The Simputer: Technology with Heart[1]

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This is an inside and personal account of the Simputer project written by one of the founders of the project, an academic and a technologist turned entrepreneur.

Technology with a social conscience

I have always admired Professor Amulya K N Reddy and in many ways have tried to emulate him.

In my childhood, I had heard stories of Professor Reddy and his wife Vimala as close friends of my parents, when he was a doctoral student in England. My next memories are from the late 1970's when I read some of his papers in EPW on energy and development. I did then and even now have maintained a deep interest in model based planning for development. I was a student at MIT working on my doctorate in applied mathematics with a minor in economics. To keep my social conscience and relevance to India alive I attended reading seminars offered by progressive faculty. Prof. AKN Reddy's papers were part of the reading. I was impressed that a powerful electrochemist at the Indian Institute of Science had made such a substantive transition into social sciences. Prof Reddy was certainly considered a leading intellectual and the pioneer in appropriate technology in India. In a personal encounter with Ivan Illich in Boston around 1980, I recall hearing him talk of Amulya Reddy with great admiration and affection.

In the 80's I had several opportunities to interact with Prof Reddy and his team at ASTRA in IISc. It was striking that while the development issues being addressed were quite elementary and sometimes carried out under very stressful conditions, the quality of the science and technology innovation was world class and certainly a source of great pride to the Indian Institute of Science. Somewhere around 1997 I recall having a conversation with Prof Amulya Reddy about the relationship of information and development and why there ought to be lessons that we could draw from his work on energy and development. He sent me home with a simple piece of advice: "You will have to work it out". This meant an AAA journey beginning with Analysis, leading to Advocacy and eventually to Action. The Simputer Story is really about this journey.

ANALYSIS ⟶ ADVOCACY ⟶ ACTION

- **(ANALYSIS) information and development (June-October 1998)**

  Prof Roddam Narasimha, the director of NIAS (the National Institute of Advanced Studies) invited me to join a group that was looking at Information Technology and Society in the context of the IT revolution that had gripped the city of Bangalore and the seeming disconnect

[1] This paper was prepared in the context of discussion meetings that were held in 2005 on the occasion of the 75th birthday celebrations of Professor AKN Reddy (1930-2006).

with the rural countryside even a few kilometers outside the city. The late Prof M N Srinivas, the eminent social anthropologist, Sanjay Dasgupta, the then secretary for information technology of the government of Karnataka (who is tragically also no more), a group of academics from computer and information sciences (I had also pulled in my colleague and long time collaborator Prof Swami Manohar), as well as a few industrialists (including Vinay Deshpande, a founder of Processor Systems India and NCore Technologies) were pulled together.

The discussions of a "Global Village" vision enabled by information technologies were lively and gradually a plan was hatched to hold a conference in November that would bring together a few outstanding individuals who we identified as the early thinkers and "doers" in tune with our concerns. The plan was also to run this conference in parallel with the trade show "BangaloreIT.com" and the launch of the ITPL tech park in Whitefield. Sanjay seemed to be playing a balancing act of the buzz around the new technology czars (Infosys, Wipro, etc.) and the social scientists looking for more well rounded development.

After a few sessions of the brainstorming, Manohar and I felt that we should write up the stream of consciousness emanating from the discussions of the global village group. This was an absorbing exercise for us and took about a month of long discussions, many walks around the East Campus of IISc and some spells of reading and debating on issues. What emerged was the "White Paper" entitled "The Global Village: Aspirations And Opportunities For Developing Economies"[2]. We shared the white paper with several colleagues and friends and amused and perhaps mildly irritated Prof Srinivas with the mixed metaphors that popped up all over the document (the naivete of scientists writing style!).

- **(ADVOCACY) The Bangalore Declaration[3] (November 4th, 1998)**

The white paper led to the idea that the conference would debate and adopt a declaration which eventually came. to be known as "The Bangalore Declaration on Information Technology for Developing Countries in the Global Village." Manohar and I drafted the declaration with lots of inputs from Prof M N Srinivas and Prof Roddam Narasimha. The draft was discussed through the global village conference and we incorporated the suggestions of the close to one hundred participants who engaged in several lively interactive sessions. The preamble of the declaration begins with

"Information Technology presents developing countries with a historic window of opportunity that enables them to create national wealth and break the cycle of poverty and dependence they have been caught in and leverage their wealth of human resources finally to secure a rightful place for themselves in the Global Village."

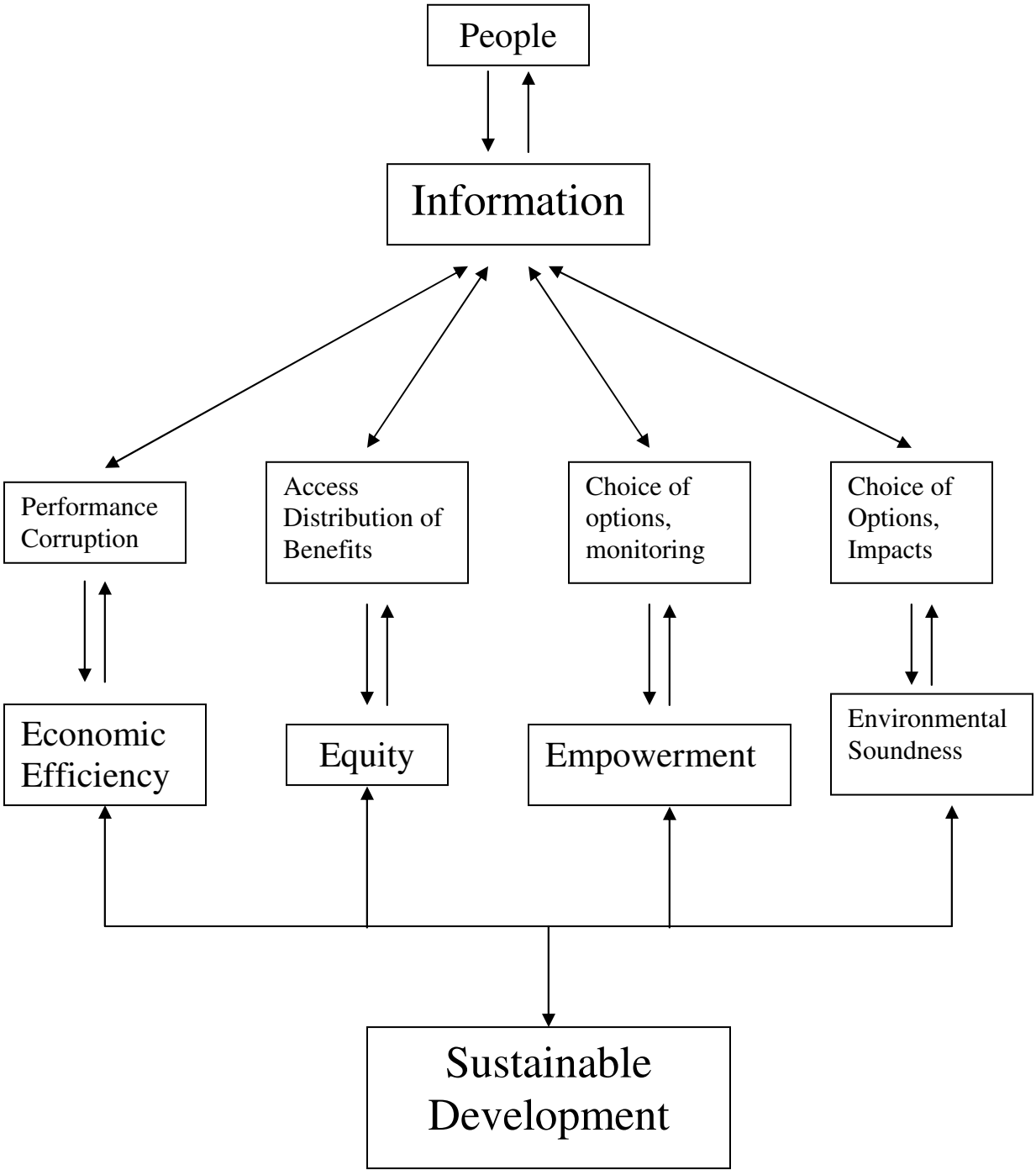
And ends with

"From all perspectives - humanitarian, moral, ecological, economic and social - Information

[2] The white paper can be accessed at http://www.csa.iisc.ernet.in/bangit/global/papers/chandru-manohar.html
[3] Published as a NIAS report and on line at http://www.csa.iisc.ernet.in/bangit/bangdec/bangdec.html

Technology has the potential to elevate the quality of human life everywhere. It is imperative that we, the citizens of this Global Village, seize this historic opportunity."

AKN was away on one of his frequent visits with his collaborators in IEI and I sent a copy of the white paper to him for comments. He returned in November called Manohar and me over, congratulated us for the effort and suggested the following diagram for developing our thoughts further. He was now willing to help us translate his experiences with energy to the field of information.

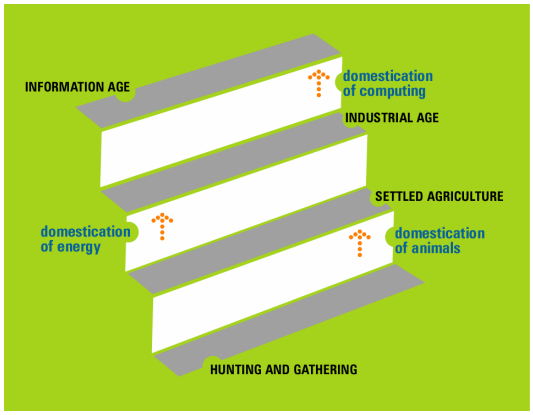


This could have led to a collaboration with AKN on some conceptual and theoretical investigation of information and sustainable development. But Manohar and I had already embarked on the next stage of "Action" and our patience with analysis and advocacy had run out. The Bangalore Declaration had many calls to action and we had already responded to one such call.

"Facilitate the rapid and equitable development of infrastructure for I.T., and in the process, ... facilitate the availability of a range of computers, including cable-TV, modified telephone instruments, and **rugged, low-cost, hand-held devices***, along with traditional computers, for purposes such as information gathering, communication and transaction processing."*

(ACTION) The Simputer

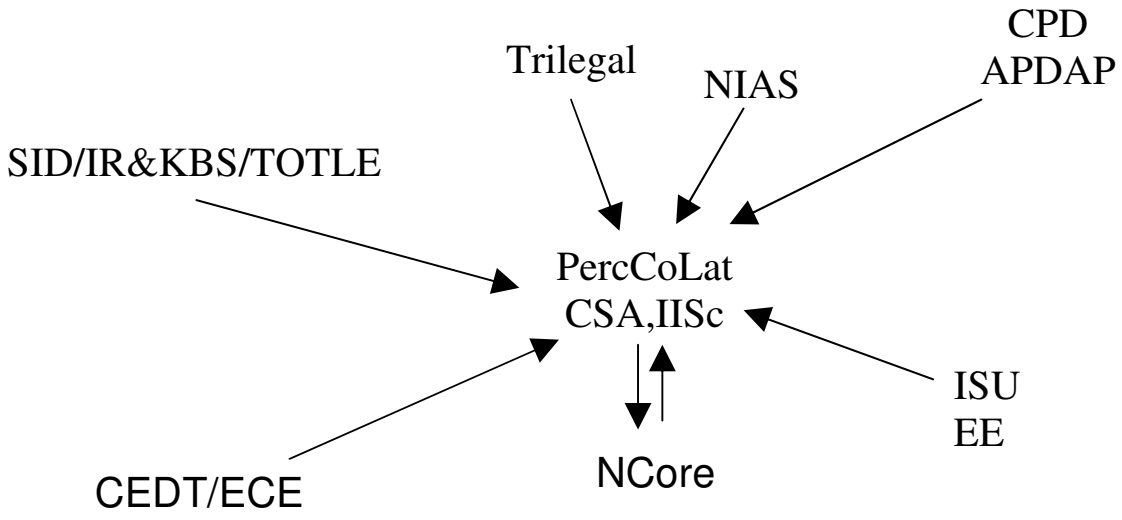
As technologists are wont to, Manohar, Vinay Deshpande and I soon tired of all the talking and declaring that was going on and resolved to actually work on some solutions. We met a couple of times in October 1998 and decided that we should work on a small handheld computer that could penetrate the Indian landscape the way transistor radios had. Since we could leverage the telecom revolution that had already been seeded by C-DoT and Sam Pitroda's vision, rural connectivity was no longer an issue. Vinay Deshpande had a paradigm application in mind – that of rural banking (micro-finance). The idea of a smart card integrated handheld was an early commitment. From a techno-historical perspective, we also believed that building a computer from scratch was a necessary rite of passage that Indian technologists needed to make any reasonable claims of having entered the information age.



Manohar, the prolific blogger (well before blogging became such a widespread phenomenon), quickly put together a high level spec document and christened the device "The Simputer". As he pointed out, the name Simputer obviously suggests that it is an abbreviation for "simple computer". It is also an acronym that expands to **S**imple, **I**nexpensive, and **M**ulti-lingual **P**eople's comp**UTER**. The framing of the Bangalore Declaration on Information Technology for Developing Economies clarified and fortified the concept of the Simputer and its role in information technology driven development by design. By November 1998, the Simputer team had expanded to include Professors V Vinay and Ramesh Hariharan from IISc and Mark Mathias and Shashank Garg (an IISc alumnus) from NCore. We pulled in Rahul Matthan as a legal counsel and formed the non-profit Simputer

Trust with Vinay Deshpande, “the elder” of the team as the Managing Trustee. The group began regular meetings.

The rest of the story is one of determination and camaraderie within the Trust. The hardware responsibility was given to the NCore team. The Alpha board had some minor problems and the debugging of the board had some interesting twists and turns and finally got resolved at IISc in PerCoLat (Perceptual Computing Laboratory) with Ramesh spending a night in the lab staring at a memory dump in Hexcode to pattern recognize that two wires had been switched. Porting the Linux kernel onto the board was the next challenge and the duo V Vinay – Swami Manohar pulled it off. The VV-SM pair went to make a number of huge software strides with IML etc. Ramesh was focused on getting the text to speech system “Dhvani” squaking in Kannada, Hindi, English and Tamil, while Vijay worked on the box with the product design students and the rapid prototyping centre APDAP at IISc. The following diagram gives an interesting view of the many departments and individuals at IISc/NIAS/Trilegal/NCore who were pulled together to make the Simputer a reality. The fact that this was all done with no funding at all from IISc or any other agency (we were deliberate in this frugality as we wanted the Simputer to be completely free of encumberances) is perhaps a testimony to the academic goodwill enjoyed by the trustees.



The Simputer was designed to be a low cost and portable alternative to PCs, by which the benefits of information technologies can possibly reach across the digital divide. It was to have a special role in developing economies because it offered the possibility that illiteracy is no longer a barrier to handling a computer, by using icons and text to speech technologies for multiple languages. One key to bridging the digital divide is to have shared devices that permit truly simple and natural user interfaces based on sight, touch and audio. The Simputer met these demands through a browser for a new XML language defined at IISc known as the Information Markup Language (IML). IML had been created to provide a uniform experience to users and to allow rapid development of solutions on any platform. The Simputer was to offer conversion of unicode text to speech. Demonstrating, its universality, the Simputer was to read and speak in several Indian languages in its initial release.

The Simputer, a hand-held computing device, was to be about the size of a palmtop though much more powerful. In its power and features it fit somewhere between a palmtop and a laptop computer. It was very clear to us, right from the outset, that the Simputer had to run on the Linux operating system. The Open Source movement had become very close to home. IISc probably had the largest install base of Linux amongst all universities in India. The CSA (Computer Science Automation) department had hosted Richard Stallman in 1993 when the Dunkel Draft of GATT-TRIPS (ultimately WTO) was being debated. Faculty of the CSA department and the National Law School pulled together an advisory conference with a view to warn the Indian Government of the consequences of accepting the Dunkel Draft. After 1993, the GNU products and the eventually Linux had almost universal acceptance. So, when it came to a choice of operating system for the Simputer, we stuck to Linux and ensured through the structuring of the license that all Simputer derivates would always stay with an open source operating system. The open source meme was persistent.

The projected cost of the Simputer was about Rs 9000 (US$ 200) at large volumes – this price point was arrived at as a compromise between engineering specs and the market's ability to pay (the price of a colour television set in 1998 was used as the benchmark). But even this, we knew, was beyond the means of most citizens. The Smart Card integrated feature of the Simputer enabled the Simputer to be shared by a community.

A local community such as the village panchayat, the village school, a kiosk, a village postman, or even a shopkeeper should be able to loan the device to individuals for some length of time and then pass it on to others in the community. The Simputer, through its Smart Card feature allowed for personal information management at the individual level for an unlimited number of users. The impact of this feature coupled with the rich connectivity of the Simputer can be dramatic. Applications in diverse sectors such as micro banking, large data collection, agricultural information and as a school laboratory is now made possible at an affordable price. We used the slogan "Radical Simplicity for Universal Access!" to describe the vision of the Simputer Trust.

The Simputer General Public License

The Simputer Trust is the coming together of academics and technologists from industry with a broad imperative of harnessing the potential of the Simputer for the benefit of all sections of society. The vision of this non-profit trust is to promote the Simputer, not as an end product but as an evolving platform for social change.

An innovative licensing mechanism has evolved through intense discussion within the Simputer Trust. We acknowledge the influence of the Free Software movement in this regard. However, the Simputer General Public License (SGPL) is more complex in many ways, partly due to the nature of hardware and partly to ensure that there are sufficient incentives for continuous innovation on top of the Simputer platform. Some clarifications on the similarities and differences between GPL and SGPL are presented in < http://www.simputer.org/simputer/license/sgplvsgpl.php >.

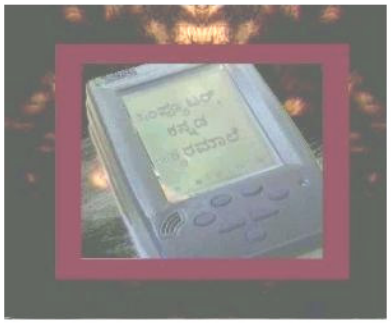
The Proliferation of Simputers: Making it happen

Rapid growth of knowledge can only happen in an environment which admits free exchange of thought and information. Indeed, nothing else can explain the astounding progress of science in the last three hundred years. Technology has unfortunately not seen this freedom too often. Several rounds of intense discussions among the trustees convinced them that the only way to break out of the current absurdities is to foster a spirit of cooperation in inventing new technologies. The common mistake of treating cooperation as a synonym of charity poses its own challenges. The Simputer Licensing framework is the Trust's response to these challenges.

The system software of the Simputer, since it is Linux based is under GPL. We have been working on a license similar to the GPL, but applicable to hardware. We realised, after considerable discussions, that hardware has significant differences that precludes the possibility of using a simple extension of the software GPL. We now have the Simputer General Public License (SGPL) that we believe to be a practicable license which at the same time facilitates the rapid spread of Simputers. The full text of SGPL can be accessed at the Simputer website www.simputer.org. We invite your comments on the SGPL. The hardware specifications of the Simputer can be downloaded only under SGPL. The SGPL permits anyone to build devices out of the downloaded specification. However, once a product is ready for commercialisation, one of two possible licenses need to be obtained from the Simputer Trust. These are

The Simputerised Device Manufacturing License
The Simputer Device Manufacturing License

The Simputer manufacturing License referes to a Core Simputer Specification, a functional description of the Simputer to be specified by the Simputer Trust and which evolves with the development of the Simputer. The highlights of SGPL are compiled in the appendices.



The Proptotypes are Launched (April 25th, 2001)

The Trustees shown below and Rahul Matthan (Trilegal), the legal counsel for the Simputer Trust who played a key role in defining the Simputer General Public License, received the nations hghest honour for innovation in information technology, the Dewang Mehta Award, the first time it was awarded in 2002.

Standing L to R: Swami Manohar, V Vinay, Vijay Chandru, Vinay Deshpande
Sitting L to R: Mark Mathias, Shashank Garg, Ramesh Hariharan

Courtsey: Frontline Magazine

The Simputer prototypes were launched by the Trust on April 25th, 2001 and the complete design details of the Simputer have been made available on the web site (www.simputer.org).

The Simputer was profiled by BBC's Click OnLine show, made the cover of Business Week, was written up in Wired, Technology Review and New York Times (below). The Simputer became a meme – a persistent idea that would represent technology innovation that uses "radical simplicity for universal access". The image below is of children in a school in Chhattisgarh using Simputers as part of their school curriculum. This lab was part of an educational initiative funded by the South Asia Foundation and implemented by PicoPeta Simputers in 2002-2003. The Simputer in the hands of a child is an idea that Nicholas Negroponte has re-invented in a Western idiom as the OLTPC project (one lap top per child) – while the Simputer was designed to be shared, the OLTPC is designed to be "personal". While the former is computing "as Gandhi would have invented", the latter is computing as donated by the invisible hand of Adam Smith! Recall: "The reason that the invisible hand often seems invisible is that it is often not there" - Joseph E. Stiglitz.

The most significant innovation in computer technology in 2001 was not Apple's gleaming titanium Powerbook G4 or Microsoft's Windows XP. It was the Simputer, a Net-linked, radically simple portable computer, intended to bring the computer revolution to the third world.

…

This is computing as it would have looked if Gandhi had invented it …. India has already succeeded in localizing cinema, satellite communications,cable television and radio. The Simputer is meant to do the same for the Internet.

…

Bruce Sterling, NY Times Magazine, December 9, 2001 "The Year in Ideas"

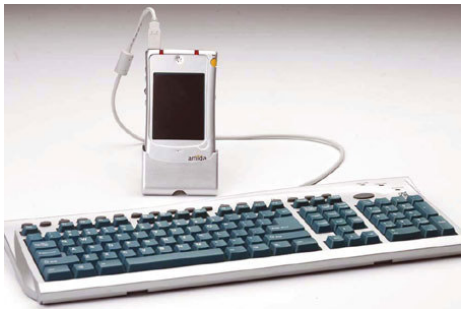
Epilogue

After the launch of the prototypes in April 2001, the trustees from IISc were empowered by IISc to launch a commercial venture to realize the proliferation of Simputers. This bold step by the Governing Council of IISc will be remembered as a turning point in the history of the institute. The Institute also granted full rights for the Simputer to the Simputer Trust which had the licensing scheme worked out under SGPL as described above.

As of this writing there are two licensees of the Simputer technology are taking the Simputer forward on a commercial basis. These are PicoPeta Simputers Pvt Ltd (http://www.picopeta.com/) which spun out from IISc, launched the Amida Simputer (cf. Appendix A4) in 2004.

The Amida Simputer

Introducing the Amida Simputer. It's time to Rewrite.



And Encore Software (http://www.ncoretech.com/) with the Encore Simputers licensed by the NCore trustees (NCore Technologies had been reinvented as a public company with a new name Encore Software).

Encore Simputers – Launched October 30, 2002

The story of this commercialization and its aftermath is still unfolding and will be told by others. This author moved on to guide another venture in scientific computing that was also blessed by the IISc Council – Strand Genomics Pvt Ltd.

APPENDICES

Appendix A1: Technology Choices and Challenges Tech Speak: The Simputer Specs

Hardware
- CPU 32-bit Strong Arm SA-1100 RISC CPU running at 200MHz
- 32 MB of DRAM
- 32 MB Flash for Permanent Storage (DOC)
- Display I/F 320x240 Monochrome LCD Display Panel

Interfaces
- Touch-panel Overlay on LCD Display used with a plastic stylus (Pen)
- Speaker and MIC Jacks Smartcard Connector
- RJ-11 Telephone Jack
- USB Connector

Dimensions
- Approximately 8cm x 13 cm x 2 cm
- Power Supply 3 AAA-sized NiMh batteries

System Software
- Operating System: GNU/Linux
- Soft-Modem Algorithms V.34/V.17 Data/Fax Modem Technology
- Perl/Tk scripting environment

Application Software
- imli: an IML browser
- Tapatap: Input method
- Internet access (Browser, Email, etc.)
- Dhvani: Text-to-Speech Software
- MP3 Player

Information Markup Language (IML) is an XML (Extensible Markup Language) application for describing the content and applications handled by a Simputer. The goal of IML is to enable handheld computers, that have limitations in the display size and input capabilities, to access and render content from the Internet.

Appendix A2: Highlights of SGPL

- Any individual or company can download the hardware specification, PCB layout details, the bill of materials, etc., henceforth called "Specifications" free of charge. The act of doing so binds the individual or company to the SGPL.

- Any derivative work has to come back to the Trust to allow for further dissemination. To allow the commercial exploitation of the derived work, a one year delay in putting back the derived work is permitted. This does not however preclude others from independently engineering a similar derivative work during this period.

- Any derivative work is subsumed as Specifications and hence, they are also governed by this same license.

- The word "Simputer" is trademarked and cannot be used without the permission of the Trust. If an individual or company is interested in using the word "Simputer" in conjunction with their products, they can do so only if their product conforms to certain rules that will be put up on the trust website (and which may undergo periodic revision). The product has to provide a visual clue to attest it being a Simputer by way of displaying a logo issued by the Trust.

- While recognizing the possibility of using the Specifications in application other than as a Simputer, the License deems that such derived work be called "Simputerized" products. The product description should state that the product is "Simputerized" and provide a visual clue on the product by way of displaying a logo issued by the Trust.

- Any commercial exploitation of the Specifications (whether Simputer or Simputerized) involves a nominal one time payment to the Trust. The payment will be $25,000 for companies in developing countries and $250,000 for developed countries.

Appendix A3:

Prof AKN Reddy's "TALK TO SIMPUTER TRUST" (15 MAY 2001)

- Your launch was one of the most inspiring events in my recent life.
- What inspired me was
  - Your teamwork
  - The technical excellence
  - The balanced emphasis on hardware and software
  - The attention to detail
  - The interaction with users
  - The social concerns
  - The articulation of a perspective
- Like many others, I felt that we were at the cutting edge of history and watching the salvation of India
- But the real reason for my excitement was that the whole atmosphere was reminiscent of the launch of ASTRA in 1974 over 25 years ago
- ASTRA was
  - An informal group of like-minded scientists
  - Inspired by a shared vision that our deep concern for deprived rural masses could be implemented through the instrument of S & T
  - Based on the synergy between social concerns and technical excellence
  - A group with intellectual excitement, sense of innovation, frontier spirit and harbingers of hope rather than prophets of despair
- ASTRA had a meteoric rise
  - It very soon became a world leader in almost every area it touched It acquired an international reputation
  - It was flooded with visitors including the PM
  - It was publicised, e.g., the BBC film "West of Bangalore"
  - It defined a new paradigm for R & D -- identify topics through a study the immediate environment rather than following the West
- After about 15 years, the meteor burnt out
  - The movement became a department
  - The fervour became routine
  - The voluntary commitment became jobs and career
  - The openness of learning system became the closed mindset of a group avoiding peer review
  - The social concerns disappeared
  - The partnership with villagers became a hierarchical bureaucratic top-down approach
  - The power of the market was extolled without seeing the limits of the market
  - The onslaught of LPG could not be, withstood

- At my Keynote Address to the 25 year review of ASTRA on July 20, 2000, I revealed the changes in ASTRA through the SWOT analyses of 1974, 1989 and 2000
    - I argued that a sustainable institution was characterised by relevance, excellence, governance and financial stability.
    - I urged ASTRA to re-affirm its socioeconomic objectives, to induct new people, to strengthen old areas and initiate new areas
    - I identified IT and Biotechnology as the new areas
- Everyone listened spellbound... but nothing has been done
- Then came the Simputer launch
- But it must he noted that the Simputer came from outside ASTRA which missed the significance of the Simputer -- "none so blind as those who will not see"
- The Simputer is a break-through because
    - It bridges the digital divide
    - It is a new road to rural empowerment in which illiteracy is not a road block (cf. my 5 year-old granddaughter Aqeela)
    - It links IT and Sustainable Development
    - It forges the badly required bond between advanced S&T and the people - in which there is flow of knowledge from the people and to the people
    - It is a world leader
- It also throws new light on the pro- and anti-LPG positions and shows a new path
- Someone should do the theorizing. This is the only lacuna 1 see in the Simputer effort -- there is no sustainable development analyst. Had I been 20 years younger, 1 would volunteer. Now my advice is: don't turn to any gurus with entrenched positions. Get a person from Bangalore as young as you -- from the National Law School or from IIMB or an economist
- A word of caution
    - as you become more successful and as you grow, you will have to institutionalise
    - institution's are built by charismatic pioneers
    - make sure that you identify all the elements of charisma and creativity and inspiration and institutionalize those elements
- My golden rule is listen carefully to criticism and switch off praise
- I am breaking that rule deliberately
- The stone-breaker story

Appendix A4

PRESIDENT APJ KALAM'S COMMENTS AT THE LAUNCH OF AMIDA SIMPUTER

26-03-2004 : Bangalore
Tele-Conference from New Delhi

I am glad you are launching the indigenously developed simputer with the academy, industry and academy developed entrepreneurs. This joint venture between Indian Institute of science, Bharat Electronics, Pico-peta Ltd., is the first example of such partnership in the country. I greet the entrepreneurs led by Dr. Swami Manohar, and from industry Dr. GopalRao, the Chairman and Managing Director, BEL, and from Indian Institute of Science Prof. Balakrishnan and other participants of this programme. I recall a presentation by Dr. Swami Manohar and his team on the development of Simputer, where Prof. Balakrishnan took me. What I like most about AMIDA Simputer venture is, the academic institution has generated entrepreneurs, which is the need of the hour for the country. It was a visionary job done and now I am happy to note that the product is getting launched and has a large market potential. The partnership will ensure a high tech cost effective product for multiple applications such as e-governance and citizen centric services in language independent environment using open source operating system. I am sure you will keep pace with the technological improvements taking place in the field and also work for providing wireless connectivity to the simputer, which will enhance its application potential.

I have one message for you, you have to constantly improve the product and make it competitive. The competitiveness has three dimensions, one is cost effectiveness, second is quality that what you specify that is what you deliver and third is deliver just-in time when the market needs.

I congratulate all of you on this mission and I wish you all success in bringing out many more cost effective products for taking the technology to the common man especially to the rural India.

REFERENCES

The Simputer Trust website www.simputer.org contains a lot of material related to the technology of the Simputer, the SGPL (license) details as well as documentation of the evolution of the Simputer project. The Wikipedia discussion of the Simputer is also a well compiled source of information http://en.wikipedia.org/wiki/Simputer

The Simputer was also profiled in the first Development by Design conference held by the MIT Media Lab in 2001 http://www.thinkcycle.org/tc-filesystem/?folder_id=16173

ABOUT THE AUTHOR

Vijay Chandru.

Vijay Chandru (PhD, MIT 1982) is an academic turned entrepreneur. Vijay's academic career as a teacher and researcher in computational mathematics has spanned over two decades – from 1982-1992 at Purdue University and 1992-2005 at the Indian Institute of Science. Vijay was elected to the Indian Academy of Sciences as a fellow in 1996 and served as an associate editor of *Resonance*, the journal of science education published by the academy. As an inventor of the Simputer, a novel hand-held computer, Vijay received the Dewang Mehta Award the first time it was awarded (it is India's highest award for innovation in information technology).

In October 2000, Vijay and three colleagues (the Simputer gang) from IISc also founded Strand Life Sciences, India's first *in silico* life sciences company. He currently serves as Chairman & Chief Executive of Strand. The company is well established as a leading provider of bioinformatics and cheminformatics products and solutions to biotech and pharmaceutical companies.