CSI Launches Knowledge Management Portal
16th February 2010
PRISM

is a full-time / part-time Program in Information Security Management. It has a 4 trimester course structure covering 24 topics and is designed on global standards of pedagogy. The PRISM curriculum is accredited by the Computer Society of India.

Why PRISM?
PRISM offers industry-specific and relevant course content to produce employment-ready Information Security Professionals.

Who can enrol
- Graduates or Post Graduates in Engineering
- B.Sc. (Information Technology or Computer Science)
- Diploma Holders in Engineering from recognized Polytechnic Institute/s
- IT professionals aspiring for a career in Information Security Management

PRISM Training Methodology
- Theory
- Cases/Snippet
- Extrapolation
- Simulation
- On-Job-Training

PRISM Course Content
- Group 1 Security Basics
- Group 2 Network Security
- Group 3 Software Security
- Group 4 Advanced Security

Opportunities after PRISM
- Placement facilities with large organisations
- Readiness for various Information Security certifications
- Participants can start or leap-frog their careers as ISOs, Network Security Administrators, Application Security Specialists, Penetration Testers, Information Security Auditors, etc.

MIEL invites reputed academic institutions to partner with us in accomplishing our mission of creating industry-ready Information Security Professionals through world-class education.

For details on PRISM registration / partnering / other inquiries, please contact:

MIEL e-Security Pvt. Ltd.
Aml Centre 1, 4th Floor
8 Mahakali Industrial Estate
Off Mahakali Caves Road
Andheri (East)
Mumbai - 400 093, India
Tel: +91 (22) 3009 69 69
Fax: +91 (22) 2821 58 38
E-mail: info@mielesecurity.com
Website: www.mielesecurity.com

Dr. K. Gondhalekar
kaustubh@mielesecurity.com
Ms. Pushpa Radkar
pradkar@mielesecurity.com
Mr. V. L. Mehta
vlmehta@mielesecurity.com
## Executive Committee 2009-10/11

- **President**
  - Mr. S Mahalingam
  - president@csi-india.org

- **Vice-President**
  - Prof. P Thrimurthy
  - vp@csi-india.org

- **Hon. Secretary**
  - Mr. Bipin Mehta
  - secretary@csi-india.org

- **Hon. Treasurer**
  - Mr. Saurabh H Sonawala
  - treasurer@csi-india.org

- **Immd. Past President**
  - Prof. K K Aggarwal
  - aggarwal_krishan@hotmail.com

### Regional Vice-Presidents

<table>
<thead>
<tr>
<th>Region</th>
<th>Name</th>
<th>Region Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Mr. M P Goel</td>
<td><a href="mailto:rvp1@csi-india.org">rvp1@csi-india.org</a></td>
</tr>
<tr>
<td>II</td>
<td>Mr. Rabindra Nath Lahiri</td>
<td><a href="mailto:rvp2@csi-india.org">rvp2@csi-india.org</a></td>
</tr>
<tr>
<td>III</td>
<td>Prof. S G Shah</td>
<td><a href="mailto:rvp3@csi-india.org">rvp3@csi-india.org</a></td>
</tr>
<tr>
<td>IV</td>
<td>Mr. Sanjay Mohapatra</td>
<td><a href="mailto:rvp4@csi-india.org">rvp4@csi-india.org</a></td>
</tr>
<tr>
<td>V</td>
<td>Dr. D B V Sarma</td>
<td><a href="mailto:rvp5@csi-india.org">rvp5@csi-india.org</a></td>
</tr>
<tr>
<td>VI</td>
<td>Mr. V L Mehta</td>
<td><a href="mailto:rvp6@csi-india.org">rvp6@csi-india.org</a></td>
</tr>
<tr>
<td>VII</td>
<td>Mr. S Ramanathan</td>
<td><a href="mailto:rvp7@csi-india.org">rvp7@csi-india.org</a></td>
</tr>
<tr>
<td>VIII</td>
<td>Dr. S V Raghavan</td>
<td><a href="mailto:rvp8@csi-india.org">rvp8@csi-india.org</a></td>
</tr>
</tbody>
</table>

### Division Chairpersons

- **Division-I (Hardware)**
  - Dr. Deepak Shikarpur
  - div1@csi-india.org

- **Division-II (Software)**
  - Mr. H R Mohan
  - div2@csi-india.org

- **Division-III (Applications)**
  - Dr. S Subramanian
  - div3@csi-india.org

- **Division-V (Communications)**
  - Dr. C R Chakravarthy
  - div4@csi-india.org

- **Division-V (Edu & Research)**
  - Prof. Swarnalatha Rao
  - div5@csi-india.org

### Nominations Committee

- Dr. A K Nayak
- Dr. D D Sarma
- Mr. Lalit Sawhney

### Publications Committee

- **Chairman**
  - Prof. S. V. Raghavan
  - svi@cs.iitm.ernet.in

- **Chief Editor**
  - Dr. T V Gopal
  - gopal@annauniv.edu

- **Director (Education)**
  - Wg. Cdr. M Murugesan (Retd.)
  - director.edu@csi-india.org

- **Executive Secretary**
  - Mr. Suchit Gogwekar
  - hg@csi-india.org

## Published by

- Mr. Suchit Gogwekar
- For Computer Society of India

## Contents

### Theme Section : CYBER LAWS

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Author(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Cyberlaw in 2010</td>
<td>Pavan Duggal</td>
</tr>
<tr>
<td>06</td>
<td>2009 – The Golden Year for Cyber Laws in India</td>
<td>Na.Vijayashankar</td>
</tr>
<tr>
<td>09</td>
<td>The Potential for Messy, Costly eCrises is Huge!</td>
<td></td>
</tr>
</tbody>
</table>

### Special Article

- **CSI Knowledge Management Portal**
  - A Paradigm Shift
  - Ravi Raman and Shankarasih Bologona

### Computer Science : Hall of Fame

- 1+1=1; a tale of genius
  - George Boole and Claude Elwood Shannon....

### Articles

- **Grid to Cloud (G2C) – A Infrastructure based transition**
  - K. Kalaiselvan and P. Venkata Krishna

- **Software Reuse: A Road Map to Business Success**
  - Jasmine K S

- **Moving Object Detection Algorithms: A Systematic Survey – A Report**
  - Remyamol R and G Santhosh Kumar

- **Search Engine Optimization**

### CSI Section

- **SciPy 09 – A Report**
  - Satish Babu

- **MDGICT 2009 International Conference – A Report**
  - M. Somasundaram

- **CSI-IEEE MoU – The Highlights and Roadmap Ahead – A Report**
  - H R Vishwakarma

- **CSI-BCS MoU- The Highlights and Roadmap Ahead – A Report**
  - H R Vishwakarma

### Departments

- **Community Talk**

### CSI Topics

- **National Conference on India IT2020 (Last Cover)**

### Feature

- **CSI Chapter News**
"We will create a civilization of the Mind in Cyberspace. May it be more humane and fair than the world your governments have made before."

- John Perry Barlow,


“Technology is neither good nor bad, nor even neutral. Technology is one part of the complex of relationships that people form with each other and the world around them; it simply cannot be understood outside of that concept.”

- Samuel Collins

Cyberspace is a new form of living space generated virtually in the Internet. Cyberspace has unique spatial order where physical distance is no more valid and accessibility depends thoroughly on the topological linkage. It is also unique in that spaces can be easily modified and different places can be united. However, the existing cyberspace appears to be a vast chaotic space filled with various kinds of information. Anyone who has an access to the server machine is able to edit the contents and upload it. There is no perfect index of the entire cyberspace components.

“Unlike a virus, which is encoded in DNA molecules, a meme is nothing more than a pattern of information, one that happens to have evolved a form which induces people to repeat that pattern. Typical memes include individual slogans, ideas, catch phrases, melodies, icons, inventions, and fashions. It may sound a bit sinister, this idea that people are hosts for mind-altering strings of symbols, but in fact this is what human culture is all about.”

- Glenn Grant

Cyberspace is expected to give some alternatives to serve such diverse life styles. Cyberspace allows a wide range of choice of environments where each individuals may find the ideal place or may customize the space according to one’s own taste. It is a communal space in which everyone can enjoy a social life of one’s own style; i.e. expressing oneself, listening selectively to the others’ opinion, communicating with each other, and receiving multi-modal information.

In many ways, the situation in cyber-space is similar to the problems faced in dealing with the High Seas, where the absence of any consensus legislation had also created an avoidable and acute vacuum. The international community finally woke up to the challenge, and started negotiations on the Law of the Sea. Those negotiations went on for almost a decade before they succeeded. The world is much better off as a result.

In Cyberspace, there are in total four things that regulate. The Cyber Laws (by government sanction and force), Social Norms (by expectation, encouragement, or embarrassment), Markets (by price and availability), and Architecture (what the technology permits, favors, dissuades, or prohibits).

However, in the case of cyberspace, the challenge is far greater. The speed of change is phenomenal, new shoals and icebergs appear every day, the dangers affect all countries without exception, but global responses are sporadic or non-existent. That is why a globally negotiated and comprehensive Law of Cyber-Space is so essential.

The following report is very insightful and explores the various dimensions of Cyber Space set in a multi-national context.


This report by Ahmad Kamal highlights the pertinent aspects related to Data Protection, Malicious Code, Spam, Cyber-Hooliganism, Cyber-Stalking, Identity Theft, Cyber-Terrorism, Cyber-War, Distance Contracting, Intellectual Property, Obscene Publications, Digital Signatures and many issues pertaining to making and enforcing Laws in the Cyberspace.

The problems posed by the Cyber Space are relatively new and very complex. One may have to borrow the leadership skills from Winston Churchill and Franklin Roosevelt and cap them with the problem solving skills borrowed from Albert Einstein. Every organization has to nurture core competencies in the following areas.

1. A knowledge of current infrastructure and its limitations knowing it will take considerable time to be replaced.
2. What future technological infrastructure and vulnerabilities will look like.
3. How future threats will be executed.
4. What controls, safeguards, countermeasures and decisions must be implemented to counter what will/may occur. Given that the technology infrastructure in five years will look quite different from today, the coordinator must put a high priority on research and technology forecasting as part of federal information system initiatives.

Depth of knowledge and wisdom through life experiences, an unbreakable spirit and fearless determination and Impeccable integrity are the three major assets for anyone who is working in the Cyberspace.

We are distinctly fortunate to have Mr. Pavan Duggal, a practicing Advocate, Supreme Court of India and an authority on Cyberlaw and E-Commerce law as the Guest Editor for this issue.

I must also thank Mr. Na. Vijayashankar [www.naavi.org] for readily granting us permission to include his article in this issue.

Dr. Gopal T V
Hon. Chief Editor
gopal@annauniv.edu
Dear Members,

The election for the year 2010 – 11 is over and the results (published elsewhere in this issue) were declared a day after the last date of polling. Let me offer my sincere thanks to all those who stood for election. There was contest for each seat and the contestants were all eminent people, who have many years of service to CSI behind them. The active involvement of so many capable professionals is a testimony to the growing interest in CSI. Going by the statement of interest of the winning candidates, I can visualize a period of hectic activity in CSI.

The Knowledge Management Portal of CSI will be launched by Mr. Sachin Pilot, Honourable Minister of State for Communications and Information Technology on February 16, 2010 at Delhi. While inviting the Minister to launch the KM Portal, I described its revolutionary intent in the following words:

“CSI, in the process of responding to the needs of a new generation of members, is revamping the interaction between the Society and IT professionals. With this in view, we are launching a virtual platform, built on Open Source Technology and hosted in a Cloud. This Knowledge Management System enables creation of Communities of Practices, provides Forum for discussions on issues and host Digital Library.

CSI’s services are being redefined through this State of the Art platform and this will enable it to play an even bigger tract in reshaping the professional development of IT professionals.”

Systems, unless used, will remain mere platforms. It is upto us to participate actively in this new attempt. We now have a powerful tool to help us in enlarging our contacts with other professionals and in learning.

Elsewhere in this issue, we describe the features of this portal, its architecture, the rigor of its development and the manner of its hosting. We have built these user friendly features on top of a highly advanced technological foundation. The development effort, its user acceptance, hosting approach and content development – all of these have involved large and painstaking effort, with exemplary dedication shown by those involved. Tata Consultancy Services and Zenith Computers have provided, at no cost to CSI, enormous resources to make this happen. We express our gratitude to them. In addition, MIEL and CDAC have provided specific help in key areas to make this a secure portal with interesting features. Ravi Raman took this task as his personal mission in the larger context of Membership Development and Service. We acknowledge their great contribution.

Another initiative where we have made good progress is on Publication. In order to bring the latest applied research material to IT Professionals, CSI will bring out five quarterly publications under the broad heading of CSI Transactions on ICT. The five quarterly publications will deal with Systems and Architecture, Software Design and Engineering, Cyber Security, Education and Health Care & Economics, Practice and Management. We have formed an Advisory Council made up of eminent people. We are in active discussion with a Publication organization to bring out the first issue in later part of this year.

This issue again is on a theme - that of Cyber Law. As computer usage becomes more pervasive, there is need for Regulation, Governance Processes and Investigation. Laws will deal not only with criminal activities, but also with issues such as privacy protection and intellectual property. The fact that CSI Communication is dealing with Cyber Law shows its intent to go beyond just technology. We are grateful to Mr. Pavan Duggal for his editorial as well as his direction.

I welcome the winners in this election to the CSI Execom. I place our collective hopes on the new team to carry forward the major initiatives of CSI.

S. Mahalingam
Executive Director & Chief Financial Officer
Tata Consultancy Services Limited
Cyberlaw in 2010

Pavan Duggal

Advocate, Supreme Court of India, President, Cyberlaws.Net, President, Cyberlaw Asia, S-307, Greater Kailash-I, New Delhi-110 048, India. Email: pavan@pavanduggal.com, pavan@pavanduggal.net, pduggal@gmail.com

India has seen various cases that have emerged pertaining to different aspects relating to Cyberlaw jurisprudence. Right from India’s first cyber crime conviction in the case of Arif Azim till today, these cases have presented various distinct legal challenges and issues. Arif Azim became a legendary name when he became the first cyber criminal to be convicted in India. Baazee.com case was also a hallmark watershed in the development of jurisprudence pertaining to growth of Cyberlaw in India. This case highlighted the liability of network service providers like Baazee.com for third party data or information made available by them. The Katti case demonstrated the perils of attempting to do morphing and circulating it to the target’s friends and family all aimed at defaming the concerned person. Dr. L Prakash became a legend in Cyberlaw jurisprudence when he became the first cyber criminal to be convicted in India with life imprisonment. Dr. L Prakash was convicted for online obscenity and various other offences committed by him.

We have large number of cases, which have not yet been reported in the public domain due to confidentiality reasons. These cases have all contributed towards the growth and evolution of Cyberlaw jurisprudence till date.

However, with the coming of the year 2010, there are few Cyberlaw challenges that are likely to come up in the coming times. In the year 2010, the growth of Cyberlaw jurisprudence is likely to be important and significant. Various challenges are likely to arise as the evolution of Cyberlaw jurisprudence continues.

One of the biggest problems and challenges that Cyberlaw is likely to encounter in the year 2010 is the development of jurisprudence pertaining to social networking.

Social networking has gained centre stage currency and is of extreme relevance today. However, misuse of information as also various other criminal and unwarranted activities on social networking platforms and social media have ensured that there will be number of legal challenges that Cyberlaw jurisprudence will have to tackle in the year 2010.

It will be interesting to see how legislations across the world deal with these complicated legal issues pertaining to social media and social networking.

Another major important challenge for the growth of Cyberlaw in the year 2010 will be the evolution and development of appropriate legal responses to the complicated legal challenges poised and raised by cloud computing and virtualization. Cloud computing is likely to gain more momentum and strength. However, legislations across the world need to come up with enabling provisions so as to ensure that the companies are benefited by the benefits of cloud computing and are not inhibited or prohibited by the various complicated legal challenges surrounding cloud computing or virtualization.

Cyber crime will continue to grow at an enormous rate in the year 2010. Cyber criminals and cyber terrorists will continue to keep on ingeniously using technology and Internet for their own vested criminal interests and benefits.

Cyberlaw jurisprudence in the year 2010 is likely to see far more development of the legislative provisions aimed at further effectively regulating these cyber criminal and cyber terrorist tendencies in the electronic and digital environment.

Information security and cyber security will continue to be major thrust areas as far as growth of Cyberlaw jurisprudence growth in the year 2010 across the world is concerned.

The emergence of Internationalized Domain Names is likely to throw up very complicated legal issues and challenges which will also engage the attention of Cyberlaw jurisprudential thinkers and legislative departments of various sovereign Governments as time passes by in the year 2010.

Further, we are also likely to see far more growth of cyber terrorist tendencies and activities on the Internet and the permeation of social networks and social media by cyber criminals and cyber terrorists. It will be interesting to see how Governments across the world use their existing and proposed legal legislative frameworks in order to appropriately regulate these highly undesirable and unwarranted activities.

Further, the year 2010 is also likely to see complicated legal issues arising from mashups gaining more prominence. Googlewave has just started the trend which will further be consolidated in the coming times.

The emergence of real-time web search and real-time internet is the biggest phenomenon that is likely to be far more consolidated in the year 2010. The year 2010 will be the year of the real-time web search and real-time internet. The legal complicated issues and challenges surrounding real-time internet and real-time web search will continue to surface in the year 2010. Cyberlaw jurisprudence will have to
appropriately address itself to the various ticklish issues pertaining to real-time web search and real-time internet publications.

Far more innovative mechanisms and legal strategies will need to be adopted so as to meet up with the complicated legal challenges pertaining to real-time web search and real-time internet.

The pervasive influence of Information and communication technologies (ICT) has mainly involved devices that we use for private purposes or at the workplace such as personal computers, mobile phones, laptops and the like. Due to rapid technological advancement these devices are becoming more and more part of our bodies, either because we wear them (wearable computing) or because they are implanted in our bodies.

At first sight ICT implants are unproblematic if we think for instance about cardiac pacemakers. However, problems arise if these devices are accessible via digital networks. Such devices can become a threat to human dignity and particularly to the integrity of the human body. The idea of letting ICT devices get under the skin in order not just to repair but even to enhance human capabilities gives rise to several disturbing possibilities. A formal legal mechanism needs to be instituted to study these latest trends.

The year 2010 is also going to be a watershed year as far as the development of the Uniform Domain Name Dispute Resolution Policy (UDRP) and its jurisprudential growth is concerned. ICANN has already approved changes in the UDRP rules which will allow only for electronic filing of domain name disputes with the accredited UDRP service providers like WIPO. Effective March 2010, only electronic filing will be permitted which will be far more convenient and in tune with the needs of the times.

Data protection and privacy will continue to engage the attention of Cyberlaw thinkers and Governments across the world. We are likely to see far more instances of violations of data protection and privacy liberties of individuals as time passes by.

The year 2010 is further going to look at consolidation of legal regimes pertaining to electronic governance in third world countries. More and more electronic governance projects will be engaged into third world nations for the purposes of efficient effective delivery of electronic services to their citizen community.

More and more focus will be on adopting an enabling and comprehensive inclusive access to all.

The year 2010 also is the final year of the current tenure of the Internet Governance Forum of the United Nations. While there appears to be consensus that Internet governance forum will continue as a movement, the final verdict on the same is yet to be seen in the year’s Internet Governance Forum meeting that will take place in the year 2010.

The mobile internet will continue to also engage centre stage attention. More and more communication devices, mobile phones, cell phones, personal digital assistants and smart phones will be used for the purposes of accessing the Internet. The usage of mobile phones and communication devices and the broad emergence of the mobile internet will also throw up complicated legal issues which will have to be tackled.

The year 2010 will be an year of happening events. We are likely to see consolidation of earlier trends of jurisprudence pertaining to Cyberlaw subjects in the present year. We are also likely to see emergence of appropriate innovative strategies for the purposes of effectively utilising technology legislation as a means for positively contributing to the environment. Technology law will impact climate legislations in the year 2010 and in the coming decade. More and more countries are likely to use technology legislation route as a means for effectively regulating or contributing to the subject of climate change.

The year 2010 promises to be an interesting year as far as the growth and emergence of Cyberlaw jurisprudence across the world is concerned. Needless to say, the year will also be marked by distinct regional and national approaches that will be adopted by distinct regions and nations while they go ahead in legislating various aspects and subjects connected to, relating or having nexus or association with Cyberlaw jurisprudence.

All and all, the year 2010 promises to be a year of adventure, distinct advancement, consolidation as also a year of tremendous excitement, as far as cyberlaw jurisprudence is concerned. It will be interesting to see how this year tackles with the growth of jurisprudence pertaining to cyber space and computers, computer systems, computer networks, computer resources and communication devices, at global, regional and local levels.

Mr. Na. Vijayashakar’s article on the progress of “Cyber Laws” in the year 2009 indicates the rapid pace at which various aspects pertaining to this important area that is recognised as priority both at National and International levels. This theme issue of CSI Communications also includes a good compilation of useful policies that can be adopted to prevent misuse of the Cyber technologies and Cyber Space.

I thank the CSI Communications team for giving me the opportunity to “Guest Edit” this issue.

Pavan Duggal is one of the key Cyberlaw thinkers of our times. Pavan Duggal has contributed in his remarkable manner to the growth of jurisprudence pertaining to Cyberlaw and other technology law related areas.

One of the foremost minds in the area of cyber legal scholarship, Pavan Duggal has been dedicatedly working towards the growth of technology law related issues since the last more than one decade. A distinguished jurist, academician, scholar, author, columnist and prolific speaker, Pavan Duggal has made an immense and invaluable contribution to the evolution of legal thought process pertaining to complicated issues concerning Cyberspace, Internet and the world wide web and their regulation in India and in Asia.

Pavan Duggal is one of the pioneers in the field of Cyberlaw and is Asia’s leading authority on Cyberlaw. He is a practicing Advocate, Supreme Court of India and a Cyberlaw Consultant. He is the President of Cyberlaws.Net, The Cyberlaw Consultancy which is Internet’s unique and first ever consultancy dedicated exclusively to the new field of Cyberlaw. He is the Founder President of Cyberlaw Asia, Asia’s pioneering organization committed to the passing of dynamic Cyberlaws in the Asian continent. Cyberlaw Asia is engaged in the process of creating greater awareness about Cyberlaws in different countries of Asia.

Pavan has been associated with UNESCO on Ethical, Legal, and Societal Challenges of Cyberspace in Asia and the Pacific. He is the consultant to United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) on the Asia Pacific Conference on Cybercrime and Information Security 2002. He is Member of Nominating Committee of The Internet Corporation for Assigned Names and Numbers (ICANN). He is also member of the Membership Advisory Committee and Membership Implementation Task Force (MITF) of ICANN and is involved in the legal issues of At Large Membership of this global body.

Pavan Duggal has testified before the Indian Parliamentary Standing Committee on Information Technology, on the Communication Convergence Bill, 2001.

Being a prolific writer, he has authored seven books. He has been invited as a distinguished speaker on various issues of Cyberlaw at numerous International Internet Fora, conferences and exhibitions.
The year 2000 was the launch of the Digital Society in India since Cyber Laws were first put in place in the form of Information Technology Act 2000 (ITA 2000). Now the year 2009 has turned out to be a landmark year in the history of Cyber Laws in India with the notification of the Information Technology Amendment Act 2008 (ITAA 2008). The current version of ITA 2000 which is referred to as ITA 2008 was actually notified for effect from October 27, 2009. While October 17, 2000 became the “Digital Society Day” of India, October 27, 2009 has now become a “Cyber Security Day” of India.

Naavi.org has been in the forefront of following the amendments from 2005 onwards when the process started. The developments have already been well documented on the site at http://www.naavi.org/naavi_comments_itaa/index.htm.

We can however briefly chart the transformation which ITA 2000 has undergone and why Naavi.org would like to refer to 2009 as the Golden Year of Cyber Laws in India.

ITA 2000 was drafted at a time when there was no recognition for electronic transaction in law and hence the objective of the legislation was to enable the commercial world to accept electronic documents as legally equivalent to paper document. As a necessary extension, ITA 2000 introduced Digital Signatures, the process of Adjudication, Section 66 penalizing “Diminishing of the value of information residing inside the computer”, the concept of “Due Diligence” and Section 65B of Indian Evidence Act regarding admissibility of electronic evidence in paper form.

Each one of these concepts were innovative and made the law stronger than what it otherwise appeared to be. However the deceptive strength of the legislation largely went unnoticed by the industry which largely ignored the existence of the law. Hence we saw Banks and Governments continue critical electronic transactions without adopting the recommended authentication system in the form of “Digital Signatures”. Companies refused to believe that “Due Diligence” is a Corporate Governance responsibility.

It was this refusal to understand and comply with the provisions of ITA 2000 that led to the Baazee.com conflict. The episode which created a big divide in the Cyber Law world in India when the Government went about an amendment based on the recommendations of an “Expert Committee” in 2005 which was seen as a motivated report meant to bend the laws to suit the business and protect baazee.com prospectively. It also took Naavi to the side of the divide critical of the moves of the Government and the recommendations of the Expert Committee followed by the Information Technology Amendment Bill 2006 (ITAA 2006) .

There was however a savior in the form of the Parliamentary Committee headed by Mr Nikhil Kumar whose damning report transformed the Intermediary friendly ITAA 2006 to Security friendly ITAA 2008 which finally got approved in the Parliament on December 23/24 2008. It is necessary for us to remember the contribution of this Parliamentary Committee and pay the due respects for the creation of the current version of ITA 2008 which is strongly oriented to Cyber Security.

ITA 2008 not only defined “Cyber Security” as a part of the legislation, it also introduced the concepts of “Reasonable Security Practices” to be followed by the industry to protect “Data”. It also expanded the list of Cyber Crimes covered, strengthened the institution of the Cyber Regulations Appellate Authority (Now called Cyber Appellate Authority), introduced the...
concept of “Electronic Signatures” and e-auditing. It expanded the powers of the adjudicators and at the same time also brought the judiciary into the system of civil suits involving Cyber crimes. The rules under sections 69,69A and 69B have provided enormous powers to the executive for Privacy invasion but have also made the issue of “Cyber Law Compliance” a critical issue in the industry.

In view of these developments, ITA 2008 has become a key regulatory issue in Indian industry and creeps into Corporate Governance requirements such as compliance of Clause 49 of the SEBI listing requirements. Every company signing their annual reports for the year ending March 31, 2010, which incorporates the CEO certification on compliance is deemed to have undertaken an ITA 2008 compliance audit and initiated the necessary compliance processes. This will bring a sea change in the Indian Corporate sector and make Information Security a key corporate policy in the coming years. The concept of Techno Legal Information Security which was hitherto remained a distant vision has now become the need of the hour.

It is for this reason that Naavi.org considers 2009 as the Golden Year for Cyber Laws in India.

The year 2009 is considered the “Golden Year for Cyber Laws in India” since it was during this year on October 27, 2009 that the amendments to ITA 2000 vide ITAA 2008 became effective. The new version has made Cyber Law Compliance part of Information Security Practice and firmly established the need for Techno Legal Cyber Security to be part of every Corporate policy framework. Apart from this seminal development, the year saw other developments which are worth recounting.

Naavi who has been in the working on development of Cyber Law Compliance solutions quickly identified the need for a technology solution for compliance of Section 7A of the ITA 2008 and came up with a solution called “Ujvala-Bellur e-auditing Tool” in association with Bellur Informatics Pvt Ltd.

A second initiative taken by Naavi during the year was pursuing a solution for Cyber Law Compliance with an appropriate solution for Cyber Cafes. However, due to the delay in the framing of rules under Section 79 of ITA 2008 which has not yet been released (till date), the suggested solution is kept pending. In the meantime some new Cyber Cafe management software has been introduced in the market which is partially compliant with Cyber Laws. Once the full regulation is available, the adequacy of the existing solutions can be assessed.

Ever since ITA 2008 was passed, Naavi has been advocating the formation of a National Netizen Commission. This would be pursued in the future years also.

During the year Naavi.org also raised several issues which affected Netizens in India. One such was the debate on e-Gazettes which we feel should be a free service which the Government should provide to the Citizens of India.

Another issue which caught the public attention was the fight on savita_bhabhi website which was finally blocked by the Government.

An interesting case of Burkha Dutt, the well known NDTV journalist sending a defamation notice to a blogger for the criticisms he made regarding the 26/11 coverage made headlines during the beginning of the year. The threat resulted in the blog entry from being removed.

Another incident which occurred during the fag end of the year saw a film producer in Hyderabad bringing upon his influence on a large IT company to dismiss an employee for posting links to a film download site as a copyright infringement.

There were instances of “impersonation” of Naavi reported during the year one of which was by an advocate in Maharashtra. End of the year also saw the release of the 3D film Avatar where the term “Naavi” was used as the name of a clan and made the term globally known.

During February, the conficker virus created a scare by bringing down the French Airforce by corrupting the flight plans in the server. In December the CAT examinations in India was also adversely affected allegedly due to the same virus. It continues to pose a threat in the future since it is estimated that more than 9 million computers were affected at one time and perhaps millions of computers still carry the virus and represent a potential Botnet that can cripple the Internet and trigger Cyber Wars.

The year 2009 is also important since some of the developments in US also affected the Indian scenario substantially. One such development was the passage of the HITECH Act which made compliance of HIPAA-HITECH mandatory for Indian Companies engaged in the processing of US health information.

This triggered Naavi to formulate a new Information Security Framework called IISF 309 similar to the LIIS 1008 which he had formulated in end 2008 to address the requirement of Legal Process Outsourcing companies. The IISF 309 is being refined further after the announcement of rules under ITA 2008 and will be extensively used in 2010 for ITA 2008 audits by Ujvala Consultants Pvt Ltd and other associates of Naavi.

The year also saw a general election where BJP promised setting up of a Digital Security Agency as part of its manifesto. However, BJP lost the election and it was left to the Congress led UPA Government to implement similar strategies. It still required a person like P Chidambaram as Home Minister to think of several reforms including setting up of an integrated intelligence set up for the Country, making FIRs mandatory on every complaints etc which are likely to be rolled out into action plans in the coming years.

Towards the middle of the year, Naavi started a campaign to make “Bengaluru as Information Security City” as a strategy to overcome the backlash of the Obama comment that Bangalore was taking away employment from US. As a result, several programmes were suggested by Naavi to be undertaken in Bangalore in the coming days. One such programme that materialized was the “Bangalore Cyber Security Summit 2009” under the umbrella of the IT & BT department, GOK. Hopefully more such programmes of such nature would follow.

Internationally, a case from Minnesota where a middle aged lady was asked to pay compensation US $1.92 million for having downloaded 24 songs without license. This may have its effect even in India and we may expect some aggressive prosecutions on the copyright front. The Government of India has also taken up amendment of the Copyright Act 1957 and adding some provisions on Digital Rights Management, Contributory Infringement etc to the Indian law.

Another incident that made news during the year was the blocking of savita_bhabhi website. Despite criticism from many naavi held his ground and substantiated his stand that the site needed to be blocked and finally when the GOI initiated action, there was a huge outcry. The war on savita_bhabhi appears to be a long drawn one since towards the end of the year, the site resurfaced in alternate name and Naavi has again taken up the matter with the necessary authorities. CERT-In also on its own moved to ensure that major search engines imposed a mandatory filter to ensure that obscene content is blocked from the search engines.

Another major development towards the second half of 2009 was the setting in motion of the Unique ID Project headed by Mr Nandan Nilekani. Naavi also applied the IISF 309 framework and placed his suggestions on the Reasonable Security Practices for UID Project.
Naavi also took another pioneering step in redefining the concept of Information Security. Having been a pioneer earlier in India is promoting the Techno Legal Information Security concept, Naavi has now introduced a “Theory of IS Motivation Based on a Behavioural Science Approach” which brings the behavioural science as the third dimension of Information Security. This has opened a new thought process in information security for integrating HR principles with the Legal and Technical aspects. Naavi also introduced the concept of “Compulsive Cyber Offence Syndrome” as a part of the process of understanding why people get lured into committing Cyber Crimes.

An unfinished task which Naavi carried through the year was the adjudication case in Phishing with the adjudicator of Tamil Nadu. Though reasonable time has passed for a decision in the adjudication case, the possibility of a favourable verdict has increased with more decisions from elsewhere supporting the view that Banks should be considered liable for Phishing incidents. First there was a German Case then information on the changes in the Danish law reached India. Finally, in December, the Banking Ombudsman gave a direction to Bank of India to pay back the Phished amount with interest.

Naavi has also raised an important issue on Inheritance of Virtual Assets and the need to make suitable laws in this regard. He also introduced the new concept of the relevance of CinNezens as the drivers for Cyber Laws in future.

As a final thrust in the year 2009, Naavi has launched a campaign with the Corporate world highlighting the obligations under Clause 49 of SEBI listing regulation and its relation to ITA 2008 compliance. This is likely to be followed further during the coming year.

The year started with the dawn of ITA 2008 but it took almost the entire year for the amendments to be put to action. As the year closes, we are left with a hope that 2010 shall take off as a prosperous year for Techno Legal Information Security Industry. Let the “Golden Year for Cyber Laws in India” pass on the baton to a prosperous year for all Netizens in India and elsewhere. ♦

---

**CSI Elections 2010-2011/2012**

Following are the Official Results approved by the President and communicated to ExecCom as per the CSI Byelaws Section 5.7 and Section 5.8 for the various offices of the Computer Society of India for 2010-2011/2012.

The following are declared elected:

<table>
<thead>
<tr>
<th>For the Term 2010-2011</th>
<th>For the Term 2010-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>(April 1, 2010 - March 31, 2011)</td>
<td>(April 1, 2010 - March 31, 2012)</td>
</tr>
<tr>
<td><strong>Vice President cum President Elect (2010-11)</strong></td>
<td><strong>Hony. Secretary (2010-12)</strong></td>
</tr>
<tr>
<td>Mr. M D Agrawal</td>
<td>Prof. H R Vishwakarma</td>
</tr>
<tr>
<td><strong>Nomination Committee (2010-11)</strong></td>
<td><strong>Regional Vice President (Region II – 2010-12)</strong></td>
</tr>
<tr>
<td>Dr. S S Agrawal</td>
<td>Prof. D P Mukherjee</td>
</tr>
<tr>
<td>Prof. (Dr.) U K Singh</td>
<td><strong>Regional Vice President (Region IV – 2010-12)</strong></td>
</tr>
<tr>
<td>Dr. S C Bhatia</td>
<td>Mr. Sanjay Mohapatra</td>
</tr>
<tr>
<td><strong>Chennai Chapter-Vice Chairman cum Chairman Elect (2010-11)</strong></td>
<td><strong>Regional Vice President (Region VI – 2010-12)</strong></td>
</tr>
<tr>
<td>Dr. R M Suresh</td>
<td>Mr. C G Sahasrabudhe</td>
</tr>
<tr>
<td></td>
<td><strong>Regional Vice President (Region VIII – 2010-12)</strong></td>
</tr>
<tr>
<td></td>
<td>Mr. Jayant Krishna</td>
</tr>
<tr>
<td></td>
<td><strong>Division – II (2010-12)</strong></td>
</tr>
<tr>
<td></td>
<td>Dr. T V Gopal</td>
</tr>
<tr>
<td></td>
<td><strong>Division – IV (2010-12)</strong></td>
</tr>
<tr>
<td></td>
<td>Mr. H R Mohan</td>
</tr>
</tbody>
</table>
The Potential for Messy, Costly eCrises is Huge!

The ePolicy Institute

Electronic disasters can ruin businesses, sink careers, send stock prices plummeting, and create public relations nightmares.

Don’t let an eDisaster catch you off guard. For responsible organizations operating in the age of electronic communication and commerce, a written ePolicy is an essential business tool.

An ePolicy that is well-written and effectively communicated to all employees is one of the best ways for employers to protect themselves from workplace lawsuits and other risks associated with the inappropriate use of corporate software, eMail, and Internet systems.

Inappropriate eMail Can Trigger Workplace Lawsuits & Sexual Harassment Claims

- **Wrongful Termination:** If a former employee subpoenas company eMail in the course of a wrongful termination lawsuit, your organization could face a lengthy and expensive search for back-up tapes of eMail messages. In one case, a Fortune 500 company was ordered by a court to turn over any eMail that mentioned the name of a former employee who was suing the company for improper termination. With no policy in place for purging eMail, the company faced the prospect of searching more than 20,000 back-up tapes, containing millions of messages, at a cost of $1,000 per tape. Total potential cost for that electronic search: $20 million.

- **Sexual Harassment:** Employee misuse of corporate eMail can result in six-figure litigation costs and million-dollar legal settlements. In one high-profile case, Chevron Corp. in 1995 was ordered to pay female employees $2.2 million to settle a sexual harassment lawsuit stemming from inappropriate eMail circulated by male employees. The offenders’ eMail messages included, among other gems, 25 Reasons Why Beer is Better Than Women.

Software Piracy Can Sink Your Corporate Ship

- **Lost Revenues:** In the US, one in four business software applications is illegally copied, or pirated, resulting in $3.2 billion in lost revenue for software manufacturers.

- **Fines and Imprisonment:** Get caught with pirated software and you’ll face a $150,000 fine for each

Cyberslackers Cost Employers Big Bucks & Create PR Nightmares

- **Lost Productivity:** US businesses lost $500 million in workplace productivity in 1999, when Congress released the Starr Report and President Clinton’s video deposition over the Internet. Some 13.5 million workers slacked off and logged on to see what the President, Monica Lewinsky, and independent counsel Kenneth Starr had to say about the relationship between the commander in chief and the intern.

- **Lost Productivity:** Firefighters in Columbus, Ohio triggered an internal investigation, media sensation, and public uproar when a routine scan of on-the-job Internet surfing revealed that fire division headquarters’ staff were visiting as many as 8,000 pornographic sites a day.

- **PR Headaches:** A Federal Communications Commission (FCC) employee inadvertently sent a dirty joke entitled Nuns in Heaven to 6,000 journalists and government officials on the agency’s group eMail list. This employee’s lapse in judgment and electronic mistake resulted in negative publicity and national embarrassment for the FCC.

Bad eMail Creates Human Resources Nightmares

- **Wasted Talent:** Xerox fired more than 40 employees in 1999 for idling away up to eight hours a day on X-rated sites. The downloading of porn videos was so pervasive, it actually choked Xerox’s computer network and prevented employees from sending and receiving legitimate eMail.

- **Wasted Talent:** Dow Chemical fired 64 workers and disciplined 230 more in 2000 for violating the company’s policies against pornographic eMail.

- **Wasted Talent:** The New York Times Company fired nearly two dozen employees and reprimanded another 20 workers for sending and/or receiving eMails that included sexual images and offensive jokes.
copyright infringed, a prison term of up to five years, public embarrassment, and negative publicity. One US novelty and gift company, Oriental Trading, paid $525,000 to settle claims against it for operating unlicensed software on its system.

Computer Crime & Security Breaches Threaten Business

- **Sabotage & Wasted Computer Resources:** Lockheed Martin’s eMail system crashed for six hours after an employee sent 60,000 coworkers a personal eMail with a request for an electronic receipt. The defense contractor, which posts 40 million eMails monthly, lost hundreds of thousands of dollars thanks to the resulting system crash. A Microsoft rescue squad was flown in to repair the damage and ensure that a similar time bomb would never again detonate. The employee responsible for Lockheed Martin’s eDisaster was fired for sabotage.


**ePolicies Help Reduce Employers’ eRisks & Legal Liabilities**

Want to reduce electronic risks in the workplace? Take the initiative. Don’t wait for eDisaster to strike. Develop and implement written eMail, Internet, and software usage policies that clearly spell out the organization’s expected standards of electronic behavior, along with privacy and monitoring policies.

While no workplace ever can be 100% safe from electronic risks, a written ePolicy coupled with a comprehensive employee education program can help for-profit businesses and not-for-profit entities control eRisks, insulate themselves from many workplace claims, increase productivity, and protect corporate assets.

**Excerpted from The ePolicy Handbook by Nancy Flynn, 2001. Permission to reprint granted, provided the material is reproduced in its entirety and www.epolicyinstitute.com is cited as the source.**

**ePolicy DO’s**

1. Establish comprehensive, written ePolicies that address employee use of eMail, the Internet, and software.
2. Educate employees about software piracy. Ensure compliance with all software licenses.
3. Communicate the fact that the organization’s eMail and Internet systems are to be used strictly as business communications tools. But don’t stop there. Provide clear guidance on what is, and is not, considered appropriate electronic business communication.
4. Bear in mind that some personal use of your organization’s eMail system may be warranted. American workers today put in more on-the-job hours than at any time in history. For employees who leave the house before dawn and don’t return until well past dark, eMail may be the most efficient and effective way to stay in touch with family members. For the sake of employee morale and retention, savvy employers generally are willing to accommodate their employees’ need to check in electronically with children and spouses. Let your employees know where you stand on this issue, and how much personal use (if any) is acceptable.
5. Incorporate an overview of your organization’s discrimination and sexual harassment policies in your eMail policy. Because of the relaxed, informal nature of eMail, some employees will put in writing comments they never would say aloud. Make sure employees understand that regardless of how it is transmitted, an inappropriate comment is an inappropriate comment. And all it takes is one inappropriate comment to land you on the wrong side of an expensive, protracted lawsuit.
6. Review your written ePolicies with every employee. New hires and long-time employees, managers and supervisors, full-time professionals and part-time staff, telecommuters and temporary employees, independent contractors and freelancers—everyone should be informed of your eMail, Internet, and software usage policies. Have all employees sign and date copies of each policy to confirm they have read and understand each document.
7. Incorporate your written ePolicies into your organization’s employee handbook and new-hire orientation materials. Have the organization’s human resources director review ePolicies with every new employee.

8. Address ownership issues and privacy expectations. Let employees know that the contents of the eMail system belong to the organization, not the individual user. If management monitors and reads employee eMail, say so. Make sure employees understand that their eMail can, and will, be read at any time without notice to or permission of the employee. If there is any chance you may want to monitor employees’ home computers, make that clear as well.
9. Support your eMail and Internet policies with eWriting and cyberlanguage policies designed to reduce risks by controlling content.
10. Establish netiquette policies for eMail senders and receivers, managers and staff.
11. Implement a risk management policy that incorporates retention and deletion policies, password policies, and monitoring and filtering software.
12. Establish a computer security policy. Put into place procedures and tools designed to keep unscrupulous hackers and internal saboteurs out of your system.
13. Install software to monitor and filter eMail and Internet use.
14. Purchase cyberinsurance policies to help mitigate electronic risk.
15. Develop an eCrisis communication policy for dealing with the media and public should an eDisaster occur.

**ePolicy DON’Ts**

1. Rely solely on eMail to communicate your ePolicies. Require each employee to read, sign, and date a hard copy of each policy. Do use eMail messages, along with the company’s Intranet system, to remind employees of your policies and management’s commitment to enforcing them.
2. Expect employees to train themselves. Educate employees about the what’s, why’s, and how’s of your ePolicies. Make employees aware of their eRisks, eRights, eResponsibilities, and the repercussions they will face for violating eMail, Internet, and software usage policies.
3. Create separate policies for management. Establish corporate eMail, Internet, and software policies, and insist that officers, managers, supervisors, and staff all adhere to them. A supervisor who turns a blind eye to an employee’s online gambling addiction, a manager who winks at software piracy, a board member who...
4. Forget your international associates. If you do business or operate facilities abroad, incorporate a discussion about effective international eCommunication in your eMail policy.

5. Assign one individual the responsibility of single-handedly enforcing your organization’s ePolicies. Make all managers and supervisors aware of the important role they play when it comes to monitoring employee behavior. Assign specific monitoring and enforcement roles to HR and information management professionals.

6. Allow employees to dismiss the organization’s ePolicies as insignificant or unenforceable. Make sure employees understand that their computer activity will be monitored. Stress the fact that ePolicy violators will face disciplinary action that may include termination. Let employees know you mean business by enforcing your ePolicies consistently.

Excerpted from The ePolicy Handbook by Nancy Flynn, 2001. Permission to reprint granted, provided the material is reproduced in its entirety and www.epolicyinstitute.com is cited as the source.

Beware Cyberslackers, Spammers, and Saboteurs

1. 90% of workers admit to recreational surfing on company time, accounting for nearly one third of their online activity. Cyberslackers’ favorite sites: general news 29.1%; investment 22.5%; pornography 9.7%; travel 8.2%; entertainment 6.6%; sports 6.1%; shopping 3.5%; other 14.3%.

2. 13.5 million workers slacked off and logged on in 1999 when the Starr Report was released via the Internet. Those cyberslackers cost US business $500 million in lost productivity.

3. The average cost to defend a Web-related patent-infringement claim is $1 million.

4. US corporations, government agencies, financial institutions, and universities lost more than $100 million to computer security breaches in 1999.

5 Ways to Keep Employees in Line While They’re Online

1. Establish a written Internet Policy that prohibits employees from using company computer assets to visit inappropriate sites, or upload or download objectionable material from the Internet.

2. Clearly communicate the fact that the organization’s computer resources are not to be wasted, but are to be used strictly for approved, business purposes.

3. Enforce cyberlanguage and content guidelines designed to keep Net copy clean and clear.

4. Don’t leave compliance to chance. Back up your Internet Policy with monitoring and filtering software.

5. Don’t expect your employees to train themselves. Reinforce your Internet policy with on-going employee education.

Excerpted from The ePolicy Handbook by Nancy Flynn, 2001. Permission to reprint granted, provided the material is reproduced in its entirety and www.epolicyinstitute.com is cited as the source.

What is Software Piracy?

Software piracy is the unauthorized use of software. Types of software piracy include:

1. Purchasing a single-user license then loading the software onto multiple computers or a server. This is called softloading.

2. Making, distributing, and/or selling copies that appear to be from an authorized source. This is called counterfeiting.

3. Renting software without permission from the copyright holder.

4. Distributing and/or selling software that has been unbundled, or separated, from the products with which it was intended to have been bundled.

5. Downloading copyrighted software from the Internet or bulletin boards without permission from the copyright holder.

Excerpted from The ePolicy Handbook by Nancy Flynn, 2001. Permission to reprint granted, provided the material is reproduced in its entirety and www.epolicyinstitute.com is cited as the source.

How to keep your workplace free of Software Piracy

1. Adopt an antipiracy stance.

2. Write and implement a Software Policy.

3. Notify employees that violation of the Software Policy will mean disciplinary action and/or termination.

4. Educate managers and employees about copyright law.

5. Audit your computers for illegal software.


7. Understand your software license agreements.

Software Policy Question of the Month

Q. Why shouldn’t I use pirated software? Who am I hurting by doing so?

A. There are several reasons to avoid pirated software:

1. It is illegal.

2. It is risky. Unless you are certain your software comes from an authorized source, you could get a program that is infected with a virus, is incompatible, or is not fully functioning. Since pirated software doesn’t come with a manual or technical support, you have no recourse when illegal software fails.

3. You may be hurting yourself or the organization by failing to take advantage of the economic benefits of newer software licenses.

4. There won’t be another version of your favorite software if manufacturers, hurt by software theft, do not have the revenue to reinvest in research and development.

5. Software piracy is unethical. Put yourself in the shoes of the software author, and consider how you would feel if your time and talent were stolen.

Excerpted from The ePolicy Handbook by Nancy Flynn, 2001. Permission to reprint granted, provided the material is reproduced in its entirety and www.epolicyinstitute.com is cited as the source.

Employee Misuse and Abuse of Corporate Computer Assets Creates HR Nightmares

- Wasted Talent: Xerox fired more than 40 employees in 1999 for idling away up to eight hours a day on X-rated sites. The downloading of porn videos was so pervasive, it actually choked Xerox’s computer network and prevented employees from sending and receiving legitimate eMail.

- Wasted Talent: Dow Chemical fired 64 workers and disciplined 230 more in 2000 for violating the company’s policies against pornographic eMail.

- Wasted Talent: The New York Times Company fired nearly two dozen employees and reprimanded another 20 workers for sending and/or receiving eMails that included sexual images and offensive jokes.

- Wrongful Termination Lawsuits: If a former employee subpoenaed company eMail in the course of a wrongful termination lawsuit, your organization could face a lengthy and expensive search for back-up tapes of eMail messages. In one case, a Fortune 500 company was ordered by a court to turn over any eMail that mentioned

www.epolicyinstitute.com is cited as the source.
the name of a former employee who was suiting the company for improper termination. With no policy in place for purging eMail, the company faced the prospect of searching more than 20,000 back-up tapes, containing millions of messages, at a cost of $1,000 per tape. Total potential cost for that electronic search: $20 million.

- **Sexual Harassment Claims:** Employee misuse of corporate eMail can result in six-figure litigation costs and million-dollar legal settlements. In one high-profile case, Chevron Corp. in 1995 was ordered to pay female employees $2.2 million to settle a sexual harassment lawsuit stemming from inappropriate eMail circulated by male employees. The offenders’ eMail messages included, among other gems, 25 Reasons Why Beer is Better Than Women.

- **Lost Productivity:** US business lost $500 million in workplace productivity in 1999, when Congress released the Starr Report and President Clinton’s video deposition over the Internet. Some 13.5 million workers slacked off and logged on to see what the President, Monica Lewinsky, and independent counsel Kenneth Starr had to say about the relationship between the commander in chief and the intern.

- **Lost Productivity:** Firefighters in Columbus, Ohio triggered an internal investigation, media sensation, and public uproar when a routine scan of on-the-job Internet surfing revealed that fire division headquarters’ staff were visiting as many as 8,000 pornographic sites a day.

- **PR Headaches:** A Federal Communications Commission (FCC) employee inadvertently sent a dirty joke entitled Nuns in Heaven to 6,000 journalists and government officials on the agency’s group eMail list. This employee’s lapse in judgment and electronic mistake resulted in negative publicity and national embarrassment for the FCC.

- **Fines and Imprisonment:** Get caught with pirated software and you’ll face a $150,000 fine for each copyright infringed, a prison term of up to five years, public embarrassment, and negative publicity. One US novelty and gift company, Oriental Trading, paid $525,000 to settle claims against it for operating unlicensed software on its system.

- **Sabotage & Wasted Computer Resources:** Lockheed Martin’s eMail system crashed for six hours after an employee sent 60,000 coworkers a personal eMail with a request for an electronic receipt. The defense contractor, which posts 40 million eMails monthly, lost hundreds of thousands of dollars thanks to the resulting system crash. A Microsoft rescue squad was flown in to repair the damage and ensure that a similar time bomb would never again detonate. The employee responsible for Lockheed Martin’s eDisaster was fired for sabotage.

Excerpted from The ePolicy Handbook by Nancy Flynn, 2001. Permission to reprint granted, provided the material is reproduced in its entirety and www.epolicyinstitute.com is cited as the source.

### 10 Tips for Successful Employee Training

1. **Show** employees that you mean business by having a senior company official (the more senior the better) introduce the organization’s ePolicies.
2. **If** a senior executive wants to conduct the entire training program, great. Otherwise, assign in-house experts from various departments the roles of ePolicy trainers. Your human resources director, chief information officer, cyberlawyer, and public relations director could each be called on to review various aspects of the ePolicies with employees.
3. **Distribute** printed copies of the organization’s eMail, Internet, and software usage policies. Walk employees through each policy, point by point. Encourage questions and discussion. Having experts on hand to answer questions and address concerns will help reduce resistance and increase the likelihood of compliance.
4. **Do not** wrap up training until you are certain all employees understand each ePolicy and what constitutes appropriate—and inappropriate—use of the organization’s computer assets.
5. **If** your policies include eMail and Internet monitoring, say so.
6. **Explain** to employees exactly what type of personal use is acceptable and what is unacceptable.
7. **Review** penalties thoroughly. Make it clear that policy violations will result in disciplinary action or termination.
8. **Ask** every employee to sign and date two copies of each ePolicy, acknowledging the employee has read and understands it.
9. **Provide** each employee with a signed copy of each policy. Place a master set of the written policies in the organization’s employee handbook. Make electronic copies of the ePolicies accessible through the company’s Intranet system.
10. **Develop** continuing education tools to reinforce training among managers and employees. Send policy reminders via eMail. Hold periodic training sessions to update employees on policy changes. Make annual ePolicy training mandatory for all employees and managers. Post policy updates on the company’s Intranet site. Put ePolicy reminders in paycheck envelopes. Raise employees’ eConsciousness, and keep them focused on their role in making the company’s eRisk management initiative a success.

Excerpted from The ePolicy Handbook by Nancy Flynn, 2001. Permission to reprint granted, provided the material is reproduced in its entirety and www.epolicyinstitute.com is cited as the source.

---

**IEEE Computer wants Editor-in-Chief**

The current editor in chief of IEEE Computer term expires at the end of 2010. Please see the position announcement at http://www.computer.org/portal/web/pressroom/2009/2011-12eics and please spread the information that applications are welcome. The deadline for full application materials are March 1, 2010. Potential applicants must contact Jenny Stout <stout@computer.org> at the publications office before then for application materials and procedures.

The following few years will be crucial for the IEEE Computer Society to transition from printed to digital world, and as a flagship magazine IEEE Computer will lead this transition together with the portal Computing Now.
CSI KNOWLEDGE MANAGEMENT PORTAL

A Paradigm Shift
Ravi Raman* and Shankaraiah Balagonda**

* Samadhan Information Technology Services, A-217, Sagar Tech Plaza, Saki Naka, Andheri-Kurla Road, Mumbai 400072. Email: samadhan@bom8.vsnl.net.in
** Tata Consultancy Services, GatewayPark, MIDC Road, Opp. Tunga Paradise, Andheri(E), Mumbai. Email: shankaraiah.b@tcs.com

There have been a lot of books written on Managing Change but very few on how to manage a Paradigm Shift in an organization. The reason is simple - Changes bring incremental benefits to an organization and can be managed relatively easier while Paradigm Shifts bring about a dramatic increase in the overall well-being of the organization. The **CSI Knowledge Management Portal** will be the catalyst for the paradigm shift in transforming CSI from a passive society to a pro-active vibrant organization. The Knowledge Management Portal is one of the first large scale systems developed in India using **Open Systems Software on Cloud Computing**.

We have found it difficult to increase membership without a clear answer to the question: “What is the value addition?” Is it just the ability to network in this world of Social Networking? Is it limited to discounts at CSI conferences and some free seminars if one lived in a city where the chapter was active.

The launch of the portal transforms the means of interaction between CSI and its members. It brings about a “Virtual” Society and enables Members to network with professionals sharing his/her interest. Its aim is Membership Service and Professional Development.

**Why did we envision this system and who were the motivators?**

Membership System in CSI was the “fall guy” - blamed for all the ills. It was a legacy system which had outlined its utility. The system had few controls and multiple versions were used. Under the prodding of Bipin Mehta, Saurabh Sonawala and Ravi Raman, the President Mahalingam decided that it needed to be revamped. It was not going to be a simple replacement of a database, but an active system to engage members and browsers in their quest for knowledge. An expert in Knowledge Management(KM), Mr Amiya Agarwal, was asked to define the characteristics of the KM System after surveying best practices elsewhere. The system architecture was duly defined. Mahalingam offered to get the huge task of developing a State of the Art KM system done at no cost to CSI, through Tata Consultancy Services.

Conceptually the system had to be State of the Art, with User Friendliness in its layout and navigation and Secure in its operation with good performance characteristics. This led to the following technology stack:

- **Portal**: Liferay Portal (with built in CMS)
- **Application Server**: Tomcat
- **Database**: My SQL
- **Operating System**: Ubuntu Linux

Mr. B Shankaraiah, an experienced IT Project Manager from TCS, assembled a small team of TCS professionals and worked closely with Ravi Raman to develop this system over 6 months starting from August 2009. Ravi Raman interacted with CSI Chapter Chairmen to seek their assistance in getting the membership data expected.

While the development process was on, we were actually looking to host it in a State of the Art Environment, we were looking for organizations to host it. In walked Raj Saraf, a great friend of CSI and the founder of Zenith Computers. He offered to host it in Zenith Cloud. Our resource constraint was removed and the cost again to CSI was nil.

A number of discussions were held to programme the launch. We tapped DRAFTFCB Ulka and its dynamic and creative CEO M.G. Parameswaran. He suggested quizzes and contests to popularize the portal and CDAC provided the necessary infrastructure. We had to assure ourselves that the system was secured and the security experts at MIEL e-Security Pvt Ltd, under instructions from their Director V.L.Mehta, performed the tests.

This is truly a collaborative work. But a system is only a platform and we need active users. All of us have to make this a highly used and vibrant platform.
Distinguished Speakers List (DSL)

Smaller chapters always had difficulty in getting speakers for seminars in their cities. Even bigger chapters had difficulties in getting speakers on specialized topics. The Portal now has a database of volunteers who are willing to speak on a variety of subjects. It allows any IT professional (non-members also) around the globe to register as a Distinguished Speaker. Chapters can look up speakers and invite them for a seminar in their city.

What are you waiting for? Arrange a seminar, get the audience. You have speakers at your finger tip.

Communities

A community is a group of people with common interest who can interact regularly and discuss and debate items in their areas of interest. A community can be set up by any CSI member and will be the owner of the community. A community can be:
- Public (Open to all members)
- Private (Restricted to invitees by owner)
- Restricted (anyone can apply but owner may accept or reject)

More communities, the merrier it will be for all of us at CSI. After all, Technology is never ending learning experience. Community participation will increase the pace of your learning.

Blogs

Blogs are run by individual members and they can write on their area of interest on a periodic basis. Members can view and comment on all blogs and start a debate. Public Blogs will be visible to non-members also but they will not be able to comment on blogs.
You have been waiting for this day when you can show off your technology skills at no cost. Start a blog and start debates on topics of your choice. Or else comment on items written by bloggers and start a debate.

**Forums**

Forums can be created by any member and all members can visit all forums. It is an ideal place to get answers to questions that you always wanted to ask but were afraid to ask. Someone or a number of members will respond to your query in no time and you can save valuable time on your work.

Help others by starting a forum and answering queries or just join a forum and ask questions or respond to questions? You can be a student and teacher at the same time.

**Knowledge Management**

CSI conducts a number of seminars and conferences - the average across the country is almost one conference per day. However, there is no central digital library to share the knowledge. Apart from conference material, having a well organized library of CSI magazines and journals is now available on the portal. All issues of CSI Communications, our monthly magazine, will also be available on the portal.

Your dream single stop solution for gaining knowledge on any technology subject is just a click away. So start clicking.

**Self Service Features**

New members can now fill a form online, make the payment and will be instantly given a membership number. A photo identity card will be issued within a week. If the new member opts to make an offline payment, he will become a member the day the cheque is realized.

Existing members can modify their own personal profile. They can change their contact details and profile without having to contact anyone at CSI. If a member does not have internet access, all changes can be done by the administrative officer of the local chapter. The headquarters will thus be relieved of all administrative tasks related to membership maintenance.

What are you waiting for? Get your relatives, colleagues, friends and neighbours to become members today

**Chapter Information**

If you were visiting a city and wanted to know if you can attend a CSI seminar in the city, you needed to either contact the chapter or visit the chapter website. There was no central repository. The portal now has 5 standardized pages for each chapter:
Chapter Details – History and Evolution
Chapter Management Committee Contact details
Events Calendar in each chapter
Chapter News and Chairman’s Newsletter
Special pages on Chapter request (like SPIN, CIO Club, Security Forum etc.)

Apart from chapter information, the portal has a link to all professional bodies with which CSI has a relationship.

Next time you visit a city, look up the chapter details and meet CSI people and attend CSI events and start networking.

Student Branches

Our Student members will now have two organizations to support them – Education Directorate at Chennai and the local Chapter. Each student branch is now linked to a CSI chapter so that we can have a spurt in student activities with active participation from the local chapter. The link of chapters to student branches is now available in the portal.

Students can now start ringing up the local chapters and begin a quicker and joyful journey of acquiring knowledge.

Divisions/Special Interest Groups (SIG)

Information on activities undertaken by a division or SIG was mainly circulated through word of mouth or emails. We now have a central repository giving the following information:

- Division/SIG Overview
- Division/SIG Contact Details
- Division/SIG Events

Login and track activities in your area of interest starting today.

Development Methodology

The entire development and testing was done by two independent teams. The people who tested the system had good subject matter expertise and all defects were logged in a defect tracker and tracked to closure. Any defect which was not fixed in the current release found its way to a enhancement list which contains all items which will be taken up in later releases. These lists were reviewed by entire project team on a weekly basis.

There are roles for privileged user-id in the system:

- HQ Admin (Website Manager)
  - Update static information on any page
  - Update membership data for offline entries
  - Authorize ids for chapter admin/Education Admin etc
  - Authorize user-id for Blogs, Communities, Forums and Knowledge Management
- Education Directorate Admin
  - Upload of Student data in batch after verification
  - Verify student applications
- Chapter Admin
  - Ability to modify all membership profiles for the chapter
  - Ability to maintain all pages for the chapter

A new team will be taking over Application development support and Infrastructure support after the portal goes live. The new team is fully trained on all aspects of CSI.

Getting Visitors

We want more and more people to visit our portal. As a launch activity, we are announcing a Quiz, Programming contest and Bring-A-Buddy-Along scheme on the portal. Visit the portal and participate in the contests and win exciting prizes.

The critical success factor for the system will be to reach 100,000 members by end of 2010 and to see a continuous interaction of members on Blogs, Forums and communities.

Tailpiece

The question of value addition to members should be History now and CSI should start conquering new members and increase its Geography – even beyond the borders of India. The future of CSI is in our hands – We can convert the Paradigm Shift into a paradigm leap and take it to the next generation. Start Clicking and spend your daily free time on the portal. It is all in our hands now.
George Boole...

...was born in Lincoln, England on Nov. 2nd 1815. He inherited his father’s passion for science and by the age of 14 could read Latin, Greek, French and German. But Boole’s family fell on hard times, and he was forced find work to support them.

Boole discovered and taught himself mathematics while teaching in local schools. The papers that he published in the Cambridge Mathematical Journal earned him respect as a capable mathematician. In 1849, despite lacking a university degree, he was offered the first professorship of mathematics at Queen’s College, Cork, in Ireland, where he taught until his death on Dec. 8th, 1864.

In 1854, Boole published his greatest and most influential work: “An Investigation Into the Laws of Thought, on Which are Founded the Mathematical Theories of Logic and Probabilities” in which he brilliantly combined algebra with logic. In 1937 Claude Shannon placed Boole’s abstruse reasoning in an engineering context where it became instrumental in the development of the digital computer.

Boole was well liked and known to be extremely dedicated to his research, his students and his family. He is remembered as a personable, congenial, kind-hearted teacher and a brilliant mathematician. His papers are preserved in the archives of the Boole Library at University College, Cork. A lunar crater also bears his name.

Claude Elwood Shannon....

...was born in Petoskey, Michigan, on April 30th, 1916. He graduated from the University of Michigan in 1936 with bachelor’s degrees in mathematics and electrical engineering. In 1940 he was awarded both a master’s degree in electrical engineering and a Ph.D. in mathematics from the Massachusetts Institute of Technology (MIT).

Shannon joined the Mathematics Department at Bell Labs in 1941 with which he remained affiliated until 1972. He became a visiting professor at MIT in 1956, a permanent member of the faculty in 1958, and a professor emeritus in 1978.

Shannon was renowned for his eclectic interests and capabilities. A favourite story describes him juggling while riding a unicycle down the halls at Bell Labs. He also designed and built chess playing, maze-solving, juggling and mind reading machines. These activities bear out Shannon’s claim that he was motivated more by curiosity than usefulness. In his words “I just wondered how things were put together.”

Another example of Shannon’s diverse interests is his 1949 paper entitled “Communication Theory of Secrecy Systems”, a work now generally credited with transforming cryptography from an art into a science. Claude Shannon died on February 26th, 2001
One of this journal’s editorial policies borrowed from that giant of radio broadcasting, John Reith - is “to inform, to educate and to entertain”. Well, we try our best.

While chewing on my pencil wondering how I might achieve any of these objectives, I was compelled to pause to take in what I regard to be one of the most evocative pieces of music ever written. The recording I was playing (I’m ashamed to say for background listening) was of Franz Schubert’s string quartet in D minor, popularly named “Death and the Maiden”. In the slow movement the composer paints a picture of Death responding to a maiden’s pleas to pass her by, gently assuring her that he comes to take her as a friend. And Death was soon and the Maiden”. In the slow movement quartet in D minor, popularly named “Death and the composer paints a picture of Death in “Hz”), Silver (the ubiquitous bar code) and Shakespeare are a few who spring to mind (apart, of course, from several notable religious prophets) that undoubtedly left this life with little idea of the impact that their work would have - for better or worse - on later generations.

George Boole is another. A little-known professor of mathematics, Boole left behind a curious form of algebra, of interest to his peers but of no known practical value: until, that is, it was stumbled across many years later, outside the realm of pure mathematics and almost by accident. For Boole’s “algebra of logic” and its associated laws were to become fundamental to the design of digital circuits. While it is untrue to say that digital computing and communications would not have existed but for Boole’s work, it’s difficult to imagine how, without it, complex binary circuits could operate reliably.

According to Boole

As is often the case with invention, Boole was not the first to investigate the problem. But in contrast to earlier attempts at “symbolic logic”, Boole’s exploration resulted in methods and techniques that make possible a scientific treatment of logic in which logical relationships can be expressed as formulae, free from vagueness and ambiguity. Although “Boolean logic” cannot be applied to the many everyday situations that involve speculation or uncertainty, it can be applied to the factual statements that form the basis of digital computing.

Boole argued that we tend to select things from within a boundary containing all possible choices. If asked to select the large black balls from a bowl containing black and white balls of two sizes, our selection criteria would probably be large AND black. Conversely, if asked to exclude all large black balls from our selection using the same operands, our criteria would become black NOT large.

In either case we exclude all the white balls because they’re not of the correct category. If, however, we needed all the large black and all the small white balls, our selection criteria would be (black AND large) OR (white NOT large).

Boolean logic implements this type of reasoning, an approach we now apply when using an Internet search engine to perform a “Boolean search”. For example, searching for George AND Boole returns references in which both the words George and Boole appear, while searching for George OR Boole lists those in which either word appears. In fact we’re combining and manipulating our search criteria using a binary ‘true/false’ (or ‘open-shut’, ‘zero-one’, ‘yes-no’, ‘on-off’, etc.) approach. A more recent development, “fuzzy logic", can handle the concept of partial truth - values that lie between “completely true” and “completely false” - but that’s another story.

In Boolean logic, the symbols used - for example ‘p’ and ‘q’ - are not variables in the same sense that ‘x’ and ‘y’ are often used to represent numbers in conventional algebra. Boole defined a set of rules that specify the result of the permitted operations on the symbols, but without any regard to what they actually represent. The symbols can of course be interpreted, for example in terms of the black and white balls mentioned above, but logic that results in accepting the equation “1+ 1 = 1” is certainly not true of conventional algebra!

The three basic “operators” in Boolean algebra are ‘AND’, ‘OR’ and ‘NOT’.

The ‘AND’ operator

In Boolean algebra, the AND operator is signified as a ‘·’ although the dot is often dropped. p·q simply being written as pq. Four possibilities can be derived from combining the symbols p and q (fig.1). Returning to the analogy of black and white balls, p could be interpreted as the property of being black and q of being large. In this case pq represents being black AND being large. According to Boole, if both operands are true the overall value is ‘true’ (fig.2); but if p is false (not black), or q is false (not large), or if both operands are false, then pq is false. In other words pq can only be true when both its operands p and q are true (i.e. 1·1 = 1).

An easier way to represent the possible combinations is to use a “truth table” (fig.3), each row of which shows the value of pq for

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>p·q</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
given values of \( p \) and \( q \), but using 1s and 0s to represent true and false.

**The ‘OR’ operator**

In Boolean algebra ‘+’ (not to be confused with the ‘+’ used in arithmetic) signifies the OR operator. In our analogy of black and white balls, \( p + q \) represents the selection of items in the bowl that have the property of being black OR being large (OR both). According to Boole if either or both operands are true, then the overall result is true and we finish up with all the black balls, regardless of their size, and the large white balls. And, as is illustrated by the truth table at fig. 4, the equation \( 1 + 1 = 1 \).

![Truth table for the ‘OR’ operator](image)

**The NOT operator**

The NOT operator (fig.5) has just one operand, which it negates or “inverts”; in other words it transforms true into false, and vice versa. It is represented either by placing an inverted comma behind the inverted symbol (NOT \( p \) is written \( \bar{p} \)) or by placing a bar over it (NOT \( p \) being written \( \bar{p} \)).

![Truth table for the ‘NOT’ operator](image)

**A bright idea**

With the exception of students of symbolic logic, Boole’s work was to remain largely unknown and unused for over 80 years after his death until a research student at the Massachusetts Institute of Technology, who just happened to have studied both logic and electrical engineering, applied it to the construction of switching circuits. Reflecting on events some 50 years later, Claude Shannon’s comment “it just happened that no one else was familiar with both fields at the same time” portrays commendable modesty.

Shannon was recruited by Vannevar Bush\(^1\) to work on the maintenance of Bush’s large analogue computer. Analogue machines no longer occupy a place in mainstream IT, so it’s worth saying a few words about their role in solving complex scientific and engineering problems before the age of the digital computer.

The adjective analogue can be defined as “of a circuit or device having an output that is proportional to the input”. The concept behind analogue computing is that instead of computing with discrete numbers, a physical model of the system to be investigated is built and its characteristics measured under different input conditions.

It performed its calculations in decimal, rather than in binary, and like the slide rule and the clockwork watch, these were based on measurements of movement and distance. The machine used shaft movement to represent variables, gears to multiply and divide, and differential gears to add and subtract. It could calculate up to 18 independent variables, while integration was achieved using a sharply edged wheel spinning at variable radius on a round rotating table.

Just as Charles Babbage had planned to power his computer with a steam engine a century before, the only part that electricity played in the Differential Analyser was to drive its shafts. But despite looking back to the Babbage era, Bush’s brainchild was in its time a marvel of scientific engineering, and several examples were built.

The Differential Analyser required a lot of maintenance. Its gears had to be manually configured to specific ratios before it could process a problem and Shannon was put to work on this monotonous task, while at the same time being encouraged by Bush to base his master’s thesis on the machine’s logical operations. Perhaps an inevitable consequence was that Shannon considered ways to improve the existing arrangements by replacing the purely mechanical parts with electric circuits laid out using the Boolean principles that he’d learned as an undergraduate.

Shannon completed his thesis in 1937 and in the following year published a paper based on it - “A Symbolic Analysis of Relay and Switching Circuits” - in which he demonstrated how to build logic circuits from electromechanical relays. The paper was hailed as brilliant and the ideas put forward were almost immediately applied to the design of automatic telephone switching systems.

**Gates for channelling logic**

Shannon was concerned with representing the Boolean operators ‘AND’, ‘OR’ and ‘NOT’ in terms of electromechanical circuits. He accomplished this by configuring relay contacts to conduct current (true) or not (false) according to which relays were energised (i.e. ‘shut’) or released (i.e. ‘open’). For example, a simple ‘AND’ circuit (Fig.6) requires both its relays (\( p \) and \( q \)) to be shut to light the lamp. If only one relay (or neither) is shut, the lamp will not light; these events correspond to the truth table at Fig.3.

Similarly in an ‘OR’ circuit the lamp will light if either (or both) of its relays is shut, corresponding to the truth table at Fig.4. In the ‘NOT’ circuit, relay \( p \) is fitted with a ‘break’, rather than a ‘make’ contact. The lamp is therefore lit (true) when the relay

---

\(^1\) Professor Bush was to become a key figure in 20th Century American scientific development.
is open (false), and is extinguished (false) when the relay is shut (true - see Fig.5). The analogy is rather like a succession of gates opening and shutting.

Electro-mechanical relays are useful for illustrating Boolean operators, but logic circuit designers now use standard symbols (Fig.7) to represent the “logic gates”, as they’re called, used to compute Boolean functions. In common with the relay circuits in Fig.6, all have inputs and outputs that are limited to two values, 1 (true) and 0 (false); or in electrical terms, to set voltages (e.g. +5V and 0V).

Although there are symbols for more than the Boolean operators AND, OR and NOT, all can be derived from these three. The NAND gate, for example, is simply an AND plus a NOT gate in tandem; likewise the NOR gate is an OR plus a NOT gate in tandem, whilst the exclusive OR gate-XOR—shown in Fig.7 is made up from the gates shown in Fig.8. Unlike a conventional OR gate, XOR gives a true value if either, but not both, of its inputs are true (Fig.9). One of its applications is in the circuitry used to add binary numbers in a computer’s arithmetic logic unit. The symbol for the XOR operator is a circle containing a ‘+’ sign, ⊕.

Simplifying the problem
Simply stringing gates together to perform a logical function would lead to complexity and the wasteful use of components. The rules of Boolean logic can be used to avoid creating these problems by allowing complex logical functions derived from truth tables to be greatly simplified.

For example, the truth table in Fig.10 represents the Boolean function A’B’C’ + A’BC + ABC’ + ABC + ABC. This could be implemented using five AND gates, five NOT gates and an OR gate, as shown in Fig.11, but this scheme can be simplified and the number of components reduced to achieve the same end. There are different methods for doing this, but in this particular case simply manipulating the algebra using one of the rules that Boole defined (i.e. x + x’ = 1) results in......

World’s smallest logic gate
Whereas Shannon worked with relays, vacuum tube circuits soon followed (not necessarily smaller, but very much faster), then discrete transistors (much smaller) and finally microchips, which seem continually to break new barriers of miniaturisation - according to a recent IBM research notice, scientists are now building logic circuits at the molecular level.

What are claimed to be the world’s smallest working computer circuits use an approach in which individual molecules move across an atomic surface like toppling dominoes. The new “molecule cascade” technique enables working logic circuits to be constructed some 260,000 times smaller than those in advanced microchips.

The circuits were made by creating a precise pattern of carbon monoxide molecules on a copper surface. Moving
a single molecule initiates a cascade of molecule motions, just as toppling a single domino can cause a large pattern to fall in sequence. Tiny structures were then created to demonstrate the fundamental Boolean OR and AND functions, data storage and retrieval, and the “wiring” necessary to connect these components into a functioning computing circuit. The most complex circuit built was a 12 x 17 nanometre (a billionth of a meter; the length of five to 10 atoms in a line) three-input sorter, so small that 190 billion could fit on top of a standard pencil-top eraser 7 mm in diameter.

Computation is possible because each cascade carries a single bit of information. By analogy, a toppled domino can be thought of as a logical “1”, and an untoppled domino a logical “0”. Similarly, a cascaded or noncascaded molecular array can represent a logical “1” or “0”, respectively. The logical AND and OR operations, and other features needed for complex circuits, are created by cleverly designing the intersections of two cascades. Molecular arrangements have been designed to act as crossovers (allowing two cascade paths to cross over each other) and fan-outs (splitting one cascade into two or more paths). Boole would surely be staggered by such developments!

Epilogue
Claude Shannon came to be widely regarded not just for his work on logic circuitry, but for solving technical and engineering problems within the telecommunications industry. After making the link between Boolean logic and switching circuits, he went on to undertake research at the Bell Telephone Laboratories on the problem of transmitting information more efficiently. In his paper “A Mathematical Theory of Communication” published in 1948, Shannon explained the communication of information in digital terms. The idea of transmitting pictures, words, sounds etc. as a stream of binary digits (1’s and 0’s) is something now taken for granted but at that time it had only been considered in analogue terms as the transmission of electromagnetic waves. The concept of digital transmission was fundamentally new. Although he went on to publish further research including important work on cryptography, Shannon’s 1948 paper on digital transmission was to be the pinnacle of his achievement.

Shannon’s work at Bell Labs led him to be regarded in his lifetime as the founding father of the digital communications age, but George Boole was less fortunate. He got soaked in a heavy rainstorm while walking from his home to college, where he then lectured in wet clothes before returning home to mark papers. Unsurprisingly George caught a cold. His wife Mary, believing that the remedy should resemble the cause, put him to bed, and since his illness had been caused by getting wet, poured buckets of water over him. Perhaps the inevitable consequence was that George contracted pneumonia from which he died, leaving behind the tools that would enable others to create applications of which he could never have dreamed. Taking account of the essential part played by digital circuitry in placing men on the Moon, it’s a fitting tribute to George Boole that a lunar crater now bears his name.

Ian Petticrew

Postscript
Alicia Stott (1860-1940) was the third of George and Mary Boole’s five daughters. Like her father she received no formal education in mathematics but this did not prevent her becoming well-known for her research in analytical geometry. In 1914 she was awarded an honorary doctorate by the University of Groningen in the Netherlands where her papers were published. A co-researcher described her thus: “The strength and simplicity of her character combined with the diversity of her interests to make her an inspiring friend.”

See also:
• Freeware: software to construct and run your own digital circuit http://www.spsu.edu/cs/faculty/bbrown/circuits/
• Freeware: a software tool for simplifying Boolean functions using Karnaugh maps http://puz.com/sw/karnaugh/index.htm
• George Boole: “The Calculus of Logic” http://www.maths.tcd.ie/pub/HistMath/People/Boole/CalcLogic/CalcLogic.pdf

John von Neumann – The Scientific Genius who Pioneered the Modern Computer

The ENIAC, short for Electrical Numerical Integrator and Calculator, was developed by the US Government in 1942 to fill the increasing need for computer capacity to calculate trajectory tables and other essential data. The ENIAC used 18,000 vacuum tubes, about 1,800 square feet of floor space, and consumed about 180,000 watts of electrical power. It had punched card I/O, 1 multiplier, 1 divider/square rooter, and 20 adders using decimal ring counters, which served as adders and also as quick-access (.0002 seconds) read-write register storage. The executable instructions making up a program were embodied in the separate “units” of ENIAC, which were plugged together to form a “route” for the flow of information.

Fascinated with the success of the ENIAC, a mathematician by the name of John von Neumann begins development of two important concepts that would directly affect the path of computer programming languages forever.
Grid To Cloud (G2C) – A Infrastructure based transition

K. Kalaiselvan¹ and P. Venkata Krishna²

1 C-DAC (Erstwhile NCST), 68, Electronics City, Bengaluru - 561229
2 School of Computing Science and Engineering, VIT University, Vellore, e-mail:pvenkatakrisna@gmail.com

The cloud computing is definitely making impact on all the level’s of computing and Internet world. On the other hand, the predecessor grid is well established in some parts of computing world especially in the high performance computing area. Despite of all the grid popularities, the cloud literally invaded the grid’s in HPC, so many grid’s were transited to cloud or built the cloud on top the grid. In this paper we are going to discuss about how cloud is evolved from the grid by taking the low level infrastructure and the high performance applications as a core concept, besides that merits & demerits of the grid, why one should go for cloud when the grid itself can do most of the HPC applications and the current trend of the cloud.

I. Introduction

In the recent past grid computing has emerged as one of the powerful and popular computing paradigm. Even though grid does not have international standard software’s to build the computing environment, still so many de-facto standard software’s are available in the market to build the grid. On the other hand, cloud computing is gaining the momentum in the current IT trend, most of the enterprises people are running behind the cloud to reduce the cost involvement in maintenance and deployment of hardware some times software resources. As like grid, cloud also doesn’t have any international standard. But the popular clouds are using it’s own software tools to build the data centers and the open source tools like nimbus, eucalyptus and hadoop are used by the people who want to build cloud by own, they could also be adopted as a de-facto standard software’s for cloud.

In this paper we are going discuss about cloud in relation to grid, the discussion mainly focuses on how cloud computing is evolved from grid computing, why the cloud has been seen as a future of the IT world, the current trends, the popular open source tools available for cloud & grid and the functionality wise difference between them.

Grid Computing:

In simple words grid is collection of computing resources, resources are geographically dispersed and interconnected. Usually the grid resources are from different administrative domain and maintained by different people. In spite of different administrative domain, the middle ware technology or the software’s that used to interact across different resource to accomplish job is same or at least inter operable.

Though the term grid is originated in 1990 most of the industry leaders are passive about grid computing because of the uncertainty about it’s future. When the globus toolkit version 1.0 was released in 1998, all are started working on grid based on the globus toolkit. We would say, “The globus toolkit gave new face to the grid computing”.

“Grid computing is larger version of distributed computing”, but grid has more advantages over distributed computing. Grid can run the users application on heterogeneous computing resources which are geographically distributed and the security mechanism involved in the grid is much more sophisticated than any other computing paradigm.

Grid is quite popular among big players in the IT market but still it haven’t reached the low level users
like researcher’s, scientist and the simple INTERNET users who are usually don’t have any computer related background.

The above picture shows the survey taken by sun grid engine among research community about the “Knowledge of Grid Computing”. It stat that 67% of the computer user heard the term “grid” but never experienced it, 11% of them never heard the term “grid” and only 11% of the users used the grid software’s. Interestingly the grid experts are nearly 0%. Which clearly shows that grid is not so popular among the research user community. There are so many reasons why grid is not so popular among low-level users

Open source for grid

Grid and the open source are inseparable because grid itself constructed with full of open source software’s. Grid is a community based computing paradigm, members in the community shares the data among themselves to complete large-scale problems and they often work together to solve particular problem. Grid is fully cluster based they does not required any specialized operating system as like cloud, middle wares and the schedulers are good enough to build the grid computing environment out of a cluster.

Cloud evolution:
The complexities involved in grid are
1. **One must understand the grid architecture:**
   The user must understand the grid and its architecture to submit a job through command line; though many GUI tools are available they are not generalized to run any applications

2. **Grid Entry is so difficult:**
   Grid certificate – a valid user identity issued by a grid certificate authority. This certificate is required for each and every grid operation to identify user as a valid grid user. The user should follow series of steps to get the grid certificate, it involves one to one meeting with the grid certificate authority, which is actually time consuming and cumbersome process.

3. **Building the application isn’t easy:**
   Most of the grid GUI tools does not support for application development and build. Building the applications without any GUI tool help is really a tedious task, because often user needs to shuttle between development environment to compiling environment to build the application with error free.

4. **Command line tools pose real threat:**
   Command line tools are the real culprits of the productivity loss of the application developers, because they are different for different operating systems. As grid is heterogenic in nature it consists of various OS based computing resources. Another problem with the command line tools is “their options” they are very cryptic and cannot be remembered easily.

5. **Grids are more of e-Science related**
   Grids are meant for running huge data and computing intensive applications. Usually these applications require huge computation power and data storage. Pre engineering the source code is must in order to execute the applications on the grid. Taking into account of all the facts the enterprises applications are not the suitable to exploit the grid. They can run on the platform where any size and any kind of the applications can be ported

6. **Qos Availability**
   The latest buzzword in the grid world is QOS. The new technologies like SaaS and IaaS are giving the assurance of 99.9% availability of their services. Such kind of assurance is not there at grid. The availability of the resources or the services in the grid are on the hand of local administrator who manages the resources. The grid availability is highly depends on more than one people or institution, So it’s very difficult for the grid admin to give such type of assurance

7. **Grid the successor of HPC**
   Most importantly grid is said to be successor of the High Performance Computing clusters. Applications on the HPC clusters are usually grand challenge applications requiring huge computation & data power and the same is applicable for grid also. The grid is more suitable for the application developers who are well versed on the HPC environment.

   Therefore users are desperately looking for an alternative-computing paradigm that can help to solve their compute starving application with minimum effort and cost.

   Cloud - the next generation technology promises the user free from all the above headaches with minimal effort and cost. Cloud computing is not new concept or a computing paradigm as believed by most. A popular IT quote says that 80% of Internet application or a web application available today is purely cloud based. Yes!.. Uploading photo or a plain text file in to a mail account is form of cloud computing, on line shopping is also a form of cloud and the computer games you play in the Internet is very much cloud based service only. The cloud service is everywhere in the Internet, the problem is we are not feeling it.

Cloud Computing:

Cloud is the best alternating technology for the people who are looking for “everything been be done through INTERNET with just few mouse click”. The cloud allows them to deploy the application within few seconds of the on line registration. The capital expenditure and the maintenance cost are not required when you choose cloud to run your application and it can be diverted to R&D sector to fine tune the application for better productivity.

The cloud is getting popularized among the common people slowly but steadily. The below table shows the result of “Familiar with the term Cloud Hosting” survey taken in US and UK, among small and medium size business people.

<table>
<thead>
<tr>
<th>Company Size</th>
<th>UK</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>Mid</td>
<td>53%</td>
<td>43%</td>
</tr>
</tbody>
</table>

The table depict that Cloud is popular in medium size business market when compare to the big and the small business markets. This is because the big business market players might have their own computing facility and data centers. The small and the mid sized players may fear that shifting from normal web hosting to cloud would be difficult and the cost involvement also more.

Another survey taken from the same set people “Adoption of Cloud Hosting” is shown below.

<table>
<thead>
<tr>
<th>Company Size</th>
<th>Country</th>
<th>Already Using</th>
<th>Plan to use</th>
<th>No plan</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>US</td>
<td>5%</td>
<td>33%</td>
<td>57%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>5%</td>
<td>28%</td>
<td>59%</td>
<td>8%</td>
</tr>
<tr>
<td>Mid</td>
<td>US</td>
<td>14%</td>
<td>55%</td>
<td>26%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>11%</td>
<td>42%</td>
<td>42%</td>
<td>5%</td>
</tr>
</tbody>
</table>

And the result says that the mid sized business people are using the cloud already more in numbers than the small business people. The survey also tells that the more number of mid sized business people are having plan to adopt to cloud than the small business people. On the whole adaptability of the cloud will increase rapidly in near feature and it certainly going to help the small and mid business people more than the big companies which can hold their own data center.

Some clouds are offering testing and production environment free of cost. So that the developers can develop and deploy their applications on the cloud free of cost. Once the testing is done and he is sure about the application reliability, he can actually deploy it into the cloud to open for public. This is will help the startup and the small companies to cut the cost involvement in production and testing.
Therefore the small and the mid sized companies can rely on cloud services.

**Open source tools for cloud**

As for as cloud is concerned the open source market would not make much impact. The reason is quite obvious basically cloud is commercialized and the popular clouds available today's are owned by private vendors. The bad news here is for the open source community is non of the popular clouds are using the open source softwares, even they have modified the operating systems according to their needs

Open source cloud software’s Enomaly, Eucalyptus are helping out the enterprises to build its own private cloud and allows them to tie up with other outside cloud. But they were not used in any of the popular clouds deployed till now. The point here is the open source community is benefiting the cloud providers but the reverse is not so beneficial as expected by them.

**Functionality Wise difference:**

**Grid is not fully commercial**

Famous grids available in the IT market today are not fully commercialized, and they are mostly application oriented, application oriented grids are built to deal with specific problems like disaster management system, genetic algorithm and drug discovery. The researcher and the scientist who are dealing with the same type of problem can join in genetic algorithm and drug discovery. The applications hosted on the web.

The resource sharing technique not only increases the efficiency of computing resource it also ensures that at no point of time the resource will be left idle.

Grid follows dedicated resource policy; the resource is reserved to a particular application for the particular time period that cannot be used by any other applications during that time. According to the local scheduling polices the advanced reservation method reserves the static resource to a particular user.

Grid does not use any virtualization technique, so the multi tenancy and the dynamic scaling of the resources are not possible here. The computing resources are physical resources rather then virtual. The users need to wait until the current running job to complete, if any other higher priority job comes then the currently running job will be terminated with out any prior notice and the computing resource will be released to the new job.

**Resource Sharing:**

One of the main strength of the grid is resource sharing. resources are dynamically provisioned on demand basis. Cloud provisions multiple users to share a single resource concurrently. At the same time it assures one user data or application is not shared by others. It also allows the resources removed from the resource pool dynamically.

The resource sharing technique not only increases the efficiency of computing resource it also ensures that at no point of time the resource will be left idle.

The user registration process is through on line; the security risk involved in the cloud is more anybody can interpret the packets transferred through INTERNET. Moreover the new password is sent through plain text mail and the password change also sent through mail, which is more vulnerable.

Security point of view grid is stronger than cloud. Grid uses GSI (Grid Security Infrastructure) mechanism to secure it’s users privacy inside grid environment, It basically uses X.509 based public key Infrastructure to ensure secured communication between different resources across grid and provides "single sing on" including credential delegation to other computing resources during computation that involves multiple resources.

The data transfer and every single activity in the grid is secured by PKI

**6. Managing Temporary spikes**

This is one of the important aspects in the growing INTERNET world especially for the applications hosted on the web. Let’s say you had deployed a web application which can actually serve 10000 users at a time, when the popularity of web site is increased more than 10000 users may try to access the site at the same. Definitely there will be a performance degradation to avoid such situations cloud offerers additional computing power without any manual intervention whenever there is a demand.

Grids doest not have a facility to add additional computing power during run time. As explained earlier the computing resources are static and are clearly defined before starting the computing. In fact they are reserved to run particular application.

The above image was taken from the Goggle’s popular tool called trend analyzer. It plots the graph based on the topic’s provided as an input. The X-axis shows the "Search Volumes" and the “News reference volume” .The Y-axis shows the "year": Here the graph is plotted by taking the cloud and the grid as an input.

The pointer A, B and D represents cloud and the pointer C represent Grid. The graph conveys that ‘search volume of the
cloud is always ahead of grid since from the starting expect of during the mid 2008’. On the other hand the news reference volume started increasing drastically during the end of 2008 and still continuing the same.

The results tell us that the cloud is getting familiarized among the INTERNET users and the contribution towards cloud is mounting day by day in the form of research on cloud oriented topics, developing tools for cloud and the companies adopting to the cloud.

Future of cloud

When the Microsoft windows azure and its counter part Google chrome is announced, the cloud came into the lime light and it has been firmly believed by most that the future of the computing is going to be around cloud. This will encourage more and more enterprise join hands with cloud.

Companies like Amazon, Salesforce, Gogrid,... are already providing the cloud based service, IT giants Intel, Yahoo and HP are tied up to deliver a virtual cloud computing center as part of this six data center’s will be open for selected scientist and researcher’s to test new applications. Among these six, three are from these companies itself and other three are Infocomm Development Authority of Singapore, the University of Illinois, and the Steinbuch Center for Computing in Germany. They encourage the researchers to come up with application that consumes huge computational power. On the other hand Yahoo had made tie up with world premier educational institutions for extensive survey and research on cloud computing.

Even if cloud invade the space of grid, the grid can still exists in the form of cloud yet. Some companies are deploying the cloud platform in the form of cloud. So there will not be any problem for the grid-based companies to adapt to the cloud.

Conclusion

The popular IT specialist predict that the future is undoubtedly belongs to cloud. In the forthcoming years the cloud based servicing companies will grow in numbers dramatically at the same time the companies which are not adopting the cloud and the companies which are continuing the traditional software services will shrink in numbers.

The adaptability of the cloud going to be highly based on the customer acceptance of the security mechanism provided by the cloud owner’s. It should be able to convince the user that the user data will be safe and cannot be read or altered by any third parties. The other factor that cannot be ignored is the billing structure; the billing matrix should be minimum and affordable by even small size business people.

References:

1. Dynamic Provision of Computing Resources from Grid Infrastructures and Cloud Providers: Constantino V’azquez, Eduardo Huedo, Rub’en S. Montero, Ignacio M. Llorente, Departamento de Arquitectura de Computadores y Autom´atica Facultad de Inform´atica, Universidad Complutense de Madrid, Spain
2. Cloud Computing and Grid Computing 360-Degree Compared
7. Sun gridE: https://grid.dev.java.net/

Watching the Cloud

- Forrester analyst Ted Schadler said a financial services firm migrated its employee portal to a cloud-based vendor and launched it in two months, while another firm he surveyed has spent the last 18 months building its employee portal in-house.
- Cloud computing revenue will soar faster than expected and will exceed $150 billion within five years, Gartner report predicts. Cloud-based business processes are the largest portion of the cloud services market, which includes advertising, e-commerce, human resources, and payments processing.
- Merrill Lynch estimates that By 2011 the volume of cloud computing market opportunity would amount to $160bn, including $95bn in business and productivity apps (email, office, CRM, etc.) and $65bn in online advertising.
Introduction

For many industrial and commercial enterprises, accomplishing key business goals, such as satisfying the customer, achieving time-to-market with products and services, or controlling costs, has direct implications on the way they choose to develop and use information technology and software systems for competitive advantage. In most of these cases, objects, component based development, and software reuse are key parts of their software engineering strategy [4].

Many mention reuse, architecture, and process– and domain-specific application development, they differ in their approach to reuse. In almost all cases of successful reuse, the keys were management support, system and component architecture, a dedicated component group, a stable application domain, and standard and organizational support [4]. There are many benefits to reusing components of systems. These include [12]:

- Increased quality
- Reduced time-to-market
- Increased productivity
- Reduced maintenance costs
- Increased customer responsiveness
- Reduced defects
- Reduced risks
- Rapid functional prototyping
- Leveraged technical expertise
- Increased integration

1. What Is Software Reuse?

   Software reuse at its most basic level consists of making use of any existing information, artifact or product when designing and implementing a new system or product.

   There are differing opinions as to which activities constitute genuine software reuse. For example, using a library routine for calculating square roots in several different programs is a good example of successful reuse, but calling that same routine many times within the same program does not technically constitute reuse [1]. Replication of an entire software program does not count as reuse. Reuse of assets is dependent upon both similarities and differences between the applications in which the component is being used [2].

   Many organizations already practice a limited form of reuse, for example, most developers have libraries of components that they have developed in previous projects, or they use standard libraries, which are available with many programming languages [5]. About 30% of the code is developed with this type of reusable components where the developer is simply using his own work from previous projects [6]. This is a very ad-hoc method of reuse, and while it will work very well on a small scale, for example an individual programmer or a small team, it will not be suitable for entire organisations [7]. Instead, there is a need to implement a systematic reuse program in order to gain the full advantages of reuse. Organisations need to have mature processes that are used throughout the company and metrics to measure the success of the reuse process. They need to understand how reuse can benefit the whole organisation and how they need to build a reuse program into their way of working.

2. What Can Be Reused?

   The definition of a reusable component is “any component that is specifically developed to be used, and is actually used, in more than one context” [5]. This does not just include code; other products from the system lifecycle can also be reused, such as specifications and designs [3], and even requirements on occasion [8]. ‘Components’ in this case can be taken to include all potentially reusable products of the system lifecycle, including code, documentation, design, requirements etc.
There are various criteria that should be satisfied in order for an asset to be successfully reusable. These are grouped into General, Functional and Technical requirements [2]. General requirements focus on aspects such as compliance with relevant standards, completeness, modularity and simplicity. All components should conform to the General requirements. Functional requirements include such concerns as which business processes it will simulate or automate, and how well it does this. Functional requirements mainly concern Vertical or Domain-specific assets and tend to be very specific to each information domain. Lastly, Technical requirements refer to criteria such as interoperability, portability, communication, security etc. [2].

There are different levels of reuse, which can be considered [3]. At the highest level, entire applications can be reused on different platforms provided they are portable. Sub-systems can be reused within different applications, possibly within different domains; for example, a login system could be used in a database application as well as a control application. At a lower level modules or objects can be reused, and at the very lowest level single functions can be reused. This is also known as classification of the granularity of components. Fine grained is used to describe those smaller and more generic components, for example file access functions, or I/O functions. Course grained is used for the more complex components, for example user-interface packages [5].

Reusable assets can be built in-house, retrieved from legacy systems or can be bought from an external source [9]. Many components are available free of charge from Universities or non-profit-making organisations as it is very difficult to make a profit selling generic components [5]. The provision of a repository of components is something, which must be considered before a company introduces a reuse programme as components may need to be adapted before they can be put into the repository [9].

**Reusable Artifacts**

As previously noted, software reuse encompasses more than just source code. Capers Jones [11] defines 10 software artifacts that are candidates for reuse:

1. **Project Plans:** The basic structure and much of the content (e.g. the SQA plan) of a software project can be reused. This reduces the time to develop the plan and the uncertainty associated with establishing schedules, risk analysis, and other features.

2. **Cost Estimates:** Because similar function is often implemented in different projects, it may be possible to reuse cost estimates for that function.

3. **Architecture:** There are relatively few distinct program and data architectures, even when different application domains are considered. It is possible to create a set of generic architectural templates (e.g. a transaction processing architecture) and use these as a framework for design.

4. **Requirements Models and Specifications:** Models and specifications for classes and objects are obvious candidates for reuse. In addition, artifacts of structured analysis (e.g. data flow, entity-relationship diagrams) can be reused.

5. **Designs:** The architecture, data, interface, class hierarchy of object-oriented design are commonly reused. As well, the architecture, data, interface and procedural design developed using structured methods are candidates for reuse.

6. **Source Code:** Verified program components written in compatible programming languages are candidates for reuse.

7. **User and Technical Documentation:** It is often possible to reuse large portions of user and technical documentation, even though the specific applications differ.

8. **Human Interfaces:** Probably the most widely reused software artifact, the benefits of GUI software reuse are significant as this can sometimes account for 60% of the code volume.

9. **Data:** Reusable data encompasses internal tables, lists, and record structures, as well as files and complete databases.

10. **Test Cases:** Whenever a design or code component is to be reused, the relevant test case should be “attached” to it.

**Types of Reuse**

There are three types of software reuse:

1. **Vertical or Domain reuse**
2. **Horizontal or General reuse**
3. **Product-line reuse**

**Vertical reuse**

Vertical reuse, significantly untapped by the software community at large, but potentially very useful, has far reaching implications for current and future software development efforts. The basic idea is the reuse of system functional areas, or domains, that can be used by a family of systems with similar functionality [13][15]. The study and application of this idea has spawned another engineering discipline, called domain engineering. Domain engineering is “a comprehensive, iterative, life-cycle process that an organization uses to pursue strategic business objectives. It increases the productivity of application engineering projects through the standardization of a product family and an associated production process”[14][15]. Which brings us to application engineering, the domain-engineering counterpart: “Application
engineering is the means by which a project creates a product to meet a customer’s requirements. The form and structure of the application engineering activity are crafted by domain engineering so that each project working in a business area can leverage common knowledge and assets to deliver a high-quality product, tailored to the needs of its customer, with reduced cost and risk”[14] [15]. Domain engineering focuses on the creation and maintenance of reuse repositories of functional areas, while application engineering makes use of those repositories to implement new products.

b. Horizontal Reuse

Horizontal reuse sometimes called General reuse refers to software components used across a wide variety of applications. In terms of code assets, this includes the typically envisioned library of components, such as a linked list class, string manipulation routines, or graphical user interface (GUI) functions. Horizontal reuse can also refer to the use of a commercial off-the-shelf (COTS) or third-party application within a larger system, such as an e-mail package or a word processing program. A variety of software libraries and repositories containing this type of code and documentation exist today at various locations on the Internet.

c. Product-line Reuse

A product line approach requires some different technical skills than traditional software development processes, along with many of the current familiar techniques, such as layered architectures, object-oriented programming, information hiding, and abstract interfaces. One “new” addition, an aspect of domain engineering, is domain analysis, which involves producing a domain model of the product line that identifies common members and allowable variations for each. Product line software architecture is built based on the domain model, the backbone for all current and future product line family members. Within the architecture, standard interfaces must exist, so that if a particular base component needs to be specialized for a specific customer, a specialized version will use the standard interfaces and be able to plug right into the global architecture. The biggest new technical challenge on a product line approach is the initial design of the software architecture for robustness towards potential future expansions, and its subsequent maintenance to deal with technology changes. The domain analysis and the design of the software architecture should be carried out by domain experts, people with experience and a solid understanding of the product line base [15].

5. Why Is Reuse Not Very Common?

There are many reasons why reuse is not very common in many organisations. One problem is that many managers cannot be convinced of the benefits of reuse until they are demonstrated in real projects, which of course cannot be done until it is introduced in the organisation [3]. There may be problems with starting to collate resources for the reuse repository, and with the categorising and indexing of them [10]. Managers may also feel that a reuse programme may lead to a loss of budget for them, due to the higher levels of productivity cited, or they may feel that a failure in the programme would involve their budget being used to deal with the problem. There are other considerations on the programmers side, for example, the not-invented-here issues where the developers may feel that they cannot trust the quality of the components, or a fear that the measurements being brought in to determine the success of the reuse programme, may be used to measure their performance as well [9].


The Reuse Business approach is targeted principally to organizations in which the development of mission-critical information systems and software products is key to their success. By business, it means both that the information technology and software engineering goals are key to accomplishing the enterprise business goals and that as a consequence, the software organization itself is operated as a business, with well-defined customer and financial objectives. As a reuse-driven software organization, this organization is engaged in producing multiple, related applications (a product line or product family), centered and optimised on the production and reuse of components. A software organization can achieve full success in transition to a reuse-driven business iff [4]:

- Produces related applications that are members of a product line or product family.
- willing to make a significant investment to build up reusable architectures, components, processes, and tools;
- Willing to make certain process and organizational changes.

**Incremental Transition Process**

Incremental reuse adoption is a collection of pragmatic guidelines, maturation models, and milestones that detail how a reuse organization can plan its incremental reuse evolution. The reuse research and practice community has learned that most successful reuse programs seem to naturally grow and mature through a series of distinct stages. At each stage new skills and activities are mastered by individuals and adopted by the organization. These include [4]:

- Black-box code reuse
- Library and work product management
- Architect components and systems
- Application and component engineering skills
- Reuse-oriented process and organization management
- New tools and technology.

Most reuse adoption approaches suggest starting small, with a subset of the organization, and once this proves successful, incrementally scaling to more of the organization and greater levels of reuse. Generally, the incremental, pilot-driven approach can show results sooner, confront problems sooner, contain risks more effectively, and begin with less investment [4].

7. Levels of Reuse

There are typically four levels of reuse that a company can be achieving. Which level an organisation is working at can...
indicate how mature their reuse processes are and what can be done to improve them, leading to the benefits.

The four levels of reuse are [7] [9]:

1) **Ad Hoc** - at this level engineers tend to reuse their own libraries and code fragments when they notice a similarity between the projects. Most organisations practice this level of reuse, even if they are not aware of it. There is no systematic reuse plan, and sharing of resources tends to occur accidentally or informally.

2) **Systematic Reuse** - a well-ordered process and co-ordinated planning drive this. Resources are allocated specifically for a reuse program and it is fully supported by the management.

3) **Domain-Oriented Reuse** - at this level the organizations focus on creating a library of reusable assets within the existing and future business domains. This allows the organizations to build up a repository of reusable components and therefore to be more competitive.

4) **Strategy-Driven (or Cultural) Reuse** - this is the highest level of reuse. Reuse helps to define the development of new products and processes. For example, a manager may ask, “how can I diversify in such a way which allows me to reuse as much as I can of the products we already produce?”. Reuse is accepted as part of the process of development, and should no longer require targets or incentives.

8. **Reuse Activities**

There are two main reuse activities - Development For Reuse and Development With Reuse. The difference between the two activities is that development for reuse is when new components are designed in order to be reused, and development with reuse is when existing components are made use of within a new system. Ideally the two activities should be carried out in conjunction with each other to create an environment of reuse within an organization. Early introduction of development for reuse can help to encourage the use of reuse driven development, as there will be a large store of products available for reuse within the company.

a. **Development with Reuse**

Development with reuse, or reuse driven development, is the activity of reusing components within a new system. It has been defined as “the search for, evaluation, adaptation and integration of existing components in a new context” [5]. Developers must consider the use of existing components at the design stage of the process rather than the implementation, as it is in other traditional engineering disciplines, for example, mechanical engineers design new engines from a stock of parts rather than designing the engine and then checking if any existing parts will be suitable [3].

Components should be thoroughly investigated to ensure that they suit the requirements and that they have appropriate test records and development documentation. Components need to be fully documented to facilitate easy searching, evaluation of the component, investigation, adaptation and integration. This means that a component must have three types of documentation: Engineering Documentation, Product Documentation and Maintenance Documentation. These will cover all aspects of the component from the development process through to the future evolution and maintenance [5].

To carry out reuse driven development successfully there are three conditions that an organization must fulfil. They must a) have sufficient resources which are easy to find and catalogue; b) have introduced standards which will ensure confidence in the components behaviour, and c) have associated documentation for the use of the user to help them understand the component [3].

The following process is proposed for development with reuse:

The process described above will allow the successful identification and adaptation of a component into a software system. First the requirements for the component must be identified, and a search made for existing components that satisfy these requirements. When a component has been located, it must be understood and potential adaptations noted in order for it to be easily compared with others. Once a suitable component has been selected from those located by the search, it should be adapted as necessary and integrated into the system. Finally, a report should be written on the adapted component in order to assist future users of the product. [5].

b. **Development for Reuse**

Development for reuse is the activity of designing new components with reuse in mind. It has been defined as “the planned activity of constructing a component for reuse in contexts other than the one for which it was initially intended” [5]. This makes them more

---

![Levels of Reuse Diagram](image)

**Fig.2: Levels of Reuse [7]**

![Process for Development with Reuse Diagram](image)

**Fig.3: Process for Development with Reuse [20]**

---
Difficult to design as the generic nature must be taken into account, and possibly a component designed to include excess functions which are not needed immediately but will improve the marketability of the product later on.

**Conclusion**

There are many benefits and a few costs associated with the introduction of a reuse programme into an organisation. There are the obvious direct costs for the set-up and maintenance of the software repository as well as the increased development costs to initially develop reusable components. However, these are far outweighed by the benefits which include enhanced productivity of developers leading to reduced development costs, reduced maintenance and testing costs due to the increased reliability of the software components, and therefore better quality software.

**References**


---

**Distilled Wisdom in Software Development**

“The addition of any function not visualized in the original design will inevitably degenerate structure. Repairs also, will tend to cause deviation from structural regularity since, except under conditions of the strictest control, any repair or patch will be made in the simplest and quickest way. No search will be made for a fix that maintains structural integrity.”


“[The need to minimize software cost] suggests that large-program structure must not only be created but must also be maintained if decay is to be avoided or postponed. Planning and control of the maintenance and change process should seek to ensure the most cost-effective balance between functional and structural maintenance over the lifetime of the program. Models, methods and tools are required to facilitate achieving such balance.”


Most computer technologists don’t like to discuss it, but the importance of beauty is a consistent (if sometimes inconspicuous) thread in the software literature. Beauty is more important in computing than anywhere else in technology... Beauty is important in engineering terms because software is so complicated... Beauty is our most reliable guide to achieving software’s ultimate goal: to break free of the computer, to break free conceptually. Software is stuff unlike any other... Software’s goal is to escape this gravity field, and every key step in software history has been a step away from the computer, toward forgetting about the machine and its physical structure and limitations -- forgetting that it can hold only so many bytes, that its memory is made of fixed size cells, that you refer to each cell by a numerical address. Software needn’t accept those rules and limitations. But as we throw off the limits, what guides us? How do we know where to head? Beauty is the best guide we have.


I think that it’s extraordinarily important that we in computer science keep fun in computing. When it started out, it was an awful lot of fun. Of course, the paying customer got shafted every now and then, and after a while we began to take their complaints seriously. We began to feel as if we really were responsible for the successful, error-free perfect use of these machines. I don’t think we are. I think we’re responsible for stretching them, setting them off in new directions, and keeping fun in the house. I hope the field of computer science never loses its sense of fun. Above all, I hope we don’t become missionaries. Don’t feel as if you’re Bible salesmen. The world has too many of those already. What you know about computing other people will learn. Don’t feel as if the key to successful computing is only in your hands. What’s in your hands, I think and hope, is intelligence: the ability to see the machine as more than when you were first led up to it, that you can make it more.

— Alan J. Perlis
I. Introduction

Detecting regions that correspond to moving objects in a video sequence plays a very important role in many computer vision applications. Object detection from video sequence is the process of detecting the moving objects in the frame sequence using digital image processing techniques. Moving object detection is the basis of moving object identification and tracking. Although a lot of studies have been conducted in recent years the subject is still challenging. Moving object detection becomes challenging due to several reasons such as

- Loss of information caused by the 3D world on a 2D image
- Noise in images
- Complex object motion
- Non-rigid or articulated nature of objects
- Partial or full object occlusions
- Complex object shapes
- Scene illumination changes

The survey we present here covers object detection algorithms appeared in the recent literature. We present taxonomy of object detection algorithms in which the algorithms are classified into five major categories. The advantages and disadvantages of the algorithms considered in the paper are tabulated. The performance comparison of the detection methods in terms of detection time, recognition rate and false positives are also presented. The rest of the paper is organised as follows. Section 2 presents a detailed study of recent moving object detection algorithms.

Advantages and disadvantages of various algorithms presented in the previous section is summarised in section 3. Performance analysis is presented in section 4 followed by conclusion and references.

II. Moving Object Detection Algorithms

Most of the object detection methods fall under the category of frame difference, background subtraction, statistical method and optical flow method. Taxonomy of the methods considered in the paper is presented in Figure 1. Various algorithms falls under each category are discussed in detail in the further subsections.

A. Frame difference

In this method a background image without any moving objects of interest is taken as the reference image. Pixel value for each co-ordinate (x, y) for each colour channel of the background image is subtracted from the corresponding pixel value of the input image. If the resulting value is greater than a particular threshold value, then that is a foreground pixel otherwise background. This method is simple and easy to implement, but the results are not accurate enough, because the changes taking place in the background brightness cause misjudgement.

A.1 An Improved Moving Object Detection Algorithm Based on Frame Difference and Edge Detection

A combined approach by Zhan Chaohui [1] is an efficient algorithm in which moving areas are detected...
by forming several small blocks of edge difference image and comparing the number of non-zero pixels to a threshold. The edge difference image is obtained by computing difference between two edge images. Canny edge detecting algorithm is used to detect the edges of continuous frames. Using the block-connected component labelling, the smallest rectangle containing the moving object can be obtained. It is possible to get the exact position of the moving objects by calculating connected components in binary images, delete those connected components whose area are so small and get circumference of the object. The improved moving object detection algorithm based on frame difference and edge detection has much greater recognition rate and higher detection speed than several classical algorithms.

A.2 A Moving Object Detection Algorithm for Smart Cameras

Yongseok Yoo [2] suggested a new frame differencing method for moving object detection using signed difference and Earth Mover’s Distance (EMD). First, a signed difference image is acquired by subtracting two consecutive frames while preserving the signs of the arithmetic subtraction. For each fixed blocks in the signed difference image, a motion pattern is calculated by EMD. The EMD is defined as the minimum total amount of cost to move piles of earth to holes until all the earth is moved or all the holes are filled. The neighbouring blocks are then linked to detect moving object regions. Signed difference method can reduce the fragmentation of object and pairing can reject false motions due to illumination change. However, it has no detection accuracy in practical video surveillance systems. EMD is used to analyze the pattern of motion from a difference image and detect moving objects.

The main idea behind this algorithm is to calculate matching costs for given directions separately rather than to calculate an exact EMD by linear programming. Search regions are restricted to node pairs satisfying spatial relations instead of searching for all possible combinations of node pairs in a give region. Here Block-based motion detection is used to locate moving object regions. An input image is divided into blocks of fixed size and pairing vectors are calculated for each block. Blocks with large pairing vectors indicate that there are motions in them. By combining these blocks, moving objects can be detected.

A.3 An Automatic Moving Object Detection Algorithm for Video Surveillance Applications

Xiaoshi Zheng [3] proposed an automatic moving object detection algorithm based on frame difference and region combination for video surveillance applications. Initially an automatic threshold calculation method is used to obtain moving pixels of video frames. After that, region combination is made successfully according to the proposed definition of the nearest distance. Frame difference is obtained by the absolute difference value of two frames. It can reflect the movements in the frames. Moving pixels and static background pixels can be distinguished by a threshold value. Morphological operations are used to obtain continuous moving regions. Some morphological operations can be performed to remove holes and isolated pixels of the mask.

In order to make all moving pixels continuous and filter isolated pixels, moving regions are obtained by morphological CLOSE operation. A moving object is always divided into several isolated regions. So combining moving regions is necessary, that is to say, two or more regions will be combined to one if they are near enough. Two or more regions are combined to one when the nearest distance of them is below a threshold. After combining near regions bigger regions are obtained. Different moving objects are labelled with different colour rectangles. When moving object appears and its region area is above a threshold, it can be considered as moving object and will be labelled out with rectangles.

B. Background Subtraction

In this method, the moving regions are detected by subtracting the current image pixel-by-pixel from a reference background image which was created by averaging
images over time in the initialization period. The pixels where the difference is above a threshold are classified as foreground otherwise it is background. After creating a foreground pixel map, some morphological post processing operations are performed to reduce the effects of noise and enhance the detected regions. The dynamic scene changes can be adapted in the algorithm by updating reference background image with new ones.

B.1 Real-time moving object detection for video monitoring systems

This method of moving object detection is based on the background subtraction for real time moving objects. In background subtraction method, the fixed reference background may be not applicable to the scene along with the illumination variation. Guanglun Li [4] proposes a new self-adaptive background approximating and updating algorithm for moving object detection. To obtain the correct shapes of the moving objects in every frame of the sequence, there are several steps. The subtraction of two consecutive frames provides the image and the subtraction of the current image and background model provides the image at each time. By using a temporal low-pass filter the background model is updated. The updating process is applied to all the pixels of the model. In order to cope with sudden light changes and leaves swings situation, finally AND/OR operators are applied to the images.

To guarantee reliable motion detection, the background image needs to be updated frequently. Using the first-order recursive filter the background model can be updated by integrating new incoming information to the current background image. The optimal threshold can eliminate the noise effect and minimize the false detection of the moving objects. Some morphological operations can be performed to remove tiny noise in the images and smooth the edge of objects. The moving object regions can extract accurately and completely by the self-adaptive threshold segmentation method.

C Frame difference and Background Subtraction

The combination of background subtraction and frame differencing can improve the detection speed and overcome the lack of sensitivity of light changes. Considering the pixels neighbouring relativity, the algorithm through the interval pixels establishment of Gaussian mixture model instead of the traditional point by point, establishes Gaussian mixture model in background subtraction. To extract a motion region, the differences between the current frame and its previous frame is calculated.

After getting the motion scene background by improved Gaussian mixture model, the foreground image is extracted. Foreground image was obtained by subtracting current image frame from background image. Symmetrical differencing is used to detect the undetected motion regions. At each position of the pixel, the foreground images which are achieved by using background subtraction and symmetrical differencing are processed by a logical OR operation to obtain an accurate foreground image. This method also effectively distinguishes moving shadow and moving object.

C.2 A Robust Moving Objects Detection Algorithm Based on Gaussian Mixture Model

Song Xuehua [6] proposed an algorithm, based on Gaussian Mixture Model to detect the moving objects. This method combines both the background subtraction and adjacent frame difference methods. Gaussian mixture model develops from single Gaussian background model. Its main idea is to define k Gaussian distribution models for each pixel point to describe it, that is to say, each pixel point contains k different states. In the process of detection, as long as the pixel point accords with one of the k Gaussian distributions, assuming that the pixel point is considered as background point; conversely, the pixel point is considered as object point.

Jeffrey’s divergence measure [7] is adopted to determine whether the background pixels are consistent with a known distribution. If the weight of distribution is very small, it is thought that the contribution to the background description is small, so the distribution can be removed from the background model. To determine whether there is moving object, focus should give on analyzing the differences between adjacent frames. In order to reduce disturbance caused by background noise, the background subtraction is used. For this purpose, the algorithm adopts an efficient dynamic learning method. This algorithm is the integration of adjacent frame difference and background subtraction. This method can deal with light changes and the disturbance in the background, and it is more robust.

D Background Updating

In background updating, the background of the selected pixels are replaced by the average of the current and background pixels, instead of directly replacing the background pixels with the current image pixels.

D.1 New Algorithm for Moving Object Detection

Vesna Zeljković [8] proposed a method to detect the moving objects in outdoor environments. This algorithm is based on an analytical parameter introduced in the shading model, background updating technique and window processing. The subtracting operation finds an absolute difference for each pixel, thus detecting moving objects, which usually differ from the background. If the difference is below a certain threshold, there is no change in the scene and the observed pixel is regarded as if it belongs to the background. Otherwise, there has been a change and the pixel belongs to the moving object.

The shading model change detection algorithm uses the ratio of intensities recorded in a region of the two frames to detect the change between the frames of the sequence. Illumination difference would cause significant changes in the ratio between corresponding pixels of background image and current picture. Instead of using the variance, a new coefficient is used to measure the ratio between average pixel value of the first frame when the moving object entered the scene and average pixel value of every current frame while the moving object is in the scene.

D.2 A Moving Object Detection Algorithm Based on Colour Information

X H Fang [9] suggested an algorithm to detect the moving objects based on colour information. This algorithm uses a pixel and its neighbours as an image vector to represent that pixel and model different chrominance component pixel as a mixture of Gaussians and set up different mixture model of Gauss for different YUV chrominance components. To make full use of the spatial information, colour segmentation and background model were combined.

The on-line K-means approximate algorithm of the maximum mean (EM), which was proposed by Stauffer et al [10], is applied to update the mixture of Gauss distribution parameters. A projection operation is applied to estimate every homogeneous region after colour image segmentation. The region considered as a moving region if most of the regions belong to moving region as dictated by background model algorithm other wise it is considered as background.
D.3 A Fast Algorithm for Moving Object Detection Based on Model Switching

Chunhui Zhao [11] proposed a method for moving object detection algorithm based on neighbour correlation kernel model and switching model. An average background technique is adopted to judge whether the pixel is a background or object. Background model based on neighbour correlation model is used here. The \( p(x) \) of current frame pixel \( x \) is estimated and a Gaussian function is selected as the kernel function. The probability density estimation of pixel \( x, P(x, y) \), based on its neighbour \( y \) is calculated. Information contribution of \( x \) based on \( y \) is defined as: \( I(x, y) \). There are many pixels, so the number of them can be supposed as \( m \). For these \( m \) pixels, there are \( m \) information contributions. Let \( I_1, I_2, \ldots, I_m \) denote these \( m \) information contributions and the self-contribution of \( x \) is defined as \( I_0 \). By using this \( I_0 \), the revise-self-contribution of \( x \) is defined as \( I'_0 \) and can detect the object by comparing this \( I'_0 \) with a threshold \( I_{th} \). If \( I'_0 > I_{th} \), it is an object otherwise it is the background.

E Cross Correlation

E.1 A Novel Approach to Detect and Track Moving Object using Partitioning and Normalized Cross Correlation

Manoj S. Nagmode [12] described a method to detect and track the moving objects by using Normalized Cross Correlation algorithm (NCC). This algorithm is based on finding the cross correlation between two consecutive frames in an image sequence. When the two consecutive frames are exactly same, the value of NCC will be a maximum and no moving object is detected. If there is a moving object in the image sequence, the value of NCC is less than maximum value obtained. Two consecutive frames from the image sequence are partitioned into four quadrants. Then moving object detection takes place after finding NCC between two partitioned frames. Moving object detection in video involves, verifying the presence of an object in image sequence and possibly locating it precisely for recognition.

F Other Approaches

F.1 Statistical Method

In statistical method, by comparing each pixel statistics with that of the background model, the foreground can be identified. Statistical method can overcome the disadvantages of background subtraction method. One example for statistical method is the W4 system [13] in which a statistical background model is used. Here if there is no moving object in any consecutive frames, each pixel can be represented with its minimum and maximum intensity values and maximum intensity difference. The noise in the detected foreground pixels can be removed by applying a single iteration of morphological erosion. To obtain the moving regions, connected component labelling can be applied to eliminate the small sized regions.

F.2 Optical Flow Method

In optical flow method flow vectors of moving objects are used to detect the moving regions. But these methods are complex and are not suitable for real time situation without any hardware.

III. Advantages and Disadvantages

Table 1 summarizes the advantages and Disadvantages of Different Moving Object Detection Algorithms

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Algorithm</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Algorithm based on FD &amp; Edge Detection</td>
<td>Higher recognition rate and Higher detection speed</td>
<td>False detection under complicated background</td>
</tr>
<tr>
<td>2.</td>
<td>Algorithm for Smart Cameras</td>
<td>Reject false motions due to illumination changes</td>
<td>Falsely detect specular reflections from moving objects</td>
</tr>
<tr>
<td>3.</td>
<td>Algorithm for Video Surveillance Applications</td>
<td>Automatic and efficient in moving object detection</td>
<td>Calculation is more complex</td>
</tr>
<tr>
<td>4.</td>
<td>Real-time moving object detection for video monitoring systems</td>
<td>Extract moving object regions accurately and completely</td>
<td>Processing time is strictly depends on the quantity of moving points and on the image dimension</td>
</tr>
<tr>
<td>5.</td>
<td>Algorithm Based on Improved Background Subtraction</td>
<td>Increased running efficiency and high detection accuracy</td>
<td>Object detected algorithm is complex</td>
</tr>
<tr>
<td>6.</td>
<td>Algorithm Based on Gaussian Mixture Model</td>
<td>Effectively deals with the light changes and disturbances in the background and it is more robust</td>
<td>Complexity of the algorithm is high</td>
</tr>
<tr>
<td>7.</td>
<td>Algorithm For Moving Object Detection</td>
<td>Effective detection at the time of varying illumination changes</td>
<td>Effectiveness and quality of moving object detection is not good</td>
</tr>
<tr>
<td>8.</td>
<td>Algorithm based on color information</td>
<td>Detect foreground completely when foreground texture and color are homogeneous.</td>
<td>Need improvements in real time capability</td>
</tr>
<tr>
<td>9.</td>
<td>Algorithm Based on Model Switching</td>
<td>Low false detection rate and better detection precision</td>
<td>Clarity of the detected object is not good</td>
</tr>
<tr>
<td>10.</td>
<td>Partitioning and Normalized Cross Correlation Algorithm</td>
<td>Poor lighting conditions giving better results</td>
<td>Average processing time per frame is high</td>
</tr>
</tbody>
</table>

References

- Zhan Chaohui, Duan Xiaohui, Xu Shouyu Song, Zheng Luo Min “An Improved moving Object Detection Algorithm Based on Frame Difference
Table 2: Performance of moving object detection methods. Ref. [1][12]

<table>
<thead>
<tr>
<th>Detection Methods</th>
<th>Detecting time/seconds</th>
<th>Recognition rate</th>
<th>False positives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame difference</td>
<td>38.08</td>
<td>92.9%</td>
<td>8</td>
</tr>
<tr>
<td>Background subtraction</td>
<td>90.34</td>
<td>98.4%</td>
<td>0</td>
</tr>
<tr>
<td>Frame difference and Edge election</td>
<td>1.873</td>
<td>99.2%</td>
<td>3</td>
</tr>
<tr>
<td>Normalized cross correlation (NCC)</td>
<td>7.65</td>
<td>95%</td>
<td>3</td>
</tr>
</tbody>
</table>


History of Hypertext

Based on the Wikipedia article


Recorders of information have long looked for ways to categorize and compile it. Early on, experiments with various methods for arranging layers of annotations around a document. The most famous example of this is the Talmud. Other reference works (for example dictionaries, encyclopedias) also developed a precursor to hypertext: the setting of certain words in small capital letters, indicating that an entry existed for that term within the same reference work. Sometimes the term would be preceded by an index, or an arrow. Janet Murray has referenced Jorge Luis Borges’ “The Garden of Forking Paths” as a precursor to the hypertext novel and aesthetic. “The concept Borges described in ‘The Garden of Forking Paths’—in several layers of the story, but most directly in the combination book and maze of Ts’ui Pen—is that of a novel that can be read in multiple ways, a hypertext novel. Borges described this in 1941, prior to the invention (or at least the public disclosure) of the electromagnetic digital computer. Not only did he invent the hypertext novel—Borges went on to describe a theory of the universe based upon the structure of such a novel.” - Wardrip-Fruin and Montfort.

Later, several scholars entered the scene who believed that humanity was drowning in information, causing foolish decisions and duplicating efforts among scientists. These scholars proposed or developed proto-hypertext systems predating electronic computer technology. For example, in the early 20th century, two visionaries attacked the cross-referencing problem through proposals based on labor-intensive, brute force methods. Paul Otlet proposed a proto-hypertext concept based on his monographic principle, in which all documents would be decomposed down to unique phrases stored on index cards. In the 1930s, H.G. Wells proposed the creation of a World Brain. Michael Buckland summarized the very advanced pre-World War II development of microfilm based on rapid retrieval devices, specifically the microfilm based workstation proposed by Leonard Townsend in 1938 and the microfilm and photoelectronic based selector, patented by Emanuel Goldberg in 1931. Buckland concluded: “The pre-war information retrieval specialists of continental Europe, the ‘documentalists,’ largely disregarded by post-war information retrieval specialists, had ideas that were considerably more advanced than is now generally realized.” But, like the manual index card model, these microfilm devices provided rapid retrieval based on pre-coded indices and classification schemes published as part of the microfilm record without including the link model which distinguishes the modern concept of hypertext from content or category based information retrieval.

The Memex

All major histories of what we now call hypertext start in 1945, when Vannevar Bush wrote an article in The Atlantic Monthly called “As We May Think”, about a futuristic device he called a Memex. He described the device as an electromechanical desk linked to an extensive archive of microfilms, able to display books, writings, or any document from a library. The Memex would also be able to create ‘trails’ of linked and branching sets of pages, combining pages from the published microfilm library with personal annotations or additions captured on a microfilm recorder. Bush’s vision was based on extensions of 1945 technology - microfilm recording and retrieval in this case. However, the modern story of hypertext starts with the Memex because “As We May Think” directly influenced and inspired the two American men generally credited with the invention of hypertext, Ted Nelson and Douglas Engelbart.

Ted Nelson coined the words “hypertext” and “hypermedia” in 1963 and worked with Andries van Dam to develop the Hypertext Editing System in 1968 at Brown University.
Search Engine Optimization (SEO) is the process of improving the volume or quality of traffic to a website from search engines via “natural” or un-paid (“organic” or “algorithmic”) search results as opposed to search engine marketing (SEM) which deals with paid inclusion. Typically, the earlier (or higher) a site appears in the search results list, the more visitors it will receive from the search engine. SEO may target different kinds of search, including image search, local search, video search and industry-specific vertical search engines. This gives a website web presence.

As an Internet marketing strategy, SEO considers how search engines work and what people search for. Optimizing a website primarily involves editing its content and HTML and associated coding to both increase its relevance to specific keywords and to remove barriers to the indexing activities of search engines.

The acronym “SEO” can refer to “search engine optimizers,” a term adopted by an industry of consultants who carry out optimization projects on behalf of clients, and by employees who perform SEO services in-house. Search engine optimizers may offer SEO as a stand-alone service or as a part of a broader marketing campaign. Because effective SEO may require changes to the HTML source code of a site, SEO tactics may be incorporated into web site development and design. The term “search engine friendly” may be used to describe web site designs, menus, content management systems, images, videos, shopping carts, and other elements that have been optimized for the purpose of search engine exposure.

Another class of techniques, known as black hat SEO or spamdexing, use methods such as link farms, keyword stuffing and article spinning that degrade both the relevance of search results and the user-experience of search engines. Search engines look for sites that employ these techniques in order to remove them from their indices.

Relationship with search engines

By 1997 search engines recognized that webmasters were making efforts to rank well in their search engines, and that some webmasters were even manipulating their rankings in search results by stuffing pages with excessive or irrelevant keywords. Early search engines, such as Infoseek, adjusted their algorithms in an effort to prevent webmasters from manipulating rankings.

Due to the high marketing value of targeted search results, there is potential for an adversarial relationship between search engines and SEOs. In 2005, an annual conference, AIRWeb, Adversarial Information Retrieval on the Web, was created to discuss and minimize the damaging effects of aggressive web content providers.

SEO companies that employ overly aggressive techniques can get their client websites banned from the search results. In 2005, the Wall Street Journal reported on a company, Traffic Power, which allegedly used high-risk techniques and failed to disclose those risks to its clients. Wired magazine reported that the same company sued blogger and SEO Aaron Wall for writing about the ban. Google’s Matt Cutts later confirmed that Google did in fact ban Traffic Power and some of its clients.

Some search engines have also reached out to the SEO industry, and are frequent sponsors and guests at SEO conferences, chats, and seminars. In fact, with the advent of paid inclusion, some search engines now have a vested interest in the health of the optimization community. Major search engines provide information and guidelines to help with site optimization. Google has a Sitemaps program to help webmasters learn if Google is having any problems indexing their website and also provides data on Google traffic to the website. Google guidelines are a list of suggested practices Google has provided as guidance to webmasters. Yahoo! Site Explorer provides a way for webmasters to submit URLs, determine how many pages are in the Yahoo! index and view link information.

Methods

Getting indexed

The leading search engines, such as Google and Yahoo!, use crawlers to find pages for their algorithmic search results. Pages that are linked from other search engine indexed pages do not need to be submitted because they are found automatically. Some search engines, notably Yahoo!, operate a paid submission service that guarantee crawling for either a set fee or cost per click. Such programs usually guarantee inclusion in the database, but do not guarantee specific ranking within the search results. Two major directories, the Yahoo Directory and the Open Directory Project both require manual submission and human editorial review. Google offers Google Webmaster Tools, for which an XML Sitemap feed can be created and submitted for free to ensure that all pages are found, especially pages that aren’t discoverable by automatically following links.

Search engine crawlers may look at a number of different factors when crawling a site. Not every page is indexed by the search engines. Distance of pages from the root directory of a site may also be a factor in whether or not pages get crawled.

Preventing crawling

To avoid undesirable content in the search indexes, webmasters can instruct spiders not to crawl certain files or directories through the standard robots.txt file in the root directory of the domain. Additionally, a page can be explicitly excluded from a search engine’s database by using a meta tag specific to robots. When a search engine visits a site, the robots.txt located in the root directory is the first file crawled. The robots.txt file is then parsed, and will instruct the robot as to which pages are not to be crawled. As a search engine crawler may keep a cached copy of this file, it may on occasion crawl pages a webmaster does not wish crawled. Pages typically prevented from being crawled include login specific pages such as shopping carts and user-specific content such as search results from internal searches. In March 2007, Google warned webmasters that they should prevent indexing of internal search results because those pages are considered search spam.

Increasing prominence

A variety of other methods are employed to get a webpage shown up at the search results. These include:

- Cross linking between pages of the same website. Giving more links to main pages of the website, to increase PageRank used by search engines. Linking from other websites, including link farming and comment spam. However, link spamming can also have a bad impact on your search result position.
- Writing content that includes frequently searched keyword
White hat versus Black hat

SEO techniques can be classified into two broad categories: techniques that search engines recommend as part of good design, and those techniques of which search engines do not approve. The search engines attempt to minimize the effect of the latter, among them spamdexing. Some industry commentators have classified these methods, and the practitioners who employ them, as either white hat SEO, or black hat SEO. White hats tend to produce results that last a long time, whereas black hats anticipate that their sites may eventually be banned either temporarily or permanently once the search engines discover what they are doing.

A search engine optimization technique is considered white hat SEO if it conforms to the search engines’ guidelines and involves no deception. We can say the legal SEO is a white hat. As the search engine guidelines are not written as a series of rules or commandments, this is an important distinction to note. White hat SEO is not just about following guidelines, but is about ensuring that the content a search engine indexes and subsequently ranks is the same content a user will see. White hat advice is generally summed up as creating content for users, not for search engines, and then making that content easily accessible to the spiders, rather than attempting to trick the algorithm from its intended purpose. White hat SEO is in many ways similar to web development that promotes accessibility, although the two are not identical.

Black hat SEO attempts to improve rankings in ways that are disapproved of by the search engines, or involve deception. One black hat technique uses text that is hidden, either as text colored similar to the background, in an invisible div, or positioned off screen. Another method gives a different page depending on whether the page is being requested by a human visitor or a search engine, a technique known as cloaking. Invisible iframes are yet another black hat SEO technique, where a page you see is not necessarily from the company that is hosting that webpage. People create these types of pages in order to download software on your computer in the background without your knowledge.

Search engines may penalize sites they discover using black hat methods, either by reducing their rankings or eliminating their listings from their databases altogether. Such penalties can be applied either automatically by the search engines’ algorithms, or by a manual site review. Infamous examples are the February 2006 Google removal of both BMW Germany and Ricoh Germany for use of deceptive practices, and the April 2006 removal of the PPC Agency BigMouthMedia. All three companies, however, quickly apologized, fixed the offending pages, and were restored to Google’s list.

As a marketing strategy

Eye tracking studies have shown that searchers scan a search results page from top to bottom and left to right (for left to right languages), looking for a relevant result. Placement at or near the top of the rankings therefore increases the number of searchers who will visit a site. However, more search engine referrals does not guarantee more sales. SEO is not necessarily an appropriate strategy for every website, and other Internet marketing strategies can be much more effective, depending on the site operator’s goals. A successful Internet marketing campaign may drive organic traffic to web pages, but it also may involve the use of paid advertising on search engines and other pages, building high quality web pages to engage and persuade, addressing technical issues that may keep search engines from crawling and indexing those sites, setting up analytics programs to enable site owners to measure their successes, and improving a site’s conversion rate.

SEO may generate a return on investment. However, search engines are not paid for organic search traffic, their algorithms change, and there are no guarantees of continued referrals. (Some trading sites such as eBay can be a special case for this, it will announce how and when the ranking algorithm will change a few months before changing the algorithm). Due to this lack of guarantees and certainty, a business that relies heavily on search engine traffic can suffer major losses if the search engines stop sending visitors. It is considered wise business practice for website operators to liberate themselves from dependence on search engine traffic. A top-ranked SEO blog Seomoz.org has suggested, “Search marketers, in a twist of irony, receive a very small share of their traffic from search engines.” Instead, their main sources of traffic are links from other websites.

International markets

Optimization techniques are highly tuned to the dominant search engines in the target market. The search engines’ market shares vary from market to market, as does competition. In 2003, Danny Sullivan stated that Google represented about 75% of all searches. In markets outside the United States, Google’s share is often larger, and Google remains the dominant search engine worldwide as of 2007. As of 2006, Google had an 85-90% market share in Germany. While there were hundreds of SEO firms in the US at that time, there were only about five in Germany. As of June 2008, the market share of Google in the UK was close to 90% according to Hitwise. That market share is achieved in a number of countries.

As of 2009, there are only a few large markets where Google is not the leading search engine. In most cases, when Google is not leading in a given market, it is lagging behind a local player. The most notable markets where this is the case are China, Japan, South Korea, Russia and Czech Republic where respectively Baidu, Yahoo! Japan, Naver, Yandex and Seznam are market leaders.

Successful search optimization for international markets may require professional translation of web pages, registration of a domain name with a top level domain in the target market, and web hosting that provides a local IP address. Otherwise, the fundamental elements of search optimization are essentially the same, regardless of language.
The International SciPy Conference 2009 was held at Technopark, Trivandrum, Kerala, during 12-13 December 2009. This was the first time SciPy was being held in India. The full event consisted of 6 days including Tutorials (14-15 Dec) and a sprint (16-17 Dec). The event was organized by the Free and Open Source Software in Science and Engineering Education (FOSSEE) project, IIT Bombay, and Society for Promotion of Alternative Computing and Employment (SPACE). It was co-organized by IC-FOSS, Government of Kerala; and SIG-FOSS of the Computer Society of India. The event targeted teachers of engineering and science colleges around the country.

Inaugurating the event, Dr Travis Oliphant, Vice President of Enthought Inc. (USA), appreciated the initiative taken by the Free Software Community in Kerala and India in organising SciPy in India. He traced the history of SciPy and the contributions of programmers over the last decade. He spoke about the potential of SciPy and hoped that India would contribute significantly to its evolution.

R Narayanan, former Vice-President, TCS, presided over the inaugural function. He noted how the programming paradigm had changed over the years with the advent of high level programming languages. These paradigms have made programming easier and accessible to people from various disciplines, he said.

Jarrod Millman, Director of Computing for UC Berkeley’s Neuroscience Institute gave a short introduction to the conference. Prof. Elizabeth Sherly, Director-Acting, IIITM-K offered felicitations. Dr. V Sasi Kumar, Coordinator, SPACE, welcomed the participants and Dr. Prabhu Ramachandran, IIT Bombay, gave a vote of thanks.

Over 170 delegates including teachers, students and practitioners from all over the country attended the conference.

Asokan Pichai, Dr Travis Oliphant, Jarrod Millman, Dr Prabhu Ramachandran, Prof. Kannan, Moudgalya Chandrasekhar Kaushik, Praneeth Bodduluri, Suryajith Chilirala, Debyan Banerjee, Abhishek Pathak, Senthil Kumaran, Kumaran M, Chris Burns, David Courmapeau, Farhat Habib, Akshay Srinivasan and Deepak Nath presented papers at the conference.

**Tutorials (14-15 Dec 2009)**

Tutorials were aimed at people who wanted to use NumPy/SciPy for their scientific and numerical computation to solve scientific and engineering problems in their domains.

Session 1 by Asokan Pichai started with a tutorial on how to use Python for all plotting needs. Rather than introducing Python as another high level language, the first day’s sessions focussed on introducing it as a problem solving tool. Session 2 was on plotting experimental data using Python.

On the second day of tutorials, Python was introduced as a programming language rather than just a problem solving tool. Delegates were made familiar with the basic as well as the advanced levels of programming using Python.

To add fun to the tutorials, a quiz was conducted among the delegates. Winners were selected from teachers, students and professionals.

**Sprint (16-17 Dec 2009)**

The sprint held on the last two days of the conference demonstrated ways in which the community could contribute to maintaining and extending the Python tools. It showed participants how they could contribute to scipy/numPy, hack on it, extend it, and fix bugs.
The International Conference on Millennium Development Goals (MDG) – Role of ICT and other appropriate technologies (MDGICT 2009) was held on December 27 – 29, 2009 in the RMK. Engineering College campus in Chennai, India. The conference was organized by the RMK and RMD Engineering colleges in association with Anna University-Chennai, Tata Consultancy Services (TCS), Computer Society of India (Students Chapter and Div II - Software) and IEEE.

Dr. Srikanta K.Panigrahi, Adviser to the Prime Minister on National Strategic Knowledge Mission on Climate Change was the Chief Guest who inaugurated the conference and gave the key note address (Picture 1). The Guest of Honors were Dr. P. Mannar Jawahar, Vice Chancellor of Anna University, Chennai and Mr. A. Srinivasan, Vice President, TCS.

MDG refers to the 8 goals set up United Nations that respond to the world’s main development challenges and are to be achieved by 2015. The objective of the Conference was to bring together all the stakeholders and people involved in these areas for an exchange of ideas and for charting future course of action.

Dr. Srikanta K. Panigrahi said “We are now at the mid-point between the adoption of MDGs and the 2015 target date. So far, our collective record has not been great. Even today, 1.1 billion people do not have access to clean drinking water and 30,000 children die every day of preventable causes. One in four children born today will not reach the age of five.” According to him, rural areas of developing countries hold the key to attainment of the goals.

He emphasized that Information and Communication Technologies (ICTs) and clean energy technologies can play a crucial role through facets such as e-governance, rural banking, safe drinking water and disaster mitigation. “Engineering students must understand that education is not about bookish and theoretical knowledge. They must help create real change in society.”

Dr. P. Mannar Jawahar, said that technology must be used as a leverage to improve the quality of life of people at the bottom of the pyramid. “The time has come to remind our scientists and engineers, especially our students, of their responsibility towards ensuring the achievement of MDGs, with the vast resources and opportunities that science and technology has put in their hands,” he said.

Mr. R.S.Munirathinam, founder and chairman, RMK Group of Institutions, Mr.R.M.Kishore, Vice Chairman and Mr. Yalamanchi Pradeep, Secretary spoke.

Other dignitaries who spoke in the Inaugural function included Dr. V. Ramachandran, Vice Chancellor, Anna University, Trichy, Dr. M. S. Palanichamy, Former Vice Chancellor, Tamilnadu Open University, Dr. Sadiq, Former Vice Chancellor, Madras University, Dr. Daniel Chandran, University of Technology, Sydney, Australia. And Mr. A.K.Pattabiraman of TCS.

Dr. Daniel Chandran, University of Technology, Sydney, Australia, Co-chair of the Conference made a presentation on the Millennium Development Goals and the theme of the Conference.

Dr. K. Chandrasekaran, Dean of RMKEC and
Conference Plenary Sessions Chair briefed on the background of the conference and about the Invited and special lectures planned. Dr. A. Jagadeesh, Head of R&D, RMKEC and Conference Co-chairman and Prof. M. Somasundaram, Conference Organizing Secretary briefed about the technical sessions planned. Prof. K. A. Mohamed Junaid, Vice Principal, gave a vote of thanks.

**Exhibition:**

Exhibition stalls had been set up wherein organizations like Tata Consultancy Services, M S Swaminathan Research Foundation (MSSRF), DHAN Foundation, National Agro Foundation, Rotary Foundation etc. showcased how they have used technology to address social development applications like Village Knowledge Centers using computers and satellite communications, Computer based Literacy Programs, Mobile applications for farmers and fishermen, Low cost water purifier etc.

**Students Contests:**

In connection with the conference, essay competitions had been held earlier for college students on the topic of ‘Innovative Solutions for addressing MDGs’, and for school students on the topic of ‘How can I contribute as an individual towards addressing MDGs’. 20 winners were given awards in the inaugural function. The students had set up poster displays of their winning ideas in the exhibition stalls.

**Gandhian Engineering:**

On the advice of Dr. R. A. Mashelkar, Former Director General of Council of Scientific and Industrial Research (CSIR), and the Chairman of National Innovation Foundation, India, a panel discussion was held. Dr. K. Chandrasekaran, Dean, RMKEC was chairing the session. He gave a briefing on the Gandhian Engineering and initiated the panel discussion. Dr. Sadiq, Mr. A.K.Pattabiraman, TCS, Mr. S. Ramasamy, Chairman, CSI Chennai Chapter, and Dr.A.Jagadeesh, Head of R&D, RMKEC actively participated with each of them sharing their thoughts. Mahatma Gandhi took on the might of the British Empire by mobilizing millions of people by a different strategy of following Ahimsa and Swadeshi as his weapons. His strategy fulfilled all the criteria of innovation. The panelists discussed the applicability and challenges of this strategy for addressing all social issues and meeting the MDGs.

**Invited speeches:**

Special invited speeches were delivered by
- Dr. Hari Srinivas, Coordinator, Global Development Research Center (GDRC), Japan,
- Dr. C. S. Ramachandran, Rotary International, Past District Governor,
- Dr. Sai Baba, Head of the Scientific Information Resources Division, Strategic & Human Resources Planning Section and the Training School at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam ,Indira Gandhi Center for Atomic Research, Chennai,
- Dr. P. Balasubramanian, Senior Technical Director, Open Technology Centre, National Informatics Center (NIC), Govt. of India, Chennai,
- Dr. A. Jagadeesh, Head, R&D, RMKEC
- Prof. Paul Nieuwenhuysen of University of Brussels, Belgium and
- Dr. Madhu Viswanath of University of Illinois, Urbana-Champaign, USA

Other invited dignitaries who made technical paper presentations were:
- Ms Ganga Vidya, Coordinator, Grameen Gyan Abhiyan (GGA) Secretariat (Mission 2007), M.S.Swaminathan Research Foundation (MSSRF), Chennai
- Mr J Srinath, Principal Scientist, M S Swaminathan Research Foundation (MSSRF), Chennai
- Dr. Gangadharan, Faculty, Institute for Financial Management & Research (IFMR), Chennai

**Technical Tracks:**

40 papers were presented in the 3 parallel tracks of Technical paper presentation sessions covering many wide ranging topics. The sessions were chaired by Dr. K. Rameshwaran, Principal, RMKEC and Dr. K. Sivaram, RMDEC and other dignitaries from academia, research and industry.

- The Infrastructure Management Track sessions covered topics like Rural Healthcare, Rural electrification, Agricultural extension through Knowledge centers and renewable energies.
- The Management Track sessions covered topics like Use of Mobile technology for e Governance, Mobile banking in rural India, and role of ICT in literacy and education.
- The Technology track sessions covered topics like enabling technologies of communications and network, data mining and image processing.

**Valedictory Function:**

Dr. H K Suhas, Member-Technical, E-Committee, Deputy Director General-NIC (Retd.), was the Chief Guest who participated in the valedictory function and gave a key note address. Delegates and speakers from abroad were honored in the function. Organizations which had set up exhibition stalls were honored and certificates were distributed to them by the Chief Guest.

**Conclusion:**

The discussions and knowledge sharing among the stakeholders were very useful and many key participants had suggested to organize this event regularly to effectively address MDGs jointly. The conference was a good platform for creating awareness and interest to students who have initiated joint technology development projects with some of the organizations who participated.

---

**Brian Russell’s Laws of Software Relativity**

(cf. Belady and Lehman’s Laws of Software Evolution)

1. As a software project approaches release, its mass increases.
2. The energy required to release a software project is inversely proportional to the time before a scheduled release.
3. It takes infinite energy to release a finished product on time; therefore, all software projects are both incomplete and late.
4. Time is relative to the observer of a software project. The last month of development appears to an outside observer to take a year.
5. If a software project becomes too large, it will collapse into a black hole. Time and money are absorbed but nothing ever comes out.
CSI Calendar 2010

February 2010
The 3rd Workshop on Automotive Software Engineering,
Date: 19-20 February 2010, VIT University Vellore
Organized by: TIFAC-CORE in Automotive Informatics and CSI Vellore Chapter
For details contact: hrvishwakarma@vit.ac.in, kganesan@vit.ac.in

NCISE-10:
2nd National Conference on Information and Software Engineering
Date: 26-27, February 2010, Chennai
Organized by: Department of Information Technology, Aarupadai Veedu Institute of Technology, Vinayaka Missions University in association with Div II (Software) - Computer Society of India, IEEE Computer Society - Madras Chapter, IEEE Computer Society Branch Chapter - AVIT.
For details contact: Dr. A Anthony Irudhayaraj, Program Chair - NCISE-10 at ncise2010@gmail.com OR Mr. H R Mohan, Chair, Div II at hrmohan@gmail.com Website: www.avit.ac.in

March 2010
LIIT-2010:
National Conference on Latest Issues in Information Technology - 2010
Date: 1st Mar 2010 at RMD Engineering College, Chennai.
Organized by: Dept. of Information Technology, RMD Engineering College and supported by CSI Div II & Chennai Chapter, IEEE Computer Society - Madras Chapter.
For details contact: Organizing Secretary at rmdliit2010@gmail.com Phone: (044) 27925910 OR Mr. H.R. Mohan, Chair, Div II at hrmohan@gmail.com. Web site: http://www.rmd.ac.in

ConfER-2010:
The 3rd National Conference on Education and Research
Date: 6-7 March 2010, JET Guna (MP)
Host: Jaypee Institute of Engineering & Technology
For details contact: hrvishwakarma@vit.ac.in, dr.vipin.tyagi@gmail.com

National Conference on Innovation and Entrepreneurship in Information & Communication Technology
Date: 12-13 March 2010
Venue: GNIT Girls Institute of Technology
Organized by: CSI Ghaziabad Chapter & GNIT Girls Institute of Technology
For details contact: Dr. Anil Pandey • Mobile: 98711 71695 OR Vijay Rastogi

April 2010
CSI Radiance 2010:
Seminar on Radical Innovation in Academics for Next-generation Computing Education
Date: 6 April 2010, VIT University, Vellore
Organized by: CSI VIT Student Branch
For details contact: gjagadeesh@vit.ac.in, pswarnalatha@vit.ac.in

ICEG 2010:
The 7th International Conference on e-Governance
Date: 22-24 April 2010
Organized by: Indian Institute of Management Bangalore, IIM Bangalore
Co-hosted: CSI-SIGe-GOV
For details contact: Dr. Ashok Agarwal, CSI-SIGeGov Chair. Tel.: 9848053024. Email: agarwal.ashok.k@gmail.com

NCSVSCOM-10:
3rd National Conference on VLSI, Embedded Systems, Signal Processing and Communication Technologies
Date: 2-3, Apr 2010 at Chennai
Organized by: Department of Electronics & Communications Engineering, Aarupadai Veedu Institute of Technology, Vinayaka Missions University and supported by Div II (Software) & Div IV (Communications) - Computer Society of India, IEEE Computer Society - Madras Chapter.
For details contact: Mr. R Vijaya Arjunan, Organizing Secretary - NCSVSCOM-10 at ncsvscom2010@gmail.com Ph: 9943368609 OR Mr. H.R. Mohan, Chair, Div II at hrmohan@gmail.com Website: www.avit.ac.in

May 2010
IFIP Networking 2009 - Conference
Date: 10-14, May 2010
Venue: Indian Institute of Technology Madras, Chennai, India
For details contact: Prof. S V Raghavan. Email: svr@cs.iitm.ernet.in

June 2010
ICAET-10:
International Conference on Advances and Emerging Trends in Computing Technologies
Date: 21 – 24, June 2010 at Chennai, India
Organised by: School of Computer Science & Engineering, SRM University in association with University of Arkansas, Little Rock, USA, Div II & Div IV, Computer Society of India, IEEE Computer Society, Madras Chapter.
For details contact: Dr. S Chellaiah, Conference Chair ICAET-10 at icaet10@srmuniv.ac.in OR Mr. H.R. Mohan, Chair, Div.II at hrmohan@gmail.com Website: http://www.srmuniv.ac.in/events.php?page=icaet10

AutInfo-2010:
National Conference on Automotive Informatics
Date: 24-26 June 2010
Organized by: TIFAC-CORE in Automotive Informatics and CSI Vellore Chapter
For details contact: hrvishwakarma@vit.ac.in, kganesan@vit.ac.in

November 2010
45th Annual Convention
Date: 25-27 Nov. 2010, Mumbai
Venue: Mumbai
Host: CSI Mumbai Chapter
For details contact: www.cgi-2010.org

Prof. P. Thirumurthy
Vice President & Chair, Conference Committee, CSI
Background

AI has always been a research-rich field with a number of challenging and practically significant problems spanning many areas. These include language processing, multiagent systems, web mining, information retrieval, semantic web, elearning, optimization problems, pattern recognition, etc. AI, hence, can offer a wide range of challenging problems matching the palate of every academic or professional. However, most colleges and universities do not have experienced AI researchers to work in these areas.

We also observe an increasing interest among the Indian academia to pursue research, usually aimed at PhD. However, lack of guides with rich research experience often makes it hard for new and aspiring research scholars to identify relevant and useful research topics and to get guidance on their approach and direction. A forum where those pursuing research can exchange ideas and seek guidance, and those seeking to get into research can get a feel of current research would be valuable for both groups.

This is the backdrop driving SIGAI to organize a workshop of this nature.

Proposed Structure of Workshop

It will be a one day programme consisting of

- Invited talks covering current trends, specific challenges, etc in AI.
- Invited talks on mentoring research scholars on publication, research methodology, etc.
- Presentations by those currently pursuing research in AI area. We will have a panel of experienced researchers to evaluate and mentor the research presentations.

Call for Papers

For the research presentations, we are now inviting brief research papers of 5 to 6 pages, outlining the problem being addressed, approach followed vis a vis existing approaches, current status/results, and future plans. A subset will be short listed for presentation, based on a formal review process. Papers must have significant AI content to be considered for presentation. Relevant topics include (but are not limited to):

- Knowledge Representation Reasoning
- Model-Based Learning Expert Systems
- Data Mining State Space Search
- Cognitive Systems Vision & Perception
- Intelligent User-Interfaces Reactive AI
- Evolutionary Computing Artificial Life
- Uncertainty in AI Machine Learning
- Constraint Satisfaction Ontologies
- Natural Language Processing Pattern Recognition
- Intelligent Agents Soft Computing
- Planning & Scheduling Neural Networks
- Case-Based Reasoning

Target Audience

Target audience will be primarily:

- Faculty members pursuing research involving AI as the base or as a tool for an application.
- Faculty members interested in pursuing research and exploring areas / options.
- Research scholars working for a postgraduate degree.
- Students seriously interested in research, specifically on AI.

Important Dates

- Last date for paper submission : 10th March, 2010
- Acceptance intimation : 25th March, 2010
- Camera ready copy due : 05th April, 2010

Contact

ERTAI Secretariat
CDAC Mumbai (formerly NCST), Rain Tree Marg, Sector 7, Near Bharti Vidyapeeth, Opp. Kharghar Railway Station, CBD Belapur, Navi Mumbai – 400614 Maharashtra, India
Email: csi.sigai@gmail.com
Web: http://sigai.cdacmumbai.in

CSI Special Interest Group on AI (SIGAI)
Convenors: Prof PVS Rao and Dr S Ramani.
Secretary: Dr M Sasikumar.
CSI-IEEE MoU – The Highlights and Roadmap Ahead

Report Prepared by: Prof. H R Vishwakarma, CSI National Student Coordinator

Prelude:
An extraordinary milestone in the international collaboration was achieved on 29th August 2009 in Bangalore when the Institute of Electrical and Electronics Engineers, Inc. (IEEE), founded in May 1884 and Computer Society of India (CSI), founded in 1965 entered into an agreement paving the way to encourage the exchange and dissemination of technical information, and to promote understanding and cooperation among members of these nonprofit organizations. As a supplement to the above agreement, the IEEE Computer Society also entered an agreement with the Computer Society of India. The IEEE Computer Society is the world’s leading organization of computing professionals. Founded in 1946, and the largest of the IEEE societies, it is dedicated to advancing the theory and application of computer and information-processing technology.

The MoU copies were exchanged by Dr. John Vig, the IEEE President and Prof. H.R. Vishwakarma on behalf of Computer Society of India during the IEEE India Council meeting held on 29th August 2009, Bangalore. Prof. Rangchar Kasturi (IEEE India Initiative Chair), Prof. S. Ramani, Fellow and Past President of CSI, Prof. S. Sadagopan (Director, IIIT-Bangalore and IEEE CS Bangalore Chair), and Mr. Satish Babu (IEEE CS Asia-Pacific Coordinator-CAB) graced the occasion along with and the IEEE India council members present.

The Highlight of MoU:
This international collaboration is aimed towards improving technical value content to CSI members. It will provide a unique opportunity of networking among academicians, researchers and professionals at international level. The scope of this understanding includes – preferential membership development, joint technical conferences and standards development, coordination of technical meetings, cooperation in technical publications, continuing education programmes, and sharing of learning resources. The agreement is valid for the period July 2009 to December 2012. The terms and tenure can be amended upon mutual consent of the IEEE and CSI. The IEEE and CSI may, subject to agreement on specific items, enter into joint projects, events, and products such as conferences, forums, publications, history, standards, educational materials, awards, etc. The following are the salient points of the MoU

1. Membership
   • A reciprocal 10% discount on the basic membership payments will be allowed on CSI
For the first time in history, all the significant literary, artistic, and scientific works of mankind can be digitally preserved and made freely available, in every corner of the world, for our education, study, and appreciation and that of all our future generations.

Up until now, the transmission of our cultural heritage has depended on limited numbers of copies in fragile media. The fires of Alexandria irrevocably severed our access to any of the works of the ancients. In a thousand years, only a few of the paper documents we have today will survive the ravages of deterioration, loss, and outright destruction. With no more than 10 million unique book and document editions before the year 1900, and perhaps 100 million since the beginning of recorded history, the task of preservation is much larger. With new digital technology, though, this task is within the reach of a single concerted effort for the public good, and this effort can be distributed to libraries, museums, and other groups in all countries.

Existing archives of paper have many shortcomings. Many other works still in existence today are rare, and only accessible to a small population of scholars and collectors at specific geographic locations. A single wanton act of destruction can destroy an entire line of heritage. Furthermore, contrary to the popular beliefs, the libraries, museums, and publishers do not routinely maintain broadly comprehensive archives of the considered works of man. No one can afford to do this, unless the archive is digital.

Digital technology can make the works of man permanently accessible to the billions of people all over the world. J.N. Tata and other great philanthropists, and visionary information scientist like Dr. S R Ranganathan, in past centuries have recognized the great potential of public libraries to improve the quality of life and provide opportunity the citizenry. A language independent digital library, widely available through free access on the Internet, will improve the global society in ways beyond measurement.

The technological advances today make it possible to think in terms of storing all the knowledge of the human race in digital form by the year 2008.
CSI-BCS MoU - The Highlights and Roadmap Ahead

Report Prepared by: Prof. H R Vishwakarma, CSI National Student Coordinator

The Computer Society of India, the first and the largest Indian IT professional society, achieves another milestone in the international collaboration when it enters into an MOU with the British Computer Society to promote wider social and economic progress the advancement of information and communication technology (ICT), education and research, dissemination of technological developments, and to facilitate collaboration and cooperation among the members of these societies. A few months ago, the CSI also entered into an MoU with the IEEE on 29th August 2009, in addition to the CSI being key member of IFIP and SEARCC.

The Highlights of the MoU

The Memorandum of Understanding (MoU) between the Computer Society of India and the British Computer Society was signed by the CSI President Mr. S Mahalingam and the BCS International Director Michiel van der Voort in the presence of CSI Senior officials and invitees from academia, industry and Govt. on Jan. 18, 2010.

The MoU aims at strengthening Academia-Industry-Government cooperation and enhancing value proposition to the members and stakeholders through the following:
(a) Memberships Development and Member-to-Member networking
(b) Conferences, Seminars, and Technical Meetings
(c) Research Studies and Standards Development
(d) Publications – Journals, Books, Technical Reports, Online Resources
(e) Continuing Education and Professional Education Programmes

Michiel Van der Voort, Executive Director, International, at the Institute said, “BCS, as the Institute for Chartered IT around the world is pleased to see its world-leading qualifications and courses recognised and incorporated into CPD programmes by the Computer Society of India. IT is a global industry and it is important that standards of competence and achievement reach beyond individual countries’ boundaries to enable the information society for all citizens.”

Mr. Seturaman Mahalingam, President of the Computer Society of India, said, “This understanding marks an important moment in the story of the Indian IT industry and its successful knowledge economy. India exports software and services to 95 countries around the world. This collaboration will provide enhanced benefits for our members, who will be secure in the knowledge that the courses and professional development sourced through us will be recognized around the globe.”

The MoU was an outcome of efforts of a committee consisting of senior academicians Prof. H.R. Vishwakarma, CSI National Coordinator, CSI Education Director Wg. Cdr. Murugesan and Mr. Unnikrishnan, Advisor, CSI Education Directorate who had two rounds of discussions with Mr. Morris Graham (BCS International Account Manager - Indian sub-continent) and several interactions to arrive the MoU draft.

The British Computer Society and Computer Society have agreed to negotiate legally binding documentation to record the following shared goals:
1. License arrangements for discounted membership rates to be decided per membership grade, subject to the other conditions and regulations outlined in the proposed agreement.
2. License arrangements to be decided per qualification, subject to the other conditions in the proposed agreement.
3. Mutual marketing co-operation and development of CPD programmes Publications and Conferences by either Party subject to the conditions outlined in the proposed agreement.
4. That the proposed agreement shall be non-exclusive.

The Chapters/Student Branches are requested to extend their support for the CSI-BCS joint activities and programmes.
As the global economy faces its complex and comprehensive challenges, Information and Communications Technologies (ICT) can play a vital role. By enhancing the understanding of ICT’s ability to transform the global economy, this conference seeks to demonstrate the power of 21st Century developments in ICT to create new opportunities for social, environmental and economic growth.

The conference brings together academic, industry, and government professionals to a premier multi-track forum on the applications of ICT towards Global Growth.

We invite researchers and practitioners to submit technical papers describing original ideas, interesting results and/or quantified system experiences. This is open for contributions from professionals in India and abroad.

**Topics of interest include, but are not limited to, the following Themes:**

- **Technology for Human Use**
  Areas such as the Semantic Web, AI, Intelligent Agents, Cybernetics, Human-Technology interaction, Accessibility, and usability.

- **Technology for Participatory Citizenship**
  Areas such as e-governance, Citizen interaction systems.

- **Technology for Communities**
  Areas such as virtual community development, digital repositories and cyber identities.

- **Technology for New Learning**
  Areas such as interactive and collaborative learning, e-learning, edutainment.

- **Technology for Common Knowledge**
  Areas such as Knowledge Management, building knowledge societies, information systems in organizations.

- **Technology for Development**
  Areas such as localization, affordable computing, Indian language computing.

Please address all queries to papers@csi-2010.org

**Key Dates**

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening of Paper Registrations</td>
<td>Feb 1, 2010</td>
</tr>
<tr>
<td><strong>Last date for Paper Registration</strong></td>
<td>May 1, 2010</td>
</tr>
<tr>
<td>Paper Submission Deadline</td>
<td>June 1, 2010</td>
</tr>
<tr>
<td><strong>Notification of Paper Acceptance</strong></td>
<td>July 30, 2010</td>
</tr>
<tr>
<td>Submission of Camera ready Papers</td>
<td>Aug 31, 2010</td>
</tr>
</tbody>
</table>

**Awards and Recognition**

- Maximum of 10 papers from each theme will be selected for oral/poster presentation in the conference
- Cash Award for the Best Overall Paper - Rs. 50,000/- (USD 1,000). Travel subsidy will be provided.
- Cash Award for the Best paper in each theme - Rs. 10,000/- (USD 200)
- All selected papers will be given a certificate.
- All selected papers will be published on the Conference Website and included in the Conference CD

For complete details please visit http://www.csi-2010.org
CALL FOR PAPERS & PARTICIPATION

NCOSOFT - 10
National Conference on
Software Engineering
20-21, Apr 2010 at Cochin
Organized by Department of Computer Science, Cochin University of Science & Technology
In association with Computer Society of India, Div. II on Software and Cochin Chapter

NCOSOFT-10 is the third conference in this series. The event will be composed of keynote lectures, invited presentations, research presentations and tutorials. We invite researchers, practitioners and educators to present and discuss the innovations, trends, experiences and concerns in the field of software engineering.

Target Audience: The conference is intended to provide a discussion forum for software professionals, faculty members, researchers and students.

Call for Papers: We solicit original research and technical papers not published elsewhere. All registered accepted papers will be published. For submission of papers, IEEE guidelines need to be followed. The topics and areas include, but not limited to:
- Software Architecture and Design
- Software Requirements Analysis & Specification
- Software Components and Reuse
- Software Product Line
- Software Maintenance
- Software Project Management
- Software Testing and Analysis
- Software Quality Assurance
- AI and Knowledge based Software Engineering
- Software process and workflows
- Software Engineering Education
- Software Engineering Knowledge Management
- Service Oriented Architecture
- Software reliability, safety and security methods
- Aspect Oriented Programming
- Reverse Software Engineering
- Software Maintenance
- Computer Aided Software Engineering and Object Oriented Software Engineering
- Emerging technologies

Paper Submissions will be reviewed and evaluated based on originality, technical quality and relevance to conference.

Important Dates:
- Submission of Full Papers: Mar 15, 2010
- Notification of Acceptance: Mar 25, 2010
- Registration:
  - CSI Members: Rs. 1500
  - Non CSI Members: Rs. 2500
  - Academia: Rs. 2000
  - Full Time Students: Rs. 1000
- Payment by DD drawn in favour of CSI-NCOSOFT and payable at Cochin

For additional details, please visit the conference site http://ncsoft.cusat.ac.in OR contact the Event Chair: Prof. K. Poulose Jacob at ncsoft@cusat.ac.in OR ncsoft10@gmail.com

For details contacts:
- Prof. K Poulose Jacob
  Event Chair
  Email: kpj@cusat.ac.in
  (0) 0484-2577126

- Mr. H R Mohan
  Chairman, Div II
  Email: hrmohan@gmail.com
  (0) 98414 32179

- Ms. Mini Ulanat
  Conf. Co-coordinator
  Email: mini_u@cusat.ac.in
  (0) 98472 89382

Quotations

- We must not forget that the wheel is reinvented so often because it is a very good idea; I’ve learned to worry more about the soundness of ideas that were invented only once.
  – David L. Parnas (Why Software Jewels are Rare, IEEE Computer, 2/96).

- Programming can be fun, so can cryptography; however they should not be combined.
  – Kreitzberg and Shneiderman

- Good judgment comes from experience, and experience comes from bad judgment.
  – Frederick P. Brooks

- Measuring programming progress by lines of code is like measuring aircraft building progress by weight.
  – Bill Gates
THIAGARAJAR COLLEGE OF ENGG., MADURAI: Faculty Development Programme on Free and Open Source Software (FOSS) in progress.

A 5-Days Faculty Development Programme on Free and Open Source Software (FOSS) was organized by Dept. of Computer Science & Engineering, Thiagarajar College of Engineering, Madurai jointly with FOSSEE Project, IIT Bombay, ILUGC & GLUGOT during 30th November - 4th December, 2009. The programme was inaugurated by Dr. R Rajaram, Dean, Computer Science & Engineering and Information Technology of Thiagarajar College of Engineering. The theory sessions focused on Linux installations, Proxy Set up, Web server, Version Control System, GCC, Debugging Practices, Scripts and Application Programming. Hands on training were given to the participants in the following areas: Debian Linux Installation, File sharing, Proxy, Apache Webserver setup and other configures.

Resource Persons were Mr. S Bharathi from Midas communication Pvt. Ltd., Chennai, Mr. P Raman, Southern Railways, Chennai, Mr. Baskar, Open Source Consultant, Mr. Joe Steeve and Mr. Senthilkumaran from GLUGOT, Mr. S Balamurugan, Mr. Deepak Dhananjaya from Nokia, Bangalore. More than 30 participants from various colleges attended this programme. The Valedictory Function was presided over by Dr. S Mercy Shalinie, HOD, Computer Science & Engineering Department. She briefed about the ongoing projects on FOSS at Thiagarajar College of Engineering. Finally Mrs. S Padmavathi, Senior Lecturer of Computer Science & Engineering Department delivered the vote of thanks.

MAM COLLEGE OF ENGG., TRICHY: Workshop & Training Programme on “Cloud Computing: The next revolution in Information Technology”

Prof. Dr. Rajkumar Buyya, Professor & Director, Cloud Computing and Distributed Systems Lab, Department of Computer science and Software Engineering, University of Melbourne, Australia, acted as the resource person for the workshop & training programme on “Cloud computing: the next revolution in Information Technology” which was organized by the Department of Information Technology, M.A.M. College of Engineering (MAMCE), Tiruchirappalli 16.12.09. In his technical talk, he addressed a gathering of around 250 participants which included researchers and faculty members from various colleges and final year of students of MAMCE at the Edison Hall. He initiated his talk on an account of making applications run faster, citing examples like drug design, prime number generation, etc., which may require even weeks to execute, if run on an ordinary machine.

The new IT trend is towards a transition from ownership model to that of a leasing one; from PCs we transform to Internet data Centres. This brought in an urge on building third party IT services by composing multiple independent services. Now there is a big switchover from classical computing to cloud computing. In the former, people bought and owned hardware, system software and applications to meet peak needs. They installed, configured, tested, verified, evaluated, managed and used them, which became an expensive affair. In contrast, cloud computing offers subscribe-use paradigm in which you pay for what you use and based on the QoS.

Primarily cloud services are organized as three types: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). The various promised benefits of Public Clouds include no upfront infrastructure investment, no procuring
hardware, set up, hosting, power, etc., On demand access, Efficient Resource Allocation, Highly Availability, Scalable, and Energy Efficient, nice pricing etc. The worldwide IT spending is much more on IT Cloud Services compared to On-Premise IT and in 2012 it is predicted that it will increase even higher.

Prof. Buyya also gave an architectural view of the cloud. He concluded with a comparison of some commercial-oriented cloud platforms/technologies. Prof. Buyya engaged the session after lunch in answering to the queries of the participants. The researchers had an opportunity to discuss with him freely the state-of-the-art and many research related questions. He not only shared his technical experience, but also he gave some tips on how to get quicker publications and also he shared his secret behind his success in becoming the most-cited author of the day.

STUDENT Branches

AISMS COLLEGE OF ENGINEERING, PUNE

The Student Branch of Computer Society of India (CSI) at Computer Engineering Department of All Indian Shri Shivaji Memorial Society’s College of Engineering, Pune, was awarded the national level BEST Student Branch for year 2008-2009. They were selected from various participating Engineering colleges of western region (Region VI – Maharashtra & Goa).

The award was presented by Mr. S Mahalingam, Executive Director and Chief Financial Officer, Tata Consultancy Services Limited and CSI President at the National convention held in Pune and was received on behalf of the college by Principal Dr. J D Bapat.

The branch has been active in conducting expert lectures, seminars, workshops, training programmes, programming contests and visit to IT industries for the benefit of the students. The initiatives of student branch counselor Prof. N. P. Mawale under the guidance of H.O.D. Prof. M A Pradhan of Computer Engineering Department made the student branch dynamic and lively.

The members of the Student Branch are thankful to Dr. J D Bapat for his critical analysis and guidance in preparing final presentation document to CSI. They are also grateful to the AISISM Society for their support in encouraging these co-curricular activities in the Department and giving an opportunity to represent the College

ANITS, VISAKHAPATNAM

Mr. B Hemanth Kumar, Alumni CSE , Test Engineer, Main Frames at Infosys Technologies limited, Hyderabad has delivering an expert lecture on Testing Methodologies, different tools used in it and a presentation. 35 students attended the seminar. He also interacted with Infosys selected students and given them valuable tips regarding challenges and opportunities in Infosys.

ANITS, VISAKHAPATNAM: Hemanth Kumar has delivering an expert lecture on Testing Methodologies.

LOYOLA COLLEGE, CHENNAI

Prof. J Jerald Inico, the Organizer of “Counseling programme for the parents of Visually Challenged -A Special care for Special Children” moderating the discussion while Mrs Uma Rao, Coordinator of Retina India, Chennai, Mr. Rajesh Parek, An illustrative entrepreneur from the Visually Challenged, Mr. Mahendran, Representative for the Visually Challenged, Loyola College, Chennai, also seen in the picture.

The parent teachers association of Loyola College along with the Resource Center for the Differently Abled had organized a counseling programme for the parents of visually impaired students on January the 23rd, 2010 in the college premises. Prof. Jerald Inico, the staff in-charge of the Resource Center for the Differently Abled, believes that in spite of being aware of the many technologies available for the differently abled, it has taken time to understand their needs and how they could be solved.

The guests of honor/Councilors for the event were Mr. Rajesh Parack, and Mrs. Uma Rao. This programme was coordinated by Professor J. Jerald Inico, faculty in charge, RCDA under the guidance of Rev. Dr. A. Albert Muthumalai S.J, the esteemed principal of Loyola College, Chennai.

Mrs. Uma Rao shared her experiences with the other parents as to how she managed looking after her son.

Mr. Rajesh Parack, who himself is a disabled person managed to do well and come up in life, also shared his views with the parents.

After the guests had shared their ideas, the parents began sharing their views and how they too went through similar hardships in bringing up their children.
Business and Technology

India has been acknowledged by the world as an Information Technology Superpower in software services for many years. The economic meltdown has been an eye opener for Business users and IT companies to re-evaluate their strategy. We are seeing a dramatic shift on application of Technology in end-user organizations and solutions provided by IT consulting organizations. It is important that senior managers and IT professionals are aware of the benefits and risks associated with evolving trends before they implement them for their clients or in their organization.

Computer Society of India (CSI) and Bombay Management Association (BMA) are jointly organizing a one-day Information Technology conference in Mumbai on February 26, 2010.

The conference has two tracks covering the technology and business aspects with talks, debates and panel discussions from experts in the field and will enable the Information Technology and Business Management professionals to get a better perspective of the road ahead. It will increase awareness and create an action plan for issues to be resolved so that India can retain its leadership role in the global IT market.

Who should attend?
CSI and BMA invites delegates from organizations with responsibilities or involvement in the major streams listed below:
1. President
2. Vice President
3. Chief Information Officer / Risk Officer / Security Officer
4. Chief Information Security Officer
5. Head of Information Technology/Security
6. Academics, Analysts and Researchers
7. Entrepreneurs
8. Others interested in these areas

Key Program Committee Members

Conference Overview

Registration Details

For more details about the conference visit our conference website: www.csi-india.org

Published by Suchit Gogwekar for Computer Society of India at 122, TV Indl. Estate, S K Ahire Marg, Worli, Mumbai-400 030 • Tel: 022-249 34776 and Website: www.csi-india.org • Email: hq@csi-india.org and printed by him at GP Offset Pvt. Ltd., Mumbai 400 059.