An Engineer's Prayer to the Blue Fairy

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As I write this article, I feel like a little boy in front of the blue fairy [1], asking her to grant me a few wishes. The fairy I address is human ingenuity, the collective abilities of millions of humans to innovate their way out to a better life. I would be very satisfied even if a few hundred engineers and students read these pages and are stimulated to try solving some of the problems discussed here. My own background ensures that I talk a bit more about Information Technology (IT) than about other matters; but, IT is not a branch of technology that works miracles in isolation. It has roles to play in almost every field of engineering and technology. It becomes particularly valuable when it is used to solve practical problems, to make us live and work better. We need to think about IT driven changes in the socio-economic context, to derive their full benefits.

Here are my wishes:

Use IT to create more jobs

IT and IT enabled services (ITES) have had a remarkable impact on the economy. They have really enabled Indian pioneers to put knowledge workers at the service of the global economy, creating jobs and contributing to our export earnings. It is amazing that already, IT and ITES contribute to India's Gross National Product more than the value of all the rice and wheat India grows annually! However, the number of jobs created by IT and ITES are not big enough to answer the challenge of job creation satisfactorily. It is easy to use IT to improve productivity and/or efficiency, but it is more difficult to use it tocreate large numbers of new jobs. This is the major boon I ask from the blue fairy! Tell us how to create more jobs using IT or otherwise. This topic is, however, complex and requires a separate article altogether. So, I will reluctantly move to the other boons I need to ask.

Get rid of the car

The revolution that will lead us to the goal is already in progress, but we need to speed it up. A written definition of the goal will help. I would like to have a virtual car as my next car. It should be

available anywhere, anytime. Tap an app on my cell phone and optionally enter a destination and time of departure; I should have the driver calling me up, and turning up in a few minutes to take me where I wish to go. This is already there, is it not? Let us look at what is not there. For one thing, I have not got rid of my car! It wastes parking space in my building, and in the places I visit. We have not recognized the virtual car as a real solution to traffic problems and atmospheric pollution in the next few decades. We have not visualized that it can create employment in significant numbers. We have only grudgingly accepted it as yet another enterprise and have done nothing to promote it. The issue is not one of administrative decisions; it is about the right visions for the transportation system of the future. Unless society recognizes that IT has made it unnecessary to have personal vehicles in most cases and creates the right policies, we will continue to have a moribund system of transportation. What are required are tax incentives to promote the use of shared vehicles, encouraging investments in companies providing shared vehicles, and support to employment generation in the form of a large number of drivers. The use of shared vehicles will reduce the wasteful investment in vehicles, because shared vehicles are far more productive. It also increases the productivity of drivers as it avoids drivers having to waste their time waiting for private car owners. The money required to buy a personal car is enough to build some accommodation for a rural family, or to create a job for someone. The efficiency of rented vehicles will vastly make our road infrastructure more productive.

Make the buses more user-friendly

Buses have to provide for the bulk of intra-city and intra-district transport capacity. One reason car or bike ownership is preferred by those who can afford them is that buses are an unfriendly lot as they work today. The IT revolution offers solutions to make them more efficient and easy to use. The App based Taxi business shows how easy it is to display the location and movement of a vehicle on anyone's smartphone. Why can't every bus be a 'thing on the Internet'? Why can't my cell phone show me when the next bus going to Gandhi Market will reach my bus stop and whether it has a few empty seats or not, using information picked up from a smart phones equipped with a suitable apps that can be installed in every bus? After all, the GPS system enables the cell phones to find out where they are from minute to minute. Why can't we centralize and use such information in every city, to control real-time allocation of buses to different routes to make them more responsive to demands?

Containerizing retail delivery

E-commerce has made it so much easier to order anything from vegetables to cameras and clothes much simpler and more efficient. The volume of goods delivered is increasing steadily. E-

commerce reduces the need for going out to buy things as and when needed, as well as the need to stock up things for future use. As a result, it improves efficiency of the economy and promotes better use of resources. E-commerce ending with retail delivery of physical goods is not yet a major part of the retail sector in India, but is a rapidly growing part. A concern about this business is the fact that it consumes a lot of packing material and creates a whole lot of waste. Garbage disposal is already a big problem in Indian metros and the growth of online purchases of retail goods will surely make this problem worse. There is a need for India to be pro-active and find solutions to the problems that E-commerce could create.

I believe that the solution is to containerize retail delivery, by inventing cost-effective, re-usable containers. Plastics manufacturers are already making containers for use by E-tailers to deliver perishables. However, there is no standardization and no significant efforts have gone into designing ideal containers. The problem is not merely a problem for India, but one for the world. Good solutions should preferably be globally acceptable ones. This will mean cooperation and learning from others as we finalize our designs, but it does not mean that we cannot hope to make major advances. With luck, we might even develop an export market in containers!

Making Electricity Supply more reliable

I believe that we are at a major inflection point in terms of the production and distribution of electricity. For a variety of reasons, including political ones, we have an electric supply system that does not promote efficiency and productivity. Most Indian cities and towns do not adhere to good standards in electricity distribution. Frequent interruptions of power supply damage equipment and reduce productivity of the economy as a whole. All this ends up increasing the cost of goods produced and services created. A major advance would promote the use of distributed generation of energy, increasing the robustness of the overall supply system. A good part of this distributed production could come from solar panels. Throughout the world, miscellaneous technical and economic arguments are advanced to resist such distributed energy creation. It is important that India figures out its own solutions to the problems envisaged. For instance, an energy production unit in customer premises could put at risk the lives of wiremen working for the centralized electricity distributor, by sending out power to a line they are repairing. Surely, Indians can invest suitable technical safeguards against such risks. The cost of protection systems would easily be justified by the benefits of permitting small units to produce electricity at customer premises. India should not wait for others to develop relevant technology to make this practical. The effective use of solar energy surely requires advanced battery technology. India should make its own contributions to this field.

Incidentally, I am writing this article in Bangalore in October. The power has tripped about twenty times during the writing of this article. The building's diesel generator kept coming up to meet every trip. The UPS under my table did its bit, but with all this, it was difficult to avoid repeated interruptions of my work.

Standardized financial reporting

If you use a credit card, or if one of your cheques is encashed, you get an email, an SMS, or both depending upon the preferences you have indicated. Every month, you also get a bank statement for every account you have. Mutual funds and other investment managers send their own periodic reports as well. At the end of the year, you hand over relevant statements to someone who first types in everything, to create an integrated picture of your income and expenditure. This is a good example of a very inefficient system in which an intelligent human being has to retype into a common format what has been received electronically in different formats. Yes, it does create a job for a human, but a tragic dead-end job, which adds no real value to the economy! You might as well pay him his salary and have him do something he enjoys doing, like learning music or bodybuilding! The tax consultant does not send you the integrated account created by him; he says that such and such software is required to open it, and that software is not meantfor customer use! Therefore, you, the customer, never get to access an integrated financial record of your own.

It is not very difficult to design a computer readable format, for sending reports of financial transactions. A suitable app on a computer or on a cell phone at the customer end can display the contents in a form suitable for the end-user to examine. Software can integrate multiple reports into a complete personal record of incomes and expenditures for the year. Reports should help us understand our situation, not merely meet some legal reporting requirement! Promoting a common reporting format is the responsibility of the concerned regulatory authority. Government departments concerned with efficiency and transparency in the financial sector also carry their share of responsibility in this regard.

Satellite based text messaging

There are many places in the country where cell phone connectivity is non-existent or poor, such as rural areas that do not generate attractive enough profits for cell phone companies, and hilly areas where the topology makes it difficult for cell phone company towers to cover the territory. There are problems that can be solved technically but are made difficult by administrative and political considerations. For instance, you might have a cell phone that works well where you live, but the company that provides the service does not usually support roaming in rural areas that are mostly

covered by a public sector company. So there are places that have cell phone coverage, but where your phone does not work. This is apart from areas where no cell phone works anyway!

Because of the problems described above, one cannot depend upon cell phones for providing communication in times of personal accident and in times of disaster that affect large numbers of people. Cellular communication failed whole villages and districts during floods in Himachal Pradesh a few years ago; media reported that electrical power supply was interrupted and that diesel fuel ran out in a few days in many places, and so cell towers stopped working.

I would like to ask the blue fairy – grant us a wish: we would like to have a system using communication satellites to enable affordable cellphones to send and receive at least text messages. We would like this system to work without depending upon a cellular communication tower being within a few miles of the customer location. We do not mind if the messages are routed through ground stations operated by profit making companies. We do not mind if the messages are subject to legally approved tapping by government agencies to prevent anti-social elements misusing the system. We do not mind paying reasonable extra charges for such satellite-based communication. We would like the system to support the use of scripts of all major Indian languages. Give us a system that is reliable, works everywhere and is affordable for the vast majority of users.

I will rest with these requests, my dear fairy! You, in the form of human ingenuity, have given so much and will no doubt give us a lot more in future.

1. "The Adventures of Pinocchio" by Carlo Collodi, http://fathom.lib.uchicago.edu/2/72810000/72810000_pinocchio.pdf

    (The Walt Disney adaptation of this story turned the fairy in this story into the "Blue Fairy").