Integrating IT into mainstream industry

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SOME years ago, when the Internet was still predominantly an American phenomenon, an American astronomer at an international conference, enumerated its three biggest beneficiaries. At the first position were the Ph.D. students for whom the Internet was a vast improvement over the classical channels of academic communication. The second position was occupied by the supermarket chain Wal-Mart, whose computer-assisted salespersons could keep track of the movement of the goods and help bring down inventory and procurement costs. The third was a group for which the Internet offered new opportunities; it comprised child abusers!

It is a measure of the computer's versatility that it could be enlisted as an ally by a wide variety of users, ranging from a Ph.D student to a criminal. The computer age is barely half-a-century old. It began in 1946 in the USA with the switching on of the world's first general purpose electronic computer called Electronic Numerical. Integrator And Calculator (ENIAC). The machine was as unwieldy as its name; it employed some 18,000 vacuum tubes and weighed a hefty 30 tons. Still, it demonstrated that electronic computing circuitry could actually work. With permissible exaggeration, its success has been called America's second revolution.

Subsequent history of the computer has been fashioned by three major developments. The first is the invention, in 1971, of the microprocessor, which is an integrated circuit (or a chip) containing the entire central processing unit of a computer. The microprocessor launched a million personal computers and workstations. These computers, in turn, could be interconnected via the Internet, introduced in 1973. The Internet is a decentralised-by-design, inherently anarchic, global network of cables and otherwise-independent computers, which can send packets of information from one computer to another till they reach their destination. The way it is designed, neither can the computer connectivity be thwarted nor the Internet contents censored.

The Internet owes its vitality and mass appeal to the World Wide Web, invented in 1990. The Net links the computers; the Web unites them. All information that is available online (printed word, pictures, moving images, sound and, futuristically, whatever can be expressed in terms of the digits zero and one) is perceived by the Web as a single, hyper-linked document which in turn is made available to each computer for perusal and interaction. Thanks to the Web, and the browsers (such as Microsoft Internet Explorer and Netscape Navigation) introduced into the market in 1993, the Net is now a multimedia vehicle for research, business, experimentation and fun.

Fun is the last thing IT pioneers would have associated with it. Both, the computer and the Internet are children of fear. The ENIAC began as a secret World War II project, whereas the Internet was started so that the communication network would withstand a nuclear attack. The Web had sedate origins; it was invented as a research aid for scientists at CERN. (The French acronym denotes European Centre for Nuclear Research, Geneva) Interestingly, the official publication, Highlights of CERN 1949-1994, makes no mention of the Web. This omission should not cause much surprise. A development becomes a breakthrough only by transcending its

immediate context. Since we are all embedded in our own context, it is not always possible to say whether the context would be transcended and if so how. That is why history records many a forecast, which were made with great fanfare but now look foolish.

One of the technological forecasts about computers that has held its ground so far is Moore's law, named after Gordon Moore, the co-founder of Intel Corporation. First enunciated in 1965, the law in its present form predicts the doubling of a chip's processing power every 18 months. For the last 30 years, computers have been dutifully living up to Moore's law, becoming in the process increasingly more powerful and faster. (Moore's law is expected to hold for another 10 years). Remarkably, the fall in the computer price has been even more spectacular than the rise in power. It is this combination of high sophistication and low price that has enabled the computer to reach out to the whole world.

It is however only the application part of the IT that has become broad-based, not the manufacture part. Making of computers remains a highly specialised, geographically restricted activity. But computer is no ordinary machine; it responds to human command via software, which is a program that translates the system of human logic into a set of electromagnetic impulses. Software economics cocks a snook at the received wisdom of traditional economy. Software brings human intellect and innovation centre stage. It is possible, today like never before, to convert (mental) labour into capital without requiring capital to begin with. A material good once sold belongs to the buyer. Its duplication requires material and extra expenditure. In contrast, a software product can be duplicated at practically no cost, and can be sold again and again, while still remaining the property of the seller. The premier role of intellect in the new economy can be gauged from the fact that computer hackers, though branded criminals, are often hired as consultants by mainstream organisations, including the government. (May be, India will be deemed to have come of software age when it produces a world-class hacker!)

In computer software India seems to have discovered its true calling, even if the inspiration has been missing. It is probably not entirely irrelevant to note that the term algorithm, an essential part of computers, has an Indian connection. It is derived from at Khwarizmi, a 10th century Central Asian astronomer whose derivative work in translation introduced Europe to the Indian numerals.

Software as a commodity was launched in the mid-60s when IBM, farsightedly, started charging its computer customers separately for the software supplied. Ten years later, in 1974, India made entry into the world of software export, when Tata Consultancy Services solicited and obtained a small programming contract, of US $2.5 m from Burroughs, the then second largest American hardware company. Since the contract involved merely sending out Indian labour abroad, the government machinery did not come in the way. From these modest beginnings, India has come a long way. Today (1999-2000) India's gross software export revenue stands at $4 b, accounting for as much as 25 per cent of all Indian exports. This high figure is more a reflection on the weakness of the general export effort rather a measure of the strength of the software export, which is a mousy 1.5 per cent of the global market. It should also be noted that the figures quoted here and elsewhere are the gross figures. A more meaningful figure, which is not furnished, is the net revenue obtained by deducting from the gross the concomitant hard-currency expenses

incurred on import of hardware and software and on sending software workers abroad. Net revenue is estimated to be about 40 per cent lower than the gross.

The hype and the excitement built around the Indian software enterprise by the Indian players and their foreign cheerleaders cannot hide the rather obvious fact that the Indian IT, while sucking in all available talent, is doing low-calibre work at low rates. The real intellectual challenge as well as profit lies in developing branded products, which can be sold to thousands of customers in the first place, and then again and again after upgradation and enhancement. India has been earning its pennies not by developing products but by helping others develop theirs. If branded products are property, India's export of labour and services is equivalent of bricklaying, a low-paid dead-end.

Products account for a mere 8 per cent of India's software export revenue (SER); the remaining 92 per cent comes from work done on-side (58 per cent) and off-shore, that is, in India (34 per cent). The peripherality of the Indian effort can be seen in the terminology itself. Both, on-side and off-shore, are location-specific. If the work was worthwhile it would have mattered where it was done. Onsite work is done on contract at the client's site under his supervision, by Indian labour sent out specifically for the purpose. It involves writing and testing of software already analysed and designed. ''It does not rely on creativity, organisational understanding, or consultation with end users.'' As we have already seen, India began its tryst with software through onsite work. In 1988 onsite work accounted for as much as 90 per cent of India's SER. Since then, India has moved towards the somewhat more respectable, offshore work, gushingly described by Nasscom:

''Even if a client is situated 10,000 miles away, he or she can still monitor the software development on a minute-to-minute basis, ensure quality checks, communicate with the programmers as if they were just next door, and still get efficient software developed, all at immense savings of both time and costs.''

India has so far been focusing on what we may call soft software. It should now focus on hard software. Even more importantly it should look ahead.

Without begrudging India's success on the software front so far, one must warn against long-term dangers. Hardware developments (Moore's law) in which India anyway has no role will be over in 10 years. Software development would probably reach a plateau in 20-30 years' time. After that, IT will not be a kalpa-vriksha, but merely a tool, an aid in other industries. While making the software hay while the IT sun shines, India should recognise that the next generation would benefit only if IT can be integrated into the mainstream industry.

In mythology, Lord Ganesha is associated with mouse. We can identify the mouse with the IT, and Ganesha with the traditional economy. If the new economy mouse is to be of use it must serve the Ganesha of traditional agriculture and manufacture.