October 24, 2003

Inventive individuals, innovative systems

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Human beings are endowed with intellect and imagination. An invention is a manifestation of an individual's creative mind and is capable of standing on its own, even in isolation. An invention becomes an innovation when it is incorporated into the mainstream, and combined with the existing knowledge in such a manner that future developments are influenced by this incorporation. We must accordingly make a clear distinction between an individual's manifest creative urges and the system's ability to benefit from these. This point is well brought out in Francis Darwin's remark: "But in science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs."

There are occasions when the wisdom of the time demands an invention. Such an invention is a child of necessity and is instantaneously incorporated into the mainstream. It may be said to belong to the realm of *compulsions of history*. There are however times when the creative urges of an individual mind produce an invention that is ahead of its time. Its incorporation into the mainstream may come later when the collective wisdom or capability catches up with the

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Prepared for STEPI New Innovation System Symposium, Seoul, 28 Oct - 01 Nov.03

Individual's creativity. Such an invention may be said to constitute *romance of history*. Note that while compulsions of history can be recognized by contemporaries, romance of history can be appreciated only with hindsight.

A telling example of invention versus innovation is furnished by early 18th century Europe and what is now the USA. In November 1730, Thomas Godfrey, a "poor glazier" from Philadelphia, invented what evolved into a sextant, which was used in voyages to Jamaica and to Newfoundland. The next year, in May 1731, the invention was independently made in England by John Hadley. America at the time did not need a sea-faring instrument; accordingly, Godfrey's invention remained a dead end. In contrast, Hadley's invention, independent or not, was immediately adopted by all European nations engaged in the hugely profitable maritime activity. Efforts by Godfrey and his mentors to persuade London to concede his priority failed. Even if Godfrey had been recognized as the inventor of the sextant, it would have been a personal honour; all fruits of his invention would still have gone to Europe.

In the closing years of the 18th century, the Indian princely state of Mysore kept British-led forces at bay for some time, using rocketry. Although this caused temporary setback to the British, they benefited from the experience in the long run. Several Indian rocket cases were sent to Britain for analysis. Empirical rocketry from India was incorporated into the mainstream of science, providing the British with military advantage in their pursuits elsewhere, as for example in their wars against the French.

The above two historical examples drive home an important point which is relevant even today. It is not sufficient for a social system to have in its midst creative people. It must also be psychologically and materially in a position to encourage, recognize and, most importantly, benefit from individual inventiveness or floating knowledge.

Readiness of a social system to translate new ideas into diffusible and tradable artefacts takes us beyond simple systems of technology areas or industrial sectors. A social system comprises institutions of culture, mores and customs, legal foundations and above all an expectation function regarding pay-off. The expectation function crucially determines the eagerness and ability with which an invention or floating knowledge would be transformed into an innovation. Prevalent educational levels, political will, and political degrees of freedom largely determine this expectation of pay-off. An expectation riveted on consumerism might fail to get transformed into expectations on profitability of innovations. A society may enjoy high levels of material consumption and yet fail to induce its population to take up creative and innovative activities (e.g. oil-rich gulf countries).

Globalization is primarily concerned with generation of wealth and tends to focus on innovation geared towards this end. It must be kept in mind that human ingenuity spans a wide variety of areas. Historically, more effort has been expended in devising ways and means of appropriating wealth created by others than in creating it oneself. In other words, there is need to create a cultural

climate that directs individual inventiveness into channels associated with production of wealth.

Rising tech versus flat tech

It will be instructive to distinguish between *rising technologies* and *flat technologies*. A rising tech is one, which is currently in a rapid phase of development. A flat tech is one, which has more-or-less been standardized. Quite obviously, a rising tech in course of time will become a flat tech. US has always tended to drive its economy through rising techs of the day, parceling out manufacture based on flat techs to other countries. These countries in turn tend to keep the higher end of flat tech to themselves and parcel out the lower end to other countries down the line. Currently, the rising techs are new biology and ICT (information and communication technology), the dynamics of both of which has been woven into the process of globalization.

We tend to view innovation in the context of rising technologies. This tends to distort the perceptive. Paradoxical as it may seem, globalization taken globally is weighted against across-the-board innovation. Much of the world economy is still based on flat tech. Also, rising production is not distributed uniformly across the world, but confined to pockets. Of the various facets of globalization, the one that has appealed the most the world over is the globalization of consumption levels. These levels are so high now that they cannot be sustained by many flat-tech economies (such as India). Consequently

most young well-trained professionals are willingly taking up low-caliber work for international companies, at positions much below their skills and expertise warrant and at ridiculously low dollar wages, which still translate into pretty packets in local currency. Consequently, peripheral support to rising techs elsewhere is creating a brain-sink in low-wage countries.

A rising tech area quickly divides itself into more and more promising sub areas leading to further divisions of labour and increased returns. . Ideally innovation in rising tech should trigger innovations in flat tech. High returns on rising tech coupled with its glamour tend to de-innovate and deglamourize flat tech and traditional tech areas, to the detriment of a vast section of the world population.

Perverse innovation

Global competitiveness is encouraging innovation of a perverse kind. Since there is a limit to which flat techs can be improvised, many flat-tech manufacturers the world over are cutting costs by taking recourse to human rights violations (child labour, exploitatively low wages, etc.)

We often tend to glamorize individual innovators (Bill Gates), forgetting that Windows had a prehistory. More generally, a country must have a flourishing culture of flat-tech production and widespread use of technology before it can effect innovations. While India's prowess in IT sector is seductively being over-rated, it is important to keep in mind that India's real success stories are pharma and automobiles sectors, which started as flat tech and have since

moved up the value ladder, the former much more than the latter. Republic of Korea and Taiwan are more successful and broad-based examples of this phenomenon.

It remains to be seen whether India's current peripheral contributions to ICT while it is a rising tech will lead to a more substantial engagement by the time ICT settles down as a flat tech. Eventually, India's success will be determined not by how much it contributes to the development of IT as a technology but by the extent to which it incorporates ICT into its manufacture and governance.

(I thank Parthasarathi Banerjee for useful conversations)

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