, manage, and operate hardware or software beyond their desktops. The computing power, including enterprise applications and the supporting infrastructure, would be owned by the hardware manufacturer or outsource service provider and delivered much as a utility company delivers conventional services such as electricity, gas, or water. Find out what CIOs should do in the face of such a seductive offer.

Information Technology (IT) as a utility or Utility Computing is a rather new idea promoted by leading hardware manufacturers (such as IBM, HP, SUN), software suppliers, and outsource service providers (such as Atos Origin). The idea is similar to the way we obtain water, gas, or electricity, a company would simply turn a switch and be able to access whatever IT power and software it wanted on a pay-as-you-go basis. The promise is very seductive since today's IT practices are overly complex, expensive, and require too much human intervention. Utility Computing (also known as "on demand computing") claimed to provide an IT infrastructural solution to the needs of today's organisations. It assembles and delivers IT services on the fly to exploit the scale and flexibility of IT operations, which is in sharp contrast to traditional systems management, with its centralised control of individual IT resources that require frequent human interventions. The attraction of utility computing is compelling as it takes existing technologies, standards, and specifications and merges these into a completely new way of running companies' IT.

In one hand, IT as a utility implies near or total use of outsourcing. In other words, these dynamically allocated resources may be maintained within the enterprise itself, or they may be procured through an outsource service provider. For example, IT resources such as CPU cycles, bandwidth availability, storage, and applications can be channelled to business users based on the tasks they are performing at specified times. If one group of business users is working with bandwidth heavy applications, for example, the bandwidth can be allocated specifically to them and diverted away from business users who do not require the bandwidth at that time. In another case, an organisation that is collecting large amounts of data may have adequate IT resources to collect the data but needs additional IT resources to analyse all of the data collected, in which case it could outsource its needs to a server farm that would provide the extra boost of resources but only at the specified times.

On the other hand IT as a utility differs from outsourcing because it is based on a per-use pricing model instead of a fixed-price contract. The utility concept is broader than using hosted software, because it includes computers, network connectivity, and services. Interestingly, most of the promoters of this new idea are either hardware or software manufactures, or outsourcers.

### **Analogy is seductive**

The advantages that utility computing claim to offer are appealing to senior business executives, the idea of turning on a tap and getting all the IT they need, together with an easy-to-read bill at the end of the month is highly attractive. From senior executives' point of view, it fundamentally alters the often strained relationships that exist between business and IT.

The idea of IT as a utility is not without its attractions. Think of electricity (see Figure 1). Today, no business builds its business and IT strategies around electricity, gas, or water usage, but even a brief lapse in supply of electricity can be devastating. Similarly, an IT disruption can paralyse a business's ability to make its products, deliver its services, and connect with its customers and other stakeholders. Therefore, as the theory goes, companies can replace their existing IT assets with utility computing suppliers. Besides the potential of saving money, the pay-as-you-go model offers Small and Medium Enterprises (SMEs) access to large, expensive, or complex applications they could not otherwise afford. SMEs do not necessarily have to buy applications and equipment as they add employees. And by outsourcing they just "rent" these applications and equipment, and sidestep a lot of headaches.

Because of escalating cost of technology and ever elusive challenge of getting adequate returns, the utility computing is presented as a way to cut cost. For example, realignment of the IT organisation and its governance model, infrastructure technology standardisation, outsourcing, and offshoring a range of applications, functions and business processes.

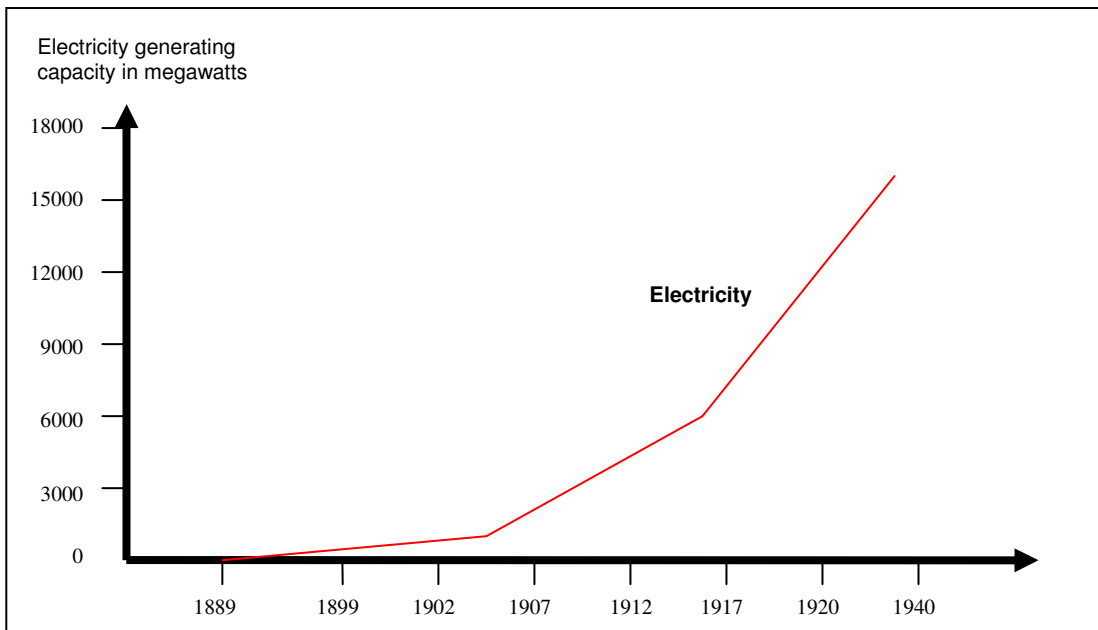


Figure 1: Commoditisation of electricity

### Is IT a commodity?

The basic premise behind IT as a utility is that all of IT, including data centre, software, computers, networks, business applications and processes is a commodity (see Figure 2). Few companies are willing to accept this notion, especially after investing tens of millions of pounds or euros in setting up computers and software to more intelligently and productively run their business operations.

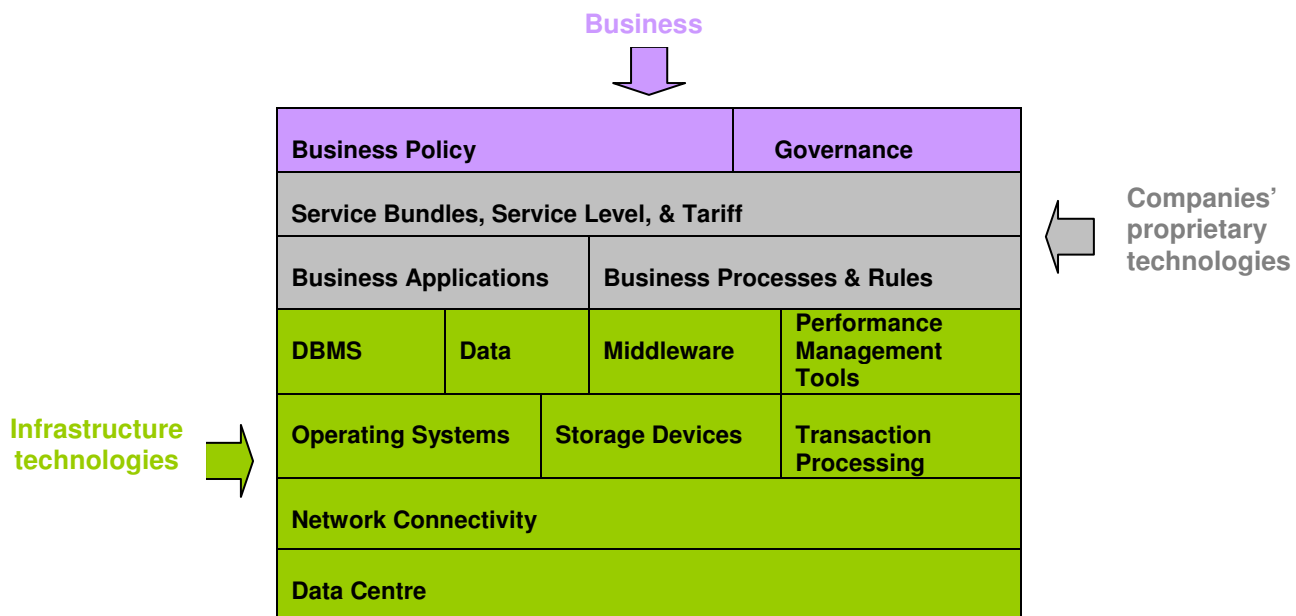


Figure 2: The IT jigsaws

Today, companies' proprietary technologies (such as business applications, processes, and business rules) have become the backbone of business, and used to leverage business by bringing differentiation and competitive advantage. This is the layer where a company's intellectual property (IP) resides. But, the same cannot be said about the IT infrastructure layer – the data centres, networks, databases, operating systems, browsers, and software tools that support companies' proprietary technologies, and therefore business. The reason is very simple – a business only gains an edge over rivals by having or doing something that rivals cannot have or do. And, companies' proprietary technologies do precisely that. There is a clear distinction between companies' proprietary technologies use and infrastructural technologies. Companies' proprietary technologies can provide long term competitive

advantages, enabling businesses to generate higher profits than their rivals. On the other hand, some components of IT infrastructural technologies are available and affordable to all and have become commodity. That is where perhaps "IT on tap" theory can play a part - similar to an electricity supplier, who provides electricity to a bank, but do not contemplate providing business processes, rules, and tariff structures for current account customers, for example. Storage devices used to be seen as a dull but necessary adjunct to the main business of IT. But as the need to store data exploded in the wake of the internet and the mass adoption of email, business users found themselves faced with the need for more and more storage resources, while the suppliers of dedicated storage machines came under tremendous pressure to cut costs. Using software to distribute and retrieve data around a network has become a popular strategy, and now the utility model is being used to add flexibility to the equation. A more flexible, scalable approach to storage infrastructure using the IT as a utility model can be a practical arrangement. IT infrastructural technologies are costs of doing business but provide distinction to none. IT Infrastructural technologies offer more value when shared than when used in isolation.

**Current barriers to IT as a utility**

Potential of IT as the new utility is enticing. Every other part of a company today is automated, so why not IT? IT must be run like a utility, on tap, if companies want to free up their most skilled talent to do smarter, more productive things, not just look after servers and applications. But, many real barriers exist today to fulfil the potential, among them are:

*Standards needed*

Virtual pools of IT resources will be a failure unless there are standards for cross-supplier management in place. Many large IT suppliers, such as, HP, IBM, Microsoft and Sun Microsystems, among others, are working on proprietary pay-as-you-go IT initiatives. Each has its own name (IBM's "e-business on demand," Microsoft's "dynamic systems"), its own approach, and its own technology. They'll need to find common ground to go main stream. When one looks at what is under the current banner of utility computing, it is clear that "IT on tap" suppliers need to do a great deal more to compare their services against electricity, gas, or water suppliers (see Figure 3). In the comparison table below, red indicates no suitable standard exists, yellow indicates a great deal of caution needs to be exercised either because of absence of any standards or shorter life span of IT resources when compared to the equivalent electricity or gas resources, and green means some form of proprietary standard exists and a reasonably safe course to navigate.

Factor	Information Technology - components						
	Utility (e.g. Electricity)	O/S	Storage	Network	Database	Application	Process
Supply of uniform resources	S	NS	S	NS	NS	NS	NS
Price/unit of resources	S	NS	NS	NS	NS	NS	NS
Power of unit of resources	S	NS	NS	NS	NS	NS	NS
Features of powered equipment	S	NS	NS	NS	NS	NS	NS
Interfaces to powered equipment	S	NS	NS	NS	NS	NS	NS
Longevity of equipment/resource	Long	Short	Short	Short	Short	Short	Short
Longevity of interfaces	Long	Short	Short	Short	Short	Short	Short
Timescale to switch supplier	Days	Years	Weeks	Months	Years	Years	Years
Financial penalties for switching	None	High	Low	High	High	High	High
Tariff	S	NS	NS	NS	NS	NS	NS
After-sales service pricing	S	NS	NS	NS	NS	NS	NS

**Legend**  
 S = Standard  
 NS = Non-standard  
 Green = Reasonably safe  
 Red = High risk and financial loss  
 Yellow = Great deal of caution needed

**Figure 3:** Hard to see commonalities between Energy/Power supply by utilities versus "IT on tap" from technology vendors beyond marketing hype

*Uniform pricing structure required*

The utilities market is highly competitive, and deregulation brought transparent pricing models and after-sales services. A business or a household can expect the same standard and quality of electricity from, say, SEEBOARD or London Electricity with comparable tariff structures, which allows a business to switch from one utility supplier to another in days without any financial penalties or disruptions. For utility computing pricing purposes, dedication and load balancing reflect different levels of IT resource allocation. Unlike the classic load balancing or resource sharing of traditional outsourcing, utility computing requires dedicated IT resources for greater control and uptime – and the customer pays the full cost. Therefore, utility computing is not cost-driven, except to the extent that the IT utility provider can buy or make the necessary IT infrastructure components more cheaply than the customer can.

### *Switching suppliers is prohibitively expensive*

Consider a company who uses infrastructure technologies from one of the "IT on tap" suppliers, and wishes to switch to another supplier for better service and tariff. First, it would take months, if not years because of long term contracts used by these "IT on tap" suppliers, to stop switching. Second, the inherent proprietary nature of infrastructural technologies from suppliers, especially software vendors, would mean cost of switching difficult, if not totally prohibitive. While the pay-as-you-go idea is simple, implementation would be anything but. It is a fundamental change requiring highly integrated systems. To get there, most companies will need to overhaul their IT infrastructures and adjust their business processes.

### *Finding measurement metrics*

IT utility suppliers need ways to measure and bill for IT resources being consumed, just as other utilities track kilowatts of electricity or pence per therm of gas usage. IT utility suppliers also need to figure out what variable factors might affect costs. For example, would they charge more during peak demand times? Might they offer volume discounts?

### *Open source software*

Harnessing IT as a utility on a large scale has an unlikely competitor - the open source software movement. The more the open source software succeeds, the more likely it is that companies will keep their IT in-house, to the clear detriment of IT utility suppliers.

### *Built-in manageability*

To achieve the fundamental objective of utility computing (i.e., it assembles and delivers IT services on the fly to improve scale and flexibility), IT resources will need to manage itself on the fly like a service. This is in contrast to traditional systems management, with its centralised control of individual IT resources. Manageability will need to be built into IT products and services as an inherent attribute, instead of bolted on as an afterthought.

### *Breaking down the scepticisms*

The idea of "IT on tap" is driven by large IT suppliers. This means that it might possibly be negatively affected by suppliers' desire to "shift product." Companies will continue to judge large IT suppliers from their past practices - the fundamental objective of large IT suppliers remain the same - that is to sell as much hardware and/or software, technical services into each customer account as possible, while maximising 'lock-in' to IT suppliers' portfolio of technologies. The move to utility computing rarely alters this objective.

### *Scope of IT resources*

The scope of IT resources needs to be defined very carefully, since it will include today's technologies and future technologies that service the same business user. While this issue arises in all long term outsourcing transactions, the issue is especially important because of need for planning to integrate the "utility" services that require ongoing management and development. The "utility" model only works for services that have been identified and dedicated or load-balanced.

### *Management of new processes and relationships*

Procuring services from IT utility suppliers mean loss of direct control of IT resources, which can be a substantial cultural adjustment. Managing supply relationships used to mean securing process inputs; now it means manipulating process outputs through experience, influence, and incentives. Companies fall back on old habits. Using IT as a utility draws on a brand-new set of capabilities and skills and requires a new set of people in key supply management positions. Successfully transitioning a company from a "make" orientation to a "buy" orientation often requires reassessing many positions within the customer organisation and process. The customer should retain a number of key components of its IT infrastructure road-map, such as management of IT strategies, architectures, and business relationships. The customer's ability to benefit from the relationship depends on its ability to plan, absorb proactive advice from its IT utility supplier, manage and oversee implementation of IT strategy.

### **Risks of pursuing IT as the new utility path**

For companies, utility computing makes outsourcing an easier decision. This form of subscription or purchasing agreement allows the companies to rely upon the IT services provider for a range of services that will evolve over time. In theory, this means that companies do not need to make decisions on management of the rapidly changing underlying infrastructure technology. In practice, companies continue to manage the process. In particular, a company can never outsource responsibility for managing its business.

How does an IT as a utility deal structure differ from traditional outsourcing? Essentially, utility computing requires the service provider to have a rapidly scalable IT infrastructure. Scalability may include variations in scope as well. In a recession, excess capacity will justify marginal pricing. In a strong economy, tight capacity or a non-scalable IT architecture will command a premium, as additional capital must be invested. With more complex paradigms for flexible scope and pricing, utility computing requires a tighter alignment of mission and governance. Thus, in return for getting control over the company's IT business operations, the IT utility provider commits to more flexibility. The formulation and structuring a contract for IT utility services requires special attention by experienced legal people. In theory, IT as a utility may be similar to outsourcing, but in reality it is not.

As a flexible business model, utility computing remains somewhat rare. It implies a long-term commitment to a technology solution that includes unknowns. It may limit the company's freedom to select other suppliers with better products or services, to make changes without incurring liability for any sunk or capital costs, or to exit the relationship. Accordingly, the company must manage its internal staff to be able to take advantage of the utility computing solutions. For example, if the company fails to manage the strategic planning process, the implementation or the ongoing operations, the company may fail to achieve the stated business objectives. This could lead to legal disputes about compliance with the contract, where the company is relying on the IT utility provider's skill or judgment to select or furnish suitable goods or services. IT as a utility, therefore, might be suitable only for companies with strong internal management capabilities of the outsourcing model.

IT as a utility requires constant capacity planning as well as clear communications between the company and its IT service provider. If the IT resources being offered have a long lead time to procure or dedicate, such IT resources will not be available except within agreed parameters. Without strong direction, communications and commitment from the company the IT utility provider might be charged with tasks that are inappropriate, outdated, and misaligned with business strategy or simply "too much" or "too little."

Another reason many companies remain wary of the utility computing is a worry that it may put data at risk. In some cases, companies with servers in other countries or on other continents running and maintaining customer files and product information. Further away a company's mission-critical data is, the greater the risk of loss of control, largely because the security of data protection remains a major issue.

Under the IT as a utility model, the IT service provider purveys a spectrum of goods and services. Channel conflicts will arise if this spectrum includes the services normally provided by the IT service provider's business partners. Therefore, for a technology manufacturer such as IBM, HP, Sun Microsystems, and Microsoft, extending services under the IT as a utility model could drive away "business partners" unless adequate provisions are made for them in advance.

### **So, what should the business do?**

Since 2001, demand for IT products and services have plummeted, but companies' aggregate operating expenses have not always come down at the same rate. Corporate budgets have grown by 5 percent in 2005<sup>[1]</sup>. As corporate profitability improves, a recovery might come as companies finally splurge on IT projects they have deferred. The evidence is mixed. Surveys of CIOs suggest only gradual improvement. The most optimistic forecasts for the next two to five years show IT spending growth only in the low single digits. This means, despite hype and optimism from large scale IT suppliers, companies cannot take comfort from current offerings, such as utility computing or service oriented architectures based on web services. After all, these offerings are designed mainly to make companies spend more on large scale IT suppliers rather than get more out of the IT resources they already have, without increasing expenditures.

Current market forces, therefore, make raising IT organisations' productivity an absolute imperative for many companies in Europe. Several factors characterise such IT productivity leaders.

- These companies focus on improving the productivity of their core business processes, for investments in new ones, such as utility computing, often yield little return and may even complicate the overall business system.
- Once the leading companies determine which processes drive their productivity, they decide where to lead, and where to match competitors, and then build a lasting competitive advantage through creating simpler and cheaper alternatives, such as shared infrastructure platforms and to service aggregation.
- Rather than relying on a "silver bullet," the IT productivity leaders have adopted an end-to-end approach to service delivery by creating service bundles and linking them through service chains (see [Why integrate, when you can integrate?](#) by Pal and Hammond). They generate gains from a combination of organisational alignment and targeted investment. In contrast, companies that bet their future on utility computing and other IT expenditures, such as ERP systems, without bothering to improve processes and services may be disappointed.

### **Defining IT organisation's productivity**

An IT organisation's productivity is the ratio of inputs to outputs—the value of what a company puts into a production process compared with what it gets out. A production process has three main inputs: labour (such as IT workers),

capital (IT equipment and buildings), and purchased inputs (IT software and services bought from IT suppliers). The numerator of the IT organisation's productivity equation is value added (output minus the purchased inputs); the denominator, costs (capital costs plus labour). IT workers productivity (value-added output per employee) and capital productivity (value-added output per pound or Euro of capital stock) can be examined separately. IT workers productivity is highly relevant to companies because much of their productive capacity resides in people. With all else equal in a given market, a company that has higher IT productivity will enjoy greater profitability. A more IT productive company can either produce the same output with fewer inputs and thus enjoy a cost advantage or produce more or better output with the same inputs and command a price premium. Over time, the higher profitability of more IT productive organisations will attract competition, and profitability will tend to converge. Profitability is therefore a reward for improvements in IT productivity.

Our work with a variety of companies has highlighted large differences in their performance in nine operational processes (see Figure 4). The first thing a company must do to improve its IT productivity is to bring market disciplines within the IT organisation. Then, it must establish which business processes have the highest impact on the economics of its customer segments. Then, it must find out where its performance lags behind in those key processes - catching up with competitors is vital. The final step is to identify processes and services in which the company could use IT to deliver superior products and customer experience that might make it a leader in IT productivity.

The greatest IT risks facing most businesses is, simply, unwise spending. Prudent cost management of IT infrastructure requires more rigour in evaluating returns from infrastructure investments, more creativity in exploring simpler and cheaper alternatives, such as shared infrastructure platforms and to service aggregation and other partnerships.

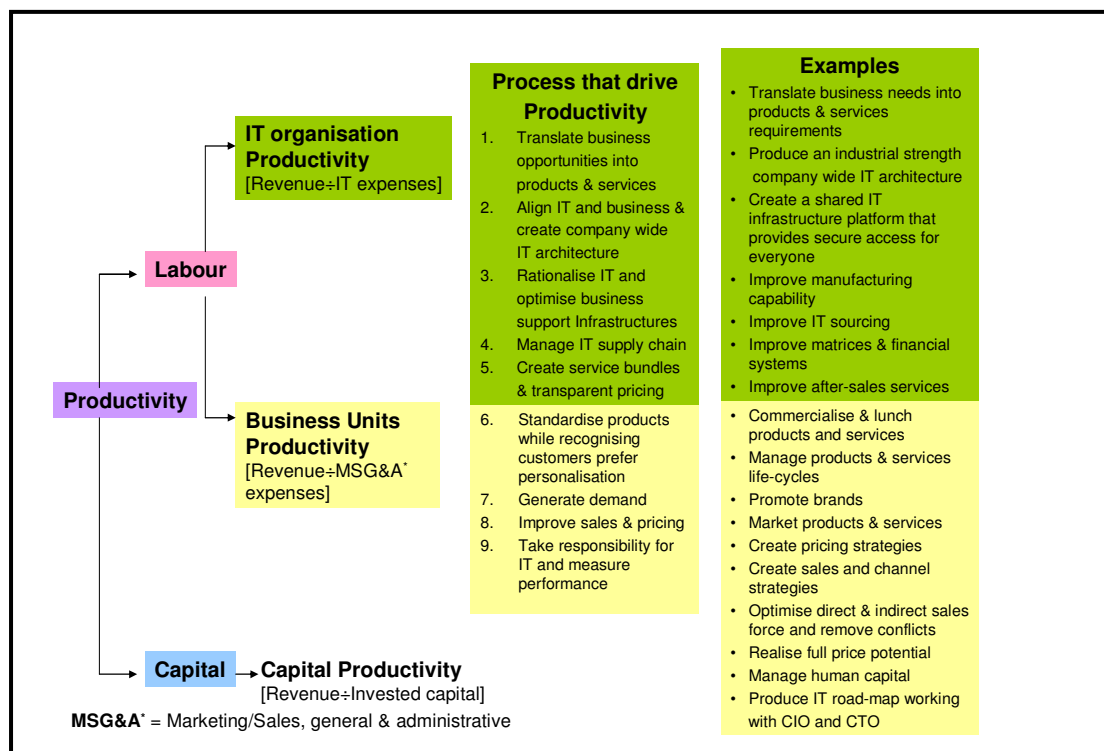


Figure 4: Processes that drive IT productivity

### How should CIOs go about utility computing?

Much of the CIOs spending, if truth be told, are driven by large hardware and software vendors, and "IT on tap" suppliers' strategies. Large hardware and software suppliers, and their partners - who are often the major outsourcers or "IT on tap" suppliers, have become very good at packaging out new features and capabilities in ways that forces business into buying new desktops, servers, new versions of the operating system, and networking equipment much more frequently than they need to. Therefore, the allure of utility computing needs to be considered by CIOs with a great deal of caution. The fundamental objective of an IT vendor remains the same - that is to sell as much hardware and/or software, technical services into each customer account as possible, while maximising 'lock-in' to that vendor's portfolio of technologies. The move to utility computing does not alter this objective at all.

The allure of utility computing is easy to see, but there's no clear road map. Getting there requires an approach that encompasses network, servers, software, services, IT governance, and human capital. It also requires balancing the running of existing IT resources with strategic new investments. Having a clear picture of what already has been deployed is crucial before companies start to deploy new technologies. This might sound obvious, but it is not always done. For example, many companies do not know where all their servers are located, who controls and owns them, and the main functions and applications running on them. Companies also do not have a clear picture of how their IT assets relate to each other. For example, one transaction might depend on data extracted from several applications running on different servers in multiple geographic locations. Identifying these types of dependencies is a prerequisite of companies' IT agility. Regardless of what the large IT suppliers say, utility computing does not exist in a vacuum. It is necessary to understand the relationships between hardware, software resources, and processes delivering a particular business service. Inventory discovery and relationship mapping are the keys to managing IT assets in a prudent manner.

That does not mean companies should ignore the marketing hype of IT as a utility. Instead, CIOs should begin consolidating, standardising and automating IT assets and data-centre resources, and begin reaping the rewards of improved system management, reduced complexity, and IT organisations' productivity (see Figure 5). Building a smarter and productive IT organisation requires incorporating business objectives and business processes into IT systems. The issue is part cultural and part technical. Business leaders need to communicate business objectives to the IT organisation, and IT executives need to map those objectives to IT resources. Collaboration is vital. The IT organisation has to sit down with different business units and help them to understand that there is a compelling business benefit of running on a shared IT infrastructure platform, such as SAFE™.

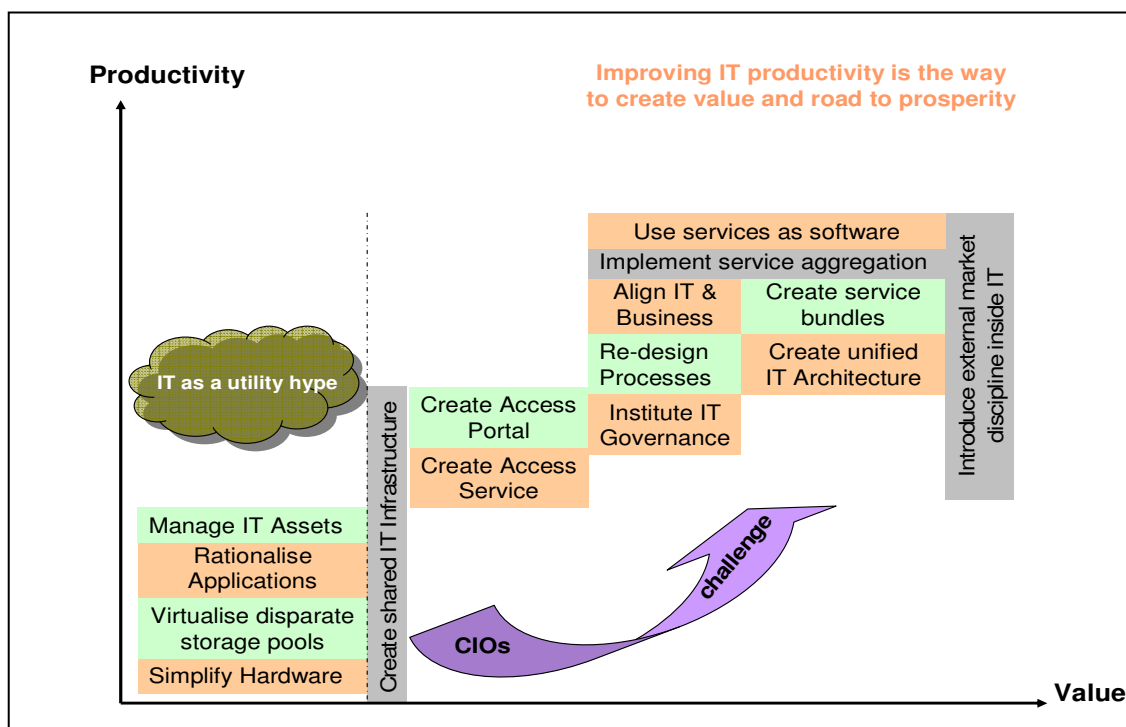


Figure 5: CIOs do not need to handover keys of IT organisations to large IT supplier to create value

### What is SAFE™?

SAFE™ is a unique industrial strength *framework* that creates and consolidates IT assets into client specific technology platforms that are leveraged across the company to provide secure access to existing and new services. SAFE™ helps companies find value from new and previously lost IT investments. It includes a series of proven best practices from mature industries such as automotive and manufacturing. For example, an automotive manufacturer gains significant efficiencies and economies of scale today by building several product lines on top of a single shared platform and by reusing 80% of common assets across these product lines.

### What SAFE™ brings to CIOs?

The key benefits that SAFE™ brings to CIOs are:-

- A decrease in IT efforts and delivery means lower capital expenditure (CAPEX);

- A faster delivery means improved productivity of IT organisations;
- An unparalleled improvement in secure access to services means mitigation of operational risks, and an increase in business benefits such as:
  - agility,
  - flexibility,
  - consolidation,
  - reduction of immediate and ongoing costs,
  - lower operational risk means higher market capitalisation and P/E ratio,
  - maximise ROI,
- A unique way to provide IT services as software.

### What does all this mean?

IT is an industry that is never short of new marketing hypes to advance sales of expensive software, hardware products and associated technical services, and utility computing is another “silver bullet”. The idea behind utility computing is seductively simple. Rather than continue to fork out for hardware and software, with all the associated costs of retaining highly skilled personnel, the IT function can be outsourced to a specialist provider, most of whom still relies on selling hardware, network, software, and associated services to make their earnings expectations.

The image that proponents of utility computing use is of a tap that can be turned on or off at the customer’s choice. It sounds like a huge relief after decades of complex IT decisions distracting companies from their core business. But is it really that straightforward? While the concept may be simple, the execution is not. Pure utility computing at the corporate level requires degrees of reporting and management unheard of at most companies, beside many technical barriers that exist today. It will be a long time before IT on tap becomes reality in any sizable company. Existing investments in infrastructure, as well as the desire to use IT as a competitive differentiator make the 100%-utility model unfeasible for most. Addressing the real needs of CIOs may not be as glamorous a job as speculating about the future, which is precisely what “IT on tap” suppliers promote. Even if the hype of utility computing was close to reality, it will not reduce IT expenses on its own. If a company’s cost is too high, it may be because it is using many IT architectures, flawed operational model, and outdated practices.

The time has come for companies’ supply chain to throw their weight around, to negotiate contracts that ensure long-term usefulness of their IT infrastructure investments and impose hard limits on upgrade/migration costs. And, if the suppliers refuse, businesses should consider cheaper alternatives, such as open source operating system and applications. If a business needs evidence of the kind of money that might be saved, it needs only to look at large software and IT on tap suppliers’ profit margin.

Proponents of utility computing suggest outsourcing of companies IT resource to large IT suppliers would lead to reduced cost by eliminating resources (both labour and capital) whose returns are, mostly in IT utility suppliers’ view, no longer covering their costs. Often utility computing includes some form of substitution of labour by capital – that is the replacement of IT resource and IT workers with low priced equipments and low cost labour. In the short run, such cost reductions are tantamount to improvements in productivity, as the surviving members of the IT organisation generate more output. This trade-off between capital and labour also has the “benefit” of showing up as a onetime windfall of higher profits once the nonrecurring expenses of severance pay and IT facility closings have been written off. Utility computing implies making do with less – realising efficiencies by pruning both IT workers (labour) and capital. Sustained productivity, however, hinges on getting more out of more – that is deriving increasing leverage from a company’s expanding resource base<sup>[2]</sup>. Just as IT workers cannot be squeezed forever, companies cannot rely for long on the hollowing tactics of utility computing to maintain market share in the global economy. The most profound challenge facing them in years ahead is how to grow. As China, India, and other developing countries propel the global economy, growth, and not fashionable cost cutting, in IT productivity in large companies becomes all the more essential in order to maintain and expand market share. The IT demand side has entered an era of geometric growth. It would be both ironic and tragic if companies squandered the fruits of organisational realignment by continuing to offshore or outsource their IT capabilities on the supply side. In the end, there is really only one way for CIOs: companies must formulate a new productivity agenda for IT organisations. The agenda must focus on the importance of investing in IT workers and innovative practices, but it must also emphasise the need to rebuild capacity by hiring talented IT workers, who are at ease with business as with IT.

If companies remain seduced by “IT on tap” marketing hype, opportunities for growth will vanish before their eyes. CIOs cannot afford to live in the hyped up world of large IT suppliers. They have to deliver results in an enormously challenging environment. And, there is a better way for CIOs to raise productivity in their organisations. It will be prudent for CIOs to tread the path of reality, as suggested above, instead of being seduced by large IT suppliers towards the path of “IT as a utility” and finding their companies profit erode, competent IT workers jobs disappear, and by extension involuntary successions.

### **About the authors**

Jon Fuller is the Operations Director of Centrix and Sukhendu Pal is a consultant.

### **About Centrix**

Centrix is a leading independent consultancy that brings together the best of business, service and technology to create lasting value for its clients.

### **What Centrix Brings**

Centrix design practical operating formulas that are built on innovative technical solutions as well as the practical realities of running a successful enterprise. We help companies deliver better services by formulating services aggregation strategy, designing strategic offshoring and outsourcing technology platforms that are secure; improve operational efficiency by reconfiguring end-to-end processes, systems, and services; design and build shared services organisations and help prepare companies to successfully outsource IT infrastructure technologies. Centrix's approach is set apart by capabilities that help companies tie operating and technology decisions to what customers' value most. When companies align their business to what really matters to the customer, they achieve performance breakthroughs.

### **NOTES**

1. IT spending, The LEX Column, 19 January 2006.
2. "Productivity is a better way to produce - leading to a better way to produce. And outsourcing is not that."  
Robert Solow, Nobel laureate.