VOLUME NO: 1 (2014), ISSUE NO: 1 (JANUARY)

ISSN No: 2348-4845

INTERNATIONAL JOURNAL & MAGAZINE OF ENGINEERING, TECHNOLOGY, MANAGEMENT AND RESEARCH(IJMETMR)

Transforming Young Engineers for Better Tomorrow

A Monthly Open Access International e-Journal

An Initiative of

YUVAENGINEERS

11-4-649/2&3, 502 TNR VAISHNAVI, REDHILLS, LAKDIKAPUL,HYDERABAD – 500004

TEL: 040-40138145 MOBILE: +91 9866110776 EMAIL: YUVAENGINEERS@GMAIL.COM

WWW.YUVAENGINEERS.COM

INSIDE

IJMETMR JANUARY 2014

INTERNATIONAL JOURNAL & MAGAZINE OF ENGINEERING, TECHNOLOGY, MANAGEMENT & RESEARCH
#11-4-649/2&3, 502 TNR VAISHNAVI, REDHILLS,
LAKDIKAPUL,HYDERABAD – 500004
TEL: 040-40138145, MOBILE: +91 9866110776
EMAIL: YUVAENGINEERS@GMAIL.COM
WWW.YUVAENGINEERS.COM/JOURNAL

Periodicity: Monthly
Language: English

Publisher, Editor and Owner: K.V.A.Sridhar

Owned, Printed and Published by K.V.A.Sridhar, #11-4-649/2&3, 502, TNR Vaishnavi Appts, Redhills, Lakdikapul, Hyderabad, A.P - 500004

Call For Papers: IJMETMR solicits innovative research papers on Engineering Technological, and Mangement issues. The initiative brings together academic, industry, and students to a single-path, highly selective forum on the design, implementation, and applications of engineering & management.

Ten Step Process for Submission:

Step 1..Covering Letter to be Attached as Below:

Dear Sir/Madam,

Please find my submission of Technical paper entitled '_____' with reference to your Call for Papers.

I hereby affirm that the contents of this Technical Paper are original. Furthermore, it has neither been published elsewhere in any language fully or partly, nor is it under review for publication elsewhere.

I affirm that all the authors have seen and agreed to the submitted version of the Technical Paper and their inclusion of names as co-authors.

Also, if my/our Technical paper is accepted, I/We agree to comply with the terms and conditions as given on the website of the journal & you are free to publish our contribution in any of your journals/Magazines and website.

Name of the Author: Signature: Designation: College/Organisation: Full address & Pin Code:

Mobile Number (s): Landline Number (s): E-mail Address: Alternate E-mail Address:

Step 2...The Technical Paper should be submitted in Hard copy and aswell as Soft copy. Soft copy should be in CD/DVD. Your soft copy will be published on website giving credits to you.

Step 3...AUTHOR NAME (S) & AFFILIATIONS: The author (s) full name, designation, affiliation (s),College/Institution, Year & Department, Guide Name and Designation(If Any), address, mobile / landline numbers, and email / alternate email address should be in italic & 12-point in Georgia Font. It must centered underneath the title.

Step 4..ACKNOWLEDGMENTS: Acknowledgments can be given to reviewers, funding institutions, etc., if any.

Step 5..ABSTRACT: Abstract should be in fully italicized text, not exceeding 250 words. The abstract must be informative and explain the background, aims, methods, results & conclusion in a single para. Abbreviations must be mentioned in full.

Step 6...FORMAT:Manuscript must be in BRITISH ENGLISH prepared on a standard A4 size PORTRAIT SETTING PAPER. It must be prepared on a single space and single column with 1″ margin set for top, bottom, left and right. It should be typed in 12 point Georgia Font with page numbers at the bottom and centre of every page.

All Headings and Sub-Headings must be bold-faced, aligned left and fully capitalized and typed in 12 Point Gerogia Font.

Figures and Table: Please do not copy figures and tables from net. Draw them on your own. Sources of data should be mentioned below the table/figure. It should be ensured that the tables/figures are referred to from the main text.

Step 7...REFERENCES: The list of all references should be alphabetically arranged. The author (s) should mention only the actually utilised references in the preparation of manuscript and they are supposed to follow Harvard Style of Referencing.

Step 8...HOSTING & CERTIFICATION FEE: Send your hard copy+Soft copy along with 1500 rupees DD favoring "**Yuva Engineers**" Payable at "Hyderabad"

Step 9....ADDRESS TO BE POSTED: Send your entries to "Yuva Engineers, D.NO: 11-4-649/2&3, 502 TNR Vaishnavi Appts, Redhills, Lakdikapul, Hyderabad – 500004

Step 10...Details Sheet: Please Attach a separate sheet with your details: Name, Address, email, Telephone number, Branch of Engineering, Semester studying, College name and Address. (If more than one student is submitting the paper, Attach separate sheet with details)

ISSN No: 2348-4845

Indian system of education – An Analysis

Dr. V.P. Chandramohan
Asst. Professor
N I T - Warangal

As per the 8th Annual Status of Education Report (ASER) 2012, in India 96.5% of all rural children between the ages of 6-14 were enrolled in school. ASER appreciated that this is the fourth annual survey to report enrolment above 96%. 83% of all rural 15-16 year olds were enrolled in school. The number of out-of-school children has declined from 2.5 crore in 2003 to 81 lakhs in middle of 2009. The most significant improvements have been in Bihar, Jharkhand, Manipur and Chhattisgarh. The percentage of out-of-school children in highly populated states like Uttar Pradesh, West Bengal, Orissa and Bihar remains a cause of concern.

Indian higher education system is the third largest system in the world. In higher education system, there are 3524 technical diploma institutions with an annual intake of 12 lakhs students as per the latest (2013) report issued by the All India Council of Technical Education (AICTE).

The AICTE also reported 3495 engineering colleges in India with an annual student intake of over 17.6 lakhs. There are 3.85 lakhs students intake of Management Education and post graduate degree slots in Computer Science reached 1 lakh. Pharmacy slots crossed 1.21 lakhs. Total annual intake capacity for technical diplomas and degrees exceeded 34 lakhs in 2012.

University Grants Commission (UGC) also quoted the same statistics as total enrolment in Science, Medicine, Agriculture and Engineering crossed 65 lakhs in 2010. Literacy rate of southern states (Kerala, Tamilnadu, Andrapradesh and Karnataka) almost reaching 100% and other states achieving the average literacy rate of 65%. These statistic shows that it's a huge success of Indian education system in recent days. Most of the developments came in our education system very recently and especially last 10-15 years. But still we need to concentrate some of the issues Indian universities facing which will be explained in next paragraphs.

There are different styles of teaching, different governing bodies, different administration styles, different teaching aids noticed in India. However, India will need to focus the quality of education. Nowadays question arises all over world about the quality of education in Indian Universities. Recently our President of India and HRD minister also questioned the same on Indian universities. The reason of such type of questions is, none of the Indian universities are placed in the top 500 world universities except India's No. 1 institute IISC Bangalore. It could catch in the world rank range of 350 to 400. The remaining all Indian IITs, IIITs, IIMs, national and other private institutes are away from top 500 ranks.

There are 149 universities from USA, 38 from Germany, 37 UK universities, 28 Chinese institutes, 23 from Canada, 22 Italian universities, 21 from France, 20 Japanese institutes, 16 Australian universities, 12 from Netherland, 11 each from Sweden and South Korea, 9 each from Spain and Taiwan, 7 each from Israel and Austria, 5 each from Denmark, Hong Kong and New Zealand, 4 Portugal universities etc. are in top 500 universities. India's top most institutes, different governing bodies, public sectors and Indian government should think about this poor ranking and further developments of Indian education system.

This is the time to analyse, where we are inadequacy, what is the objective of institutes, what is the role of governing bodies like AICTE, UGC, NBA etc, and finally what are the functions of Indian Government to tackle this issue.

First of all we need to know what the factors behind such type of ranking are. They are, publications in journal papers, patents published, number of books published, number of projects completed, students placement, number of Ph.D scholars produced annually, impact of education on people's normal life, institute-industrial collaboration, international collaboration etc. Now we can analyse the ways to rectify the deficiencies.

Steps should be followed by Indian/national/private/deemed institutes:

I) Make all necessary basic arrangements to do research like office facility, laboratory, library, instruments, computer, internet, printer etc.

ii) Make subscriptions from all international online journals and create an E-library. Give free access to all research scholars and faculties.

iii) Promote necessary changes, innovations like reduce the workloads to teaching faculties, allot incentives to faculties for producing journal publications, books published, patents etc. So they can concentrate more on research and projects.

iv) Conduct conference/workshop/seminar to enrich the current research field.

v) Review the curriculum based on the recent trends in research and job opportunities of students.

Steps should be followed by Governing bodies like UGC, AICTE, NBA etc.:

i) Strengthen the measurement of quality education.

ii) Stimulate the academic environment, quality of teaching and research in institutions.

iii) Create internal ranking system to Indian universities based on its performance.

iv) Encourage the universities which are achieving in research field by allot prize money and extra funding.

Steps should be followed by Indian government/MHRD:

i) Make a panel consists of all IIT/IIIT/NIT directors and meet twice or thrice a year about the requirements of our institutes. Sanction whatever the committee's report.

ii) Spend a considerable amount in annual budget for Research & Development.

iii) Increase the salary/incentives to Research scholars. A fresh UG candidate from a reputed Indian university is earning average Rs.50,000/month. We should think how a PG candidate come to do research for the salary of Rs.20,000.

iv) Increase the salary/incentives to Teaching faculties. A faculty from Indian university having doctorate from reputed Indian/foreign universities getting rs. 54000 only. He/she is getting the same package even he/she has a PDF (Post Doctoral Fellowship) from reputed foreign institutes which is not comparable with the salary of fresh UG candidate (Rs.50,000).

v) Create credit point system based on the performance of every institute. Give points to number of publications, patents, books published etc. and based on we can create a ranking system within Indian universities. It will create competition with institutes which is the driving force to catch good position in the world ranking.

We all professionals, institutes, governing bodies and MHRD will join hands to promote our education. Few of the public interest organisations/medias like YUVA ENGINEERS also ready to join with us for quality education and research. The main objectives of YUVA ENGINEERS is inspiring me that transforming young Engineers for better tomorrow and Promote the Research and Development in engineering. If we work together, it is not far away that most of the Indian universities capturing the world arena and therefore achieving top ranking. The Indian system of education will be signing soon.

ISSN No: 2348-4845

Implementation of Survivability Techniques by Using Point-To-Point Approach

Dr. K. V. S. S. S. S. Sairam
Professor (ECE) & Principal
Scient Institute of Technology
sairamvssss@gmail.com

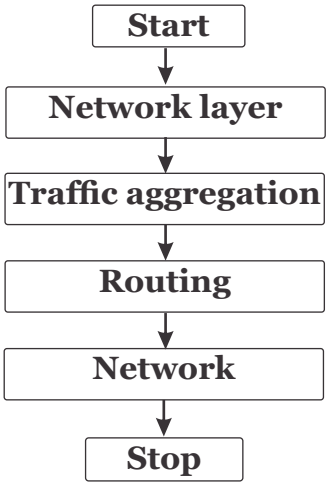
Abstract: *Due to distributed administration, large geographic coverage and expensive resource cost, communication networks are one of the most vulnerable parts in the current information infrastructure. They are the product of reactive evaluation to demand. Recent advances in fiber transmission and switching/routing techniques have dramatically increased the communication capacity of links. The exclusive growth of the internet and the convergence of optical communication and the data networking have jump started several emerging multihop optical networking technologies. This paper focuses on sphere capacity design and the network restoration techniques to mitigate the impact of failures and attacks, providing network survivability for the next generation internet.*

Keywords: Internetworking, fiber optics, restoration, survivability

Introduction: The next generation internet will provide quality of service (QoS) subject to single point failure/attacks. It is a scenario which includes multiple interconnected networks with different technologies and multi vendor equipment for both the wire and wireless infrastructure. Its main focus is on

- Working bandwidth calculation
- Restoration bandwidth calculation

Fig1: Optimization process calculation



Working bandwidth calculation:

```
All paths (cost, A, n)
{
for i: =1 to n do
for j: =1 to n do
A[i, j] = cost[i, j];
for k: = 1 to n do
for i: = 1 to n do
for j: = 1 to n do
A [Ij]: = min ( A[i, j], A[i, k] + A[k, j]);
}
```

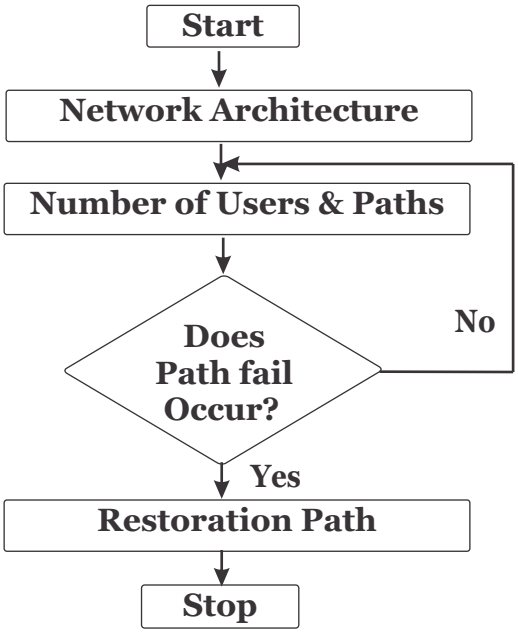


Fig2: Working bandwidth calculation

Survivable techniques implementation:
A novel can simple sphere provision matrix method was developed to implement the sphere capacity sharing operation. Its advantage is its application in aggregating information for the backup path routing. Its further advantage is successive survivable routing (SSR) and estimates the optimal sphere capacity allocation solution. It allows distributed line competition.

Evaluation of the multiprotocol labeling switching is an important method in order to evaluate the survivability techniques is as follows: such as

1. Hop count architecture:
   i. Single hop architecture
   ii. Multi hop architecture
2. Path metric
3. Resource
4. Share risk link group
5. Include node(s)
6. Exclude node(s)
7. Priority

Its further evaluation is:
1. Network management
2. Common collection management

A consolidated network management system Methods:
In single hop architecture:
a). Link sequence (LS)
b). Link distance (LD)
c). Link connectivity (LC)
d). Digital cross connectivity factor (DCSF)
In multi hop architecture:
a). Link connectivity (LC)
b). Network connectivity (NC)
c). Demand connectivity (DC)
d). Link utilization factor (LUF)
e). Restoration factor (RF)
f). Digital cross connectivity factor (DCSF)

Results:

Table 1
Traffic requirements between node pairs and optical network connectivity table:

Mixed span layout (link sequence)		
Span #	Link #	Link(s)
1	1	(1,2)
2	2	(1,3)
3	3	(1,4)
4	4	(1,5)

Table 2
Determination optical cross connectivity pattern

Criterion	Value
Link connectivity	N×N
Network connectivity	N×N
Demand connectivity	N
DCS Factor (DCSF)	80
Link utilization and restoration factor	(Maximum allowable link flow)/(maximum allowable link flow)

Conclusions:
Survivability has become a very important issue in optical networks. The significant is due to more efficient architectures in which network elements with all layers have full information about all other network elements are the most viable options for future network architecture. It provides several fundamental building blocks for self configuring survivable multi network architecture in a quality of service (QoS) enabled environment.

References:
1. T Song WU 'fiber network security', Artech House 1992.
2. S J Philips, J R Westbrook 'Approximate algorithms for restoration capacity planning ATNT Research'
3. T H WU and R H Cardwell. 'Optimum routing for fiber network design: model and applications' proceedings of IEEE, Information communications conference (ICC), Philadelphia, PA, June 1988, P2.5.1
4. T H WU, DJ Kolar and R H Cardwell. 'Survivable network architectures for broad band fiber networks: model and performance comparisons '. IEEE journal of light wave technology Vol 6, no 11, November 1988,p 1698.

ISSN No: 2348-4845

Institute of Engineers: Promoting the science and practice of engineering and to harness natural resources for the benefit of the nation.

Er Sudhakar G, FIE
Chairman, IEI

The Institution of Engineers (India) came into being in 1920 as a result of the need felt for such a body by the industrial commission of 1916-18. Dedicated to promote, advance and accelerate the art, science and practice of engineering and to harness natural resources for the benefit of the nation and to encourage high standard of professional conduct with the purpose of enhancing its service.

The Institution was granted the Royal Charter by the King Gerorge V, in 1935, "to promote and advance the science, practice and business of engineering in all its branches in India".

Starting with this humble beginning the Institution of Engineers (India) is now an unique professional body encompassing 15 engineering disciplines and with an overall membership of over 0.9 million.

Since inception in 1920, for the Institution of Engineers (India), has been a long and untiring journey, long enough, yet sustaining the test of times, characterized with multi-dimensional and multi-disciplinary growth and accredited with vital contributions towards educational, technological, industrial and economic development of our country. The quest for professional excellence never allowed the national frontiers to contain the Institution, and it moved on to occupy the rightful and highly regarded positions on almost all relevant and prestigious world organizations for ultimate service to the International community. There are various facets of the Institution's history, the history of foresight, dedication, struggle, perseverance, and success.

On 15th November, 1938 the Hyderabad Centre of the Institution of Engineers (India), was inaugurated by the Late Sir Akbar Hydari, President of the Nizam's Executive Council.

The Institution has been endeavouring to act as a think tank to the Governments on all Engineering and Technological complexities by offering appropriate solutions and generating awareness among the general public. Since inception it had organized a number of activities such as Popular Lectures, National Conventions; Indian Engineering Congress and International Conferences. It had several eminent engineers as its Chairmen, Hon. Secretaries and Members who have made a mark for themselves in the professional field and also contributed greatly to the development of the Institution. The Centre also organized Silver Jubilee, Golden Jubilee on a large scale which received high appreciation from all. The Andhra Pradesh State Centre had the opportunity of honouring 28 Veterans who were born in 1920 or earlier during the Diamond Jubilee Celebrations.

The Hyderabad Centre was started in 1938 hardly with 60 members. Due to the enthusiasm and devotion of the members the Centre was developed fast. With the donation of land by the then Government and financial support from several Engineers and well-wishers, the Centre. A few years later an examination hall of 130' x 80' was also added. The Hyderabad State Centre was transformed into Andhra Pradesh State Centre in 1956 enlarging the geographical jurisdiction.

The Andhra Pradesh State Centre has paid its humble homage to the Great Engineer Statesman of India, Bharat Ratna , Dr M Visvesvaraya, by erecting a bronze statue almost in front of the Centre's building at the traffic island on the Raj Bhavan Road. The Statue was unveiled on 12.11.1966 by the then President of India, Bharat Ratna Sir S Radhakrishna. Later, on the occasion of the 11th Engineers' Day the Institution building has been named as ' Visvesvaraya Bhavan' and the Hyderabad Municipality named the road from the Statue to Punjagutta as Visvesvaraya Marg.

The Andhra Pradesh State Centre has 9314 Corporate Members on its rolls. At present there are Local Centres at Vijayawada, Visakhapatnam, Tirupathi, Warangal, Kakinada and Kadapa attached to Andhra Pradesh State Centre.

This Centre had the privilege of getting its Corporate Members elected as National Presidents, IE (I) two during the pre-1956 period and three in post-1956 viz. Nawab Zain Yar Jung Bahadur, Shri Dildar Hussain, Dr K L Rao, Er G L Rao and Er G Prabhakar.

The Government of Andhra Pradesh in G.O. Ms. No. 234, dt. 3.6.1987 have recognized the Institution of Engineers (India), A P State Centre as a professional body with whom the Government can have continuous interaction to refine the procedure for improving efficiency and economy and for promoting technical excellence in the execution of public works.

In order to encourage the Centres for better performance for translating the objectives and ideals of the IEI, the HQ instituted the 'Best Centre' awards in 1999-2000.

The A P State Centre had the privilege of receiving the award in the first year of its institution and successively seven times i.e. 1999-2000; 2004-05; 2005-06 and 2006-07; 2008-09; 2009-10 and 2010-11.

The Andhra Pradesh State Centre Committee has decided to organize the Platinum Jubilee Celebrations from 15th November, 2012 to 14th November, 2013 and also decide to organize major events like All India Seminar and National Conventions and International Conference throughout the year.

On 15th November, 2012, the inaugural function of the Platinum Jubilee Celebrations was held at Ravindra Bharathi and on 14th November, 2013 as decided, the culmination of the Celebrations is concurrently with All India Seminar on “Green Initiatives in Mechanical Engineering” is being organized in the Centre.

It is indeed a great event for every one of us. Hon'ble Members of State Centre Committee have extended whole hearted support in making these celebrations a grand success. The Chairman of PJC Sub-Committee has spent their valuable time for designing and executing these activities which include an exhibition of publications and historical reminiscences.

It must be mentioned here that the band of devoted staff of this Centre has been a real strength behind the growth and efficient functioning of this Centre.

ISSN No: 2348-4845

Function Based Condition Indexing of Aging Infrastructure

Devi Tulasi
Senior Geotechnical Specialist - Dams
Global Mining & Metallurgy
SNC-Lavalin Inc, Canada.

One of the main challenges that the civil engineering profession facing today is the effective sustainment of aging infrastructure due to global slowdown of economy. However a systematic evaluation of the health of the infrastructure and its performance under various time bound conditions such as, natural hazards, raising population downstream of a dam, interdependence of other infrastructure etc., will enable us to allocate the limited funds in an efficient manner. This systematic approach of evaluating the infrastructure can be termed as Condition Indexing (CI).

A condition indexing (CI) system is a methodology or set of rules that may be used to systematically define the physical condition of a facility or network of related facilities. The output of a CI system is a quantitative condition index, or a number, typically between "0" and "100". The lowest possible index (CI = 0) represents the "worst" condition possible for the facility. The highest possible index (CI = 100) represents the "best," or ideal, condition.

A variety of CI systems have been implemented by state and federal agencies in the US responsible for managing complex infrastructure networks made up of numerous facilities or structures. Notable CI applications include, for example, those developed by the U.S. Army Corps of Engineers (USACE) for managing paved road networks, shore protection structures, and earth dams (e.g., Andersen and Torrey, 1995; Andersen et al., 1999a, 1999b, 2001).

In each of these cases, a rational ranking procedure is used to quantify the physical condition of the individual components comprising the larger, more-complex system. Qualitative and quantitative parameters are defined that may be observed and recorded during site inspections (e.g., corrosion of the guy wires of a tower, cracking of soil around the foundation, leaks in a dam, etc). Each component is assigned a quantitative value based on these observations to represent the physical condition of that particular component and is then weighted to capture the relative importance of that component to the overall health and performance of the structure. Weighted condition values for all of the system components are summed to generate an overall condition index for the facility.

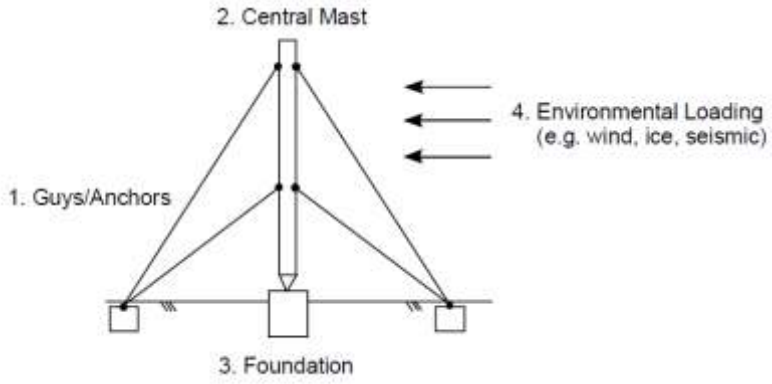
Overall condition may also be weighted by the severity of anticipated environmental loads at the structure's location (e.g., seismic, wind, ice) and by the relative importance of that particular structure in the performance of the overall network (e.g., the number of communication channels linked to a particular radio tower, purposes served by a dam like recreation, irrigation, power, water supply, etc). The output from the CI system is a numerical value that reflects the structure's level of deterioration or loss of functionality, which may in turn be used as a rational basis for recommended action and a corresponding basis for the managing agency to allocate funds for repair, evaluation, maintenance, and rehabilitation (REMR) activities.

What steps to follow in developing a CI system?

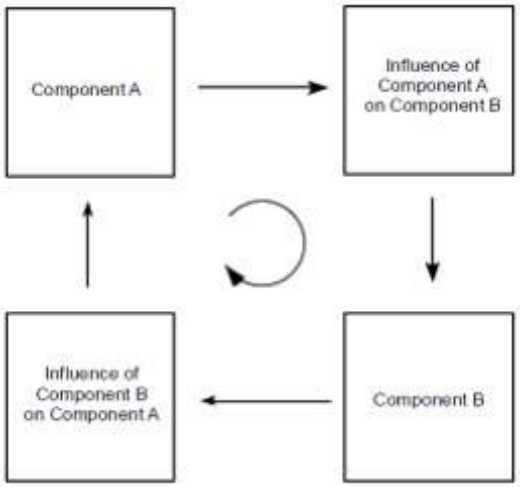
Although numerous types of CI systems exist (e.g., Hudson, 1992), many adopt the same general approach - The structure one wishes to assess (e.g., a communications tower) is sub-divided into several subunits (e.g., central mast, foundation, guy wires); the condition of each subunit is rated; and the subunit ratings are combined in a rational and systematic manner to compute an overall condition of the structure as a whole.

Andersen and Torrey (1995) describe several steps required to develop a "function-based" conditioning indexing system. A simplified synthesis of those steps is given below:

1) Identify the functional components of the system. An example of communication tower network is given below:



2) Develop a component interaction matrix (see figure below).



3) Code the interaction matrix to represent the strength of each interaction.

4) Define ranges between ideal and failed conditions for each component. The table below can be used a general guide in defining ranges:

Condition Index	Condition Description
85 – 100	Excellent: No noticeable deviation from ideal condition
70 – 84	Very Good: Only slight deviations from the ideal condition are evident
55 – 69	Good: Some deviation from the ideal condition evident but function is not significantly affected
40 – 54	Fair: Moderate deviation from the ideal condition evident but function is adequate
25 – 39	Poor: Serious deviation from ideal condition in at least some portion of the component; function is inadequate
10 – 24	Very Poor: Extensive deviation from ideal condition: Component is barely functional
0 – 9	Failed: All or a potion of component is missing or has failed

5) Develop weighting factors and formulate condition index scalar.

How to use a CI System!

Procedures for conducting a condition assessment using the proposed CI system may be summarized as follows:

1) Rank the physical condition of each principal component from 0 to 100 based on the observed deviation from ideal conditions. Generally ideal conditions are predefined best case scenarios. This produces definite numbers from 0 to 100 for various components.

2) Compute the overall CI of the structure by applying weighting factors using equation developed by including various weighting factors and condition of identified components. An example of a similar equation developed for communication towers is given below:

$$CI_{gt} = CI_{gc}(0.31) + CI_{ga}(0.19) + CI_{cm}(0.31) + CI_{fd}(0.19)$$

3) Correlate the overall CI to a qualitative description and recommended action. An example of CI scale and recommend action is given in table below:

Condition Index	Condition Description	Recommended Action
85 – 100	Excellent: No noticeable defects; some ageing or wear may be visible	Immediate action is not warranted
70 – 84	Very Good: Only minor deterioration or defects are evident	
55 – 69	Good: Some deterioration or defects but function is not significantly affected.	Economic analysis of repair alternatives is recommended to determine appropriate action
40 – 54	Fair: Moderate deterioration but function is adequate	
25 – 39	Poor: Serious deterioration and function is inadequate	Detailed evaluation is required to determine the need for repair, rehabilitation, or reconstruction. Safety evaluation is recommended.
10 – 24	Very Poor: Extensive deterioration; barely functional	
0 – 9	Failed: No longer functional	

4) Develop CI for all the assets in an infrastructure system and allocate the available funds as per the CI of the asset.

5) Organize an electronic database describing conditions and physical properties of each asset and its CI.

ISSN No: 2348-4845

In conclusion a function based condition indexing of various infrastructure systems is an important tool to efficiently assess:
• The condition of a structure;
• Identify critical structures, and;
• Can easily apply this technique to various facilities (pavements, bridges, culverts, dams etc) and gives a level playing field in allocation of funds.

References

1. Andersen, G.R. and Torrey, V.H., 1995, "Function-based condition indexing for embankment dams," Journal of Geotechnical Engineering, ASCE, 121(8), pp. 579-588.

2. Andersen, G.R., Chouinard, L.E., Bouvier, C., and Back, W.E., 1999a, "Ranking procedure on maintenance tasks for monitoring of embankment dams," Journal of Geotechnical and Geoenvironmental Engineering, 125(4), pp. 247-259.

3. Andersen, G.R., Chouinard, L.E., and Foltz, S., 1999b, "Condition ranking system for earth and rockfill embankment dams," U.S. Army Corps of Engineers, Technical Report REMR-OM-25.

4. Andersen, G.R., Cox, C.W., Chouinard, L.E., and Hover, W.H., 2001, "Prioritization of ten embankment dams according to physical deficiencies," Journal of Geotechnical and Geoenvironmental Engineering, 127(4), pp. 335-345.

ISSN No: 2348-4845

Multi-Project Management using Critical Chain Project Management (CCPM) – The Power of Creative Engineering

Prof. Siddesh K. Pai
Assistant Professor & Research scholar
National Institute of Construction
Management and Research (NICMAR)

Abstract:
CCPM) is a method of planning and managing projects that puts the main emphasis on the resources required to execute project tasks. This is in contrast to the more traditional Critical Path and PERT methods, which emphasize task order and rigid scheduling. A Critical Chain project network will tend to keep the resources levelly loaded, but will require them to be flexible in their start times and to quickly switch between tasks and task chains to keep the whole project on schedule. In this paper we analyze the Critical Chain (CC) approach to managing projects. Is CC as some authors assert one of the most important breakthroughs for project management since the introduction of the Critical Path concept (CP) or does CC merely consist of known concepts presented in a different way? Our discourse compares systematically CC and CPM on three conceptual levels to reveal the differences between the two approaches. We conclude that the philosophy behind the CP and CC approaches is remarkably different resulting in a different mindset for managers and a different set of management practices. The main difference is the application of the Theory of Constraints (TOC) in the CC case. As a result, CC focuses at improving the systems performance by laying out specific policies many of which are focused on resource management especially in multiproject environments that are not explicitly addressed by CP. We conclude that while the application of CC is complex, many of its ideas can be easily adapted by practicing managers.

Keywords: Theory of Constraints, Critical Chain, Buffer Management, Construction industry

Introduction:

Critical Chain Project Management is based on methods and algorithms derived from Theory of Constraints. The idea of CCPM was introduced in 1997 in Eliyahu M. Goldratt's book, Critical Chain. Application of CCPM has been credited with achieving projects 10% to 50% faster and/or cheaper than the traditional methods (i.e. CPM, PERT, Gantt, etc.) developed from 1910 to 1950's.From numerous studies only 44% of projects typically finish on time, projects usually complete at 222% of the duration originally planned, 189% of the original budgeted cost, 70% of projects fall short of their planned scope (technical content delivered), and 30% are cancelled before completion.

These traditional statistics are mostly avoided through CCPM. Typically, CCPM case studies report 95% on-time and on-budget completion when CCPM is applied correctly. Implementing Critical Chain resulted in mean reduction in lead-times of 69%, mean reduction of cycle-times of 66%, mean improvement in due date performance of 60%, mean reduction in inventory levels of 50% and mean increases in revenue / throughput of 68%.

How CCPM is different from traditional project management methods:

With traditional project management methods, 30% of the lost time and resources are typically consumed by wasteful techniques such as bad multi-tasking, Student syndrome, In-box delays, and lack of prioritization.

In project management, the critical chain is the sequence of both precedence- and resource-dependent terminal elements that prevents a project from being completed in a shorter time, given finite resources. If resources are always available in unlimited quantities, then a project's critical chain is identical to its critical path.

Critical chain is used as an alternative to critical path analysis. The main features that distinguish the critical chain from the critical path are:

- The use of (often implicit) resource dependencies. Implicit means that they are not included in the project network but have to be identified by looking at the resource requirements.
- Lack of search for an optimum solution. This means that a "good enough" solution is enough because:

1. As far as is known, there is no analytical method of finding an absolute optimum (i.e. having the overall shortest critical chain).
2. The inherent uncertainty in estimates is much greater than the difference between the optimum and near-optimum ("good enough" solutions).

The identification and insertion of buffers:
1. Project buffer
2. Feeding buffers
3. Resource buffers. (Most of the time it is observed that companies are reluctant to give more resources)

Monitoring project progress and health by monitoring the consumption rate of the buffers rather than individual task performance to schedule.

CCPM planning aggregates the large amounts of safety time added to tasks within a project into the buffers in order to protect due-date performance, and to avoid wasting this safety time through bad multitasking, student syndrome, Parkinson's Law and poorly synchronized integration.

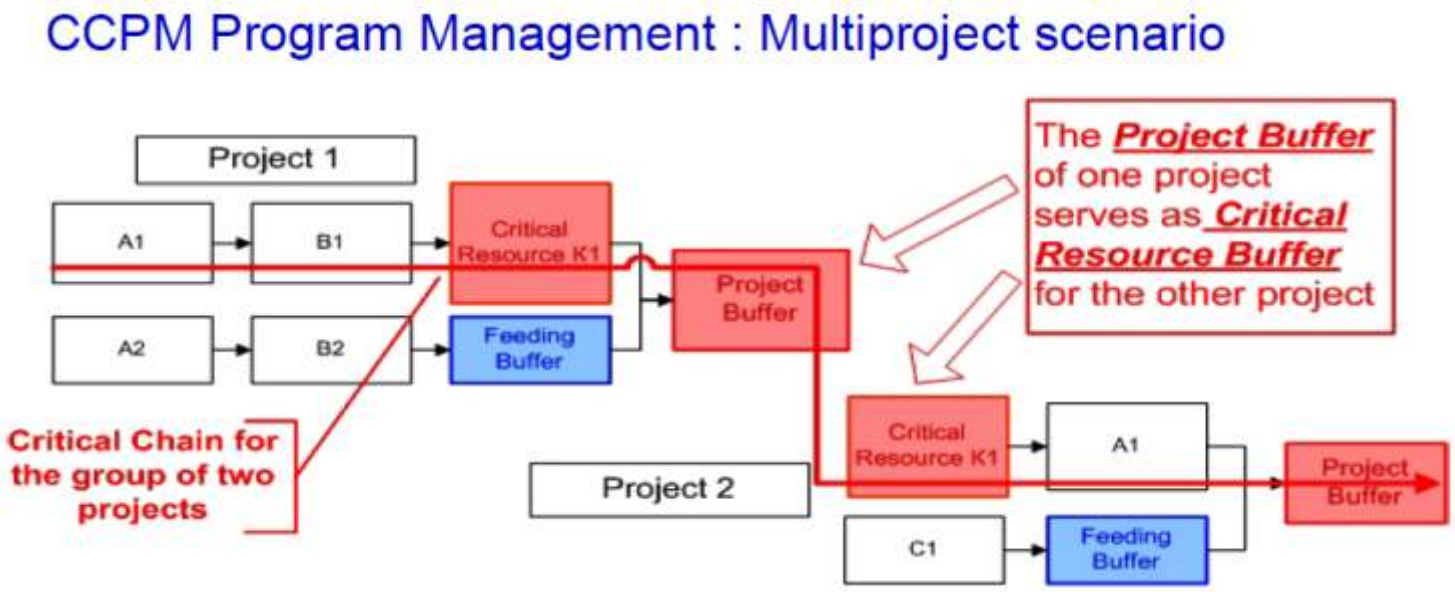
Critical chain project management uses buffer management instead of earned value management to assess the performance of a project. Some project managers feel that the earned value management technique is misleading, because it does not distinguish progress on the project constraint (i.e. on the critical chain) from progress on non-constraints (i.e. on other paths). Event chain methodology can be used to determine a size of project, feeding, and resource buffers.

Literature review:

This section sets the scene by outlining the core elements of CCPM before reviewing critical literature, evaluating recorded practice and outlining the recently published implementation guide (Goldratt, 2007).

CCPM in outline:
A central driver for adopting CCPM is enabling more predictable and shorter project lead times. The argument being that this will not only enhance time related order winning criteria but also reduce cost and improve adherence to specification. To achieve this the focus is on improving the flow of projects using similar logic to that of lean manufacturing and the operations based TOC application.

The main conceptual elements of CCPM are presented below in the context of planning, execution and continuous improvement together with the distinctions with conventional project management.(fig 1)



CCPM takes account of resource as well as precedence dependencies in determining the project duration – this is termed the critical chain. In Figure 1 the critical path would be denoted by activities 1-3-4 whereas in CC it is denoted by 1-3-2-4 due to common resource B. In such cases the critical chain is shown to be longer than the critical path and all four activities need to be managed accordingly.

Project planning:

• CCPM introduces the concept of project and feeder time buffers to accommodate the effective management of buffer time that is commonly wasted when managed locally at the activity level. The project buffer is located at the end of the project to protect the critical chain and feeder buffers isolate activity sequences with float from the critical chain (see Fig.1). Thus, such buffers enable aggregation of the buffer time as well as better control, enabling both shorter and more controllable lead times. In establishing these buffers the proposed start point is to halve existing activity times and put half of the remainder into the aggregated buffer, therefore, the buffer is equal to a third of the activity and buffer combination (see Fig. 1 for illustration).

• When planning in a multi- project environment CCPM advocates staggering the release of projects around a designated resource that acts as a drum. This is used to ensure flow and avoid too many open projects that result in excessive multitasking and missed due dates.

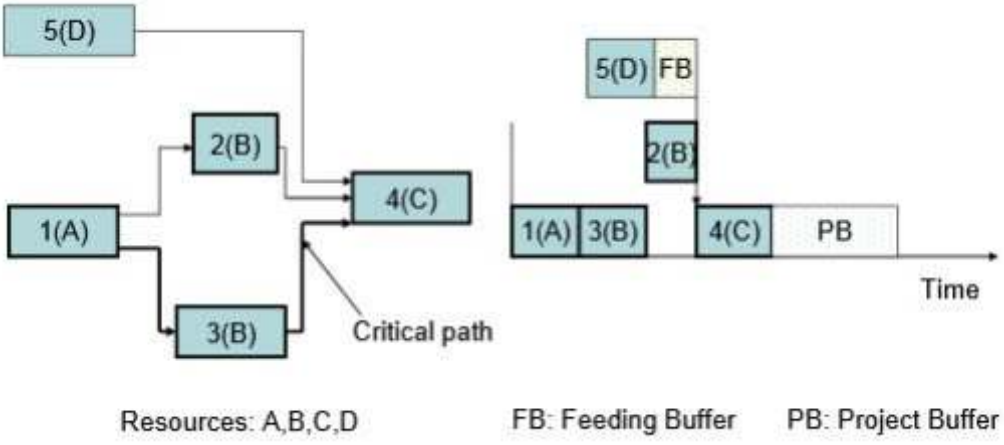


Fig 2: Network Diagram and Critical Chain Schedule showing buffers

CCPM: Where does it apply?

1.Are the individual tasks/milestones targets low on importance for business compared to project completion commitment?
2. Are the projects fed into the system with strict 'time to market' deadlines to beat/meet competition or regulation?
3. Is the 'Return discount factor' (risk associated with every project) very high because of rapid technology obsolescence, market competition and ever-changing business demands? (NPV = FV / (Discount factor)^^(Project duration)).
4. Is the firm focus on earliest delivery of business value instead of optimized resource utilization (Bigger Top line impact vs minor bottom line gains).
5. Project business value is measured by NPV and not only by ROI.

CCPM Case Study: Synergies Technologies Group

Imagine a system capable of concurrently managing over 200 complex projects. Imagine a system providing on-time delivery in an industry where lead times are being significantly slashed, and where a new key measurement of a company's performance is on-time delivery. Two years ago, Synergis Technologies Group was only imagining this. They didn't have the solution. They were trying everything they knew and used the best of their skills to do what they could to make this dream reality. Synergis was a very successful company. It had excellent engineering, excellent manufacturing, excellent try out – everything needed for a tool and die shop to be successful.

That success brought a lot of new work and growth through acquisition, but the project management techniques and the ability to manage the system did not change with the company's growth. Synergis struggled. Synergis is a group of nine companies. Because of the nine locations and the nature of the tool and die industry, theirs is a very complex environment. As in many industries, they are forced on a daily basis to make quick decisions on what must be done to keep the projects moving, keep them on time. Synergis has about 500 employees and is currently doing more than $60 million in sales per year. They concurrently manage over 200 projects, with each project having over 150 tasks. The strategy of the company is to be a single source solution, being a global supplier, taking projects from concept to reality. Typically, projects at Synergis start in Capital Engineering, move to Pattern Building, then to Casting, to Machining and Assembly, to Try-Out, and finally to Quality Control.

In this environment they deal with a lot of uncertainty. For example, it is usually hoped that the Try-Out phase of a project lasts only six week. But Murphy can strike, dragging it out to three or four or five months. It not only delays that project, it also creates for the die shop the inability to turn over, an inability to meet the customer's needs, and kills the budget.Synergis' TOC journey began with the book The Goal followed by Critical Chain. A 2-Day Project Management Workshop was held for all Project Managers, Resource Managers, and the Executive Management Team.

Prior to TOC and Critical Chain the Synergis project environment had:
- No strong project management system
- Low visibility of problems
- Clouded view of priorities
- Difficulty coordinating between facilities
- Travelling bottlenecks
- Late deliveries
- Local versus global focus

During the 2-Day Project Management Workshop all accepted that Synergis had a problem. They now had to decide where to go from there.

Their goal/ambitious target was stated:"A successful implementation of the Critical Chain solution in a multi-project environment in order to increase throughput, meet due dates, and decrease lead time to improve the overall profitability of Synergis."They had to develop a roadmap on how to get there. Using the TOC Thinking Processes, they built their Prerequisite Tree, identifying all of the obstacles to reaching their goal, and the intermediate objectives necessary to overcome these obstacles. Synergis managed the implementation like a project and came up with a detailed implementation plan which integrated the project management software implementation requirements with the business processes, as well as the cultural issues of the company. The core team then identified representatives from all departments. This team attended the

Project Management Program to develop a thorough knowledge/understanding of TOC an Critical Chain. The team next had to be trained in the Project Management software that was going to be used. Following this training phase, these team members had to then train the users of the system in the conceptual and technical issues specific to each department's needs. Once this was complete, putting Synergis' 200+ projects into the system was next.Throughout the implementation, addressing cultural change issues was important. A "Critical Chain Action Plan" meeting was called during which old priority lists were deemed obsolete, and the executive team showed that "being late" would no longer be acceptable. Actions taken to support the new philosophy included outsourcing some work done by overloaded areas, as well as moving projects to less loaded resource centers within Synergis.

These actions have shown both employees and customers that Synergis is firmly committed to contract dates and deliveries. Some of the results seen at Synergis since implementing Critical Chain include:

- Global rather than local view of all projects
- Clear identification of bottlenecks in the system
- Ability to predict problems and issues ahead of time – avoiding fire-fighting with proactive behavior
- Customers' new found confidence in Synergis' commitment to them

Synergis no longer has to imagine a system capable of managing over 200 complex projects concurrently. It no longer has to imagine a system in an industry where lead times are being slashed, and being capable of delivering jobs on time. The company has made these dreams a reality with TOC and Critical Chain.

Conclusion

Some of the people and industries who have already benefited from Critical Chain Project Management are as follows:

aerospace, agriculture, automotive, building & construction, computers, consulting, electronics, engineering, farming, food, government, health care, IT, manufacturing, medicine, media & publishing, military, pharmaceuticals, quality professionals, research, sales & marketing service, software development and telecommunications.

CCPM is not a panacea. Problems still occur in the CCPM world. However with CCPM,

- We have better tools to detect these potential problems before they are reality. We can then devise back-up plans to prepare us for these eventualities
- We can put better monitoring & measuring systems to give us early detection & warning if these adverse conditions are growing from possibility towards probability.
- We can rally the team and quickly respond to a crisis
- We can track our progress, readily see other opportunities, and with a project post mortem, we can quickly improve our system and habits so next project is even better. With CCPM, the link between cause & effect is made plainly visible to all.

If CCPM had not been used, then one or more of the following would surely have occurred:

- The project would have been refused before being rewarded as no longer possible due to client's delay,
- Scope would have been scaled down drastically from original scope,
- Wild and impossible promises would have been made to the client that had an extremely low probability of coming true. The Project Team would have been stressed out throughout the project due to their involvement in the "Big Lie". The project would have been very late, accusations made, refusal to pay, etc.
- The customer would have abandoned the project in mid stream due to the situation going from bad to worse, or their realization that they had not been informed the true state of affairs.

Obviously, none of the above would have resulted in maximum profits nor customer satisfaction.

REFERENCES

Bowers, J.A., "Criticality in Resource Constrained Networks," Journal of the Operational Research Society 46:1 (1995), pp. 80-91.

Clark, K.B., and S.C. Wheelwright, Managing New Product Development-Text and Cases, The Free Press (1993).

Cohen, I., A. Mandelbaum, et al., "Multi-Project Scheduling and Control: A Process-based Comparative Study of the Critical Chain Methodology and Some Alternatives," Project Management Journal, 35:2 (2004), pp. 39-50.

Demeulemeester, E.L., and W.S. Herroelen, "New Benchmark Results for the Resource-Constrained Project Scheduling Problem," Management Science 43:11 (1997), pp. 1485-1492.

Forsberg, K., H. Mooz, and H. Cotterman, Visualizing Project Management, 2nd ed., J. Wiley and Sons (2000).

Globerson, S., "PMBOK and the Critical Chain," PM Network, 14:5 (2000), pp. 63-66.

Goldratt, E.M., and J. Cox, The Goal, revised 2nd ed. North River Press (1986).

Goldratt, E.M., "Critical Chain, IIE Transactions, 30 (1998), pp. 759-763.

Gutierrez, G., and P. Kouvelis, "Parkinson's Law and its Implications for Project Management," Management Science, 37:8 (1991), pp. 990-1001.

Heroelen, W., R. Leus, and E. Demeulemeester, "Critical Chain Project Scheduling: Do Not Oversimplify," Project Management Journal, 33:4 (2002), pp. 48-60.

Herroelen, W., and R. Leus, "On the Merits and Pitfalls of Critical Chain Scheduling," Journal of Operations Management, 19 (2001), pp. 559-577.

Herroelen, W., B.D. Reyck, et al, "Resource-Constrained Project Scheduling: A Survey of Recent Developments," Computers and Operations Research, 25:4 (1998), pp. 279-302.

House, R.S., The Human Side of Project Management, Addison-Wesley (1998).

Leach, L.P., "Critical Chain Project Management Improves Project Performance," Project Management Journal, 30:2 (1999), pp. 39-51.

Leach, L.P., Critical Chain Project Management, Artech House Proffessional Developement Library (2000).

Synergis Technologies Group – www.CriticalChain.co.uk – http://theoryofconstraints.blogspot.com – www.focusedperformance.com

ISSN No: 2348-4845

LEARNING & DEVELOPMENT AND ITS IMPACT ON EMPLOYEE MOTIVATION IN IT INDUSTRIES

Dr.T. NARAYANA REDDY
Assistant Professor
Humanities Department
Jawharlal Nehru Technological University - Anantapur

Dr.P. SAI RANI
Associate Professor
Jawaharlal Nehru Institute of Advanced Studies
Secunderabad

DAMARAJU SIRISHA
Research Scholar
JNIAS
Jawharlal Nehru Technological University - Anantapur

ABSTRACT:
This paper attempts to discover the motivational aspects of employees in IT industries through learning and development opportunities provided by their companies, It tries to investigate how learning and development has impact on employee motivation and helps the company to retain its best employees. Employees give more preference to acquire new skills and knowledge and update them timely and they prefer such companies which provide opportunities to update their skills on- the-job rather than off- the- job. IT organizations in current scenario should invest more on Employee motivation and should know the way to retain employees and make them productive which can be achieved through training and learning and development in their organization. In the process of cost cutting IT organizations should not look forward to cut training, learning and development programs instead they should encourage employees to attend such programs which give their employees an opportunity to learn and retain them.

KEYWORDS: Learning and development, Employee motivation, motivation, IT Industries, Information Technology, Satisfaction.

INTRODUCTION:
In current scenario of IT industries Employee Motivation is the biggest confront to the management. Employee motivation plays a key role in overall effectiveness of an Organization. The more the highly motivated workforce the more is the productivity to the organization. Gareth R. Jones and Jennifer M. George's define motivation as "psychological forces that determine the direction of a person's behavior in an organization, a person's level of effort and a person's level of persistence." As per the definition behavior, effort and persistence are the key components of motivation. A persons behavior is the direction what he chose to, effort test how hard an employee is going to work, persistence occurs only when an employee chooses to continue in front of difficulties, instead of giving up. Employee motivation is such an issue which needs more attention from most of the managers, higher officials, administrators and mainly those involved with Human Resource management. Their main aim is to know how to motivate employees successfully in order to run a business successfully.

OBJECTIVES:
1. To study the impact of learning and development on employee motivation
2. To know the L&d Opportunities provided by the IT organizations to motivate its employees.
3. To know what extent the employee is feeling secured in the job.
4. To know Employee satisfaction in the position provided in order to know employee motivation.

HYPOTHESES OF THE STUDY:
1. Learning and development contributes to effective employee motivation
2. Employee motivation with importance to Learning and development programs provided to employees are most effective to both organization and employees.

RESEARCH METHODOLOGY:
The employees were given a questionnaire in various IT organizations asking response on the effects of Learning and development on

employee .In the questionnaire, the employees were asked to express their views on how they get motivation mainly focusing on how learning and development opportunities provided by their company help them to learn and acquire new skills in order to stay in the organization. Rank Correlation is used to evaluate the variables selected; questions were mainly posed on the variables to get the views of employees. The study is both empirical and analytical approach.

ANALYSIS OF IMPACT OF LEARNING AND DEVELOPMENT ON EMPLOYEE MOTIVATION:

1. Do you enjoy going to work every day and performing at your best?

Agree	30	30%
Strongly Agree	20	20%
Neutral	25	25%
Disagree	15	15%
StronglyDisagree	10	10%
Total	100	100%

Table : 1

Figure : 1

Result: As per the response 30% of employees agree that they enjoy while working in the jobs provided by their respective companies and only 10% of the employees disagree that they won't enjoy their work.

Details	No. of respondents	Percentage
Salary/Benefits Stability/Security	30	30%
Interesting work/Work Hours	25	25%
Good boss/ Vacation leave/ Promotional opportunities	10	10%
Location is convenient /Retirement Benefit	15	15%
Work assignments vary/Training, Learning and development Opportunities	20	20%
Salary/Benefits Stability/Security	100	100%

Table : 2

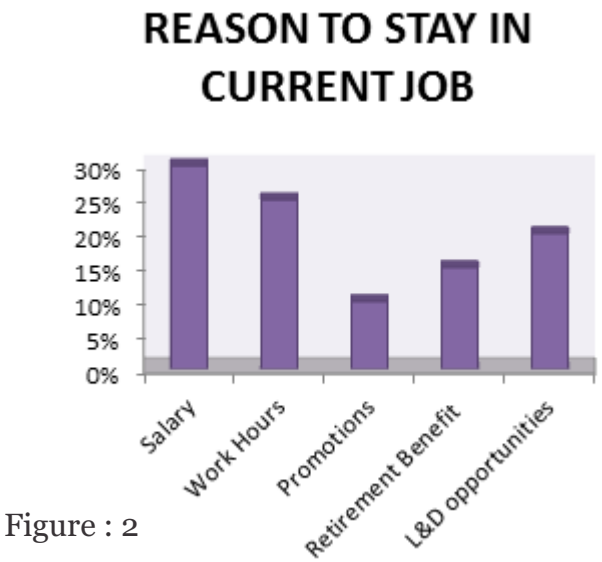


Figure : 2

Result: As per the response 30% of employees say salary benefits are the main reason for them to get motivated and continue in their job. 25% employees say flexibility of working hours are the reason for them the stay in the current job.

20% say that Learning and development opportunities provided by their companies are the main reason for them to continue in the job and only 10% of the employees said good job/vacation leave or promotion opportunities are the main reason for them to stay in the job.

3. Does your organizations provide growth opportunities to acquire new knowledge and skills (Learning and development)?

Details	No. of respondents	Percentage
Agree	26	26%
Strongly Agree	28	28%
Neutral	12	12%
Disagree	14	15%
Strongly Disagree	20	20%
TOTAL	100	100%

Table : 3

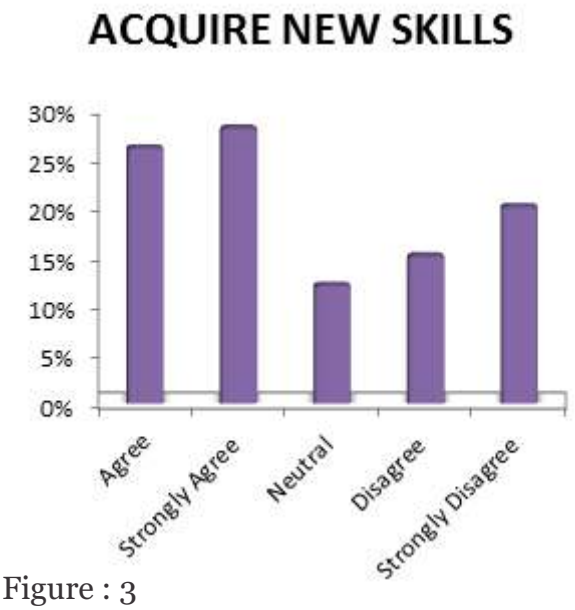


Figure : 3

Result: As per the response 28% of employees strongly agree that their organizations provide them growth opportunities and to acquire new skills, 20% of the employees strongly disagree that their organization doesn't provide any growth opportunities to acquire new skills.

Details	No. of Respondents	Percentage
Agree	20	20%
Strongly Agree	28	28%
Neutral	32	32%
Disagree	12	12%
Strongly Disagree	8	8%
TOTAL	100	20%

Table : 4

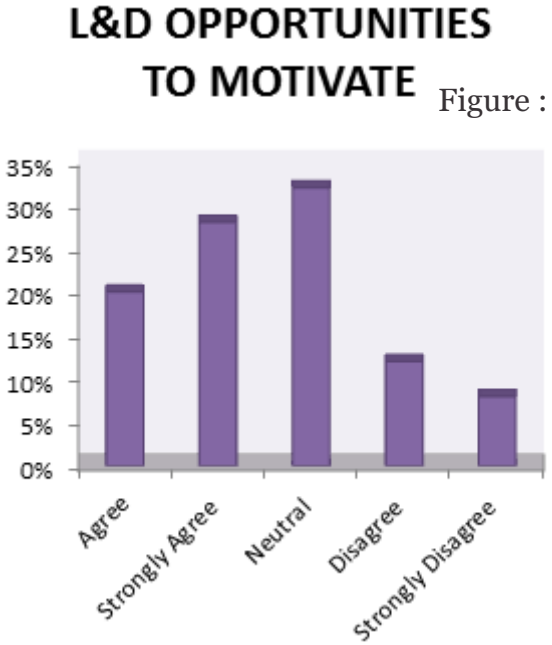


Figure : 4

Result: As per the response 28% of employees strongly agree that they are provided with learning and development opportunities to motivate themselves and work for the organization and only 8% of employees strongly disagree that they are not provided with any L&D opportunities to motivate themselves.

5. You find opportunities for advancement in this organization?

Details	No. of Respondents	Percentage
Agree	20	20%
Strongly Agree	28	28%
Neutral	32	32%
Disagree	12	12%
Strongly Disagree	8	8%
TOTAL	100	100%

Table: 5

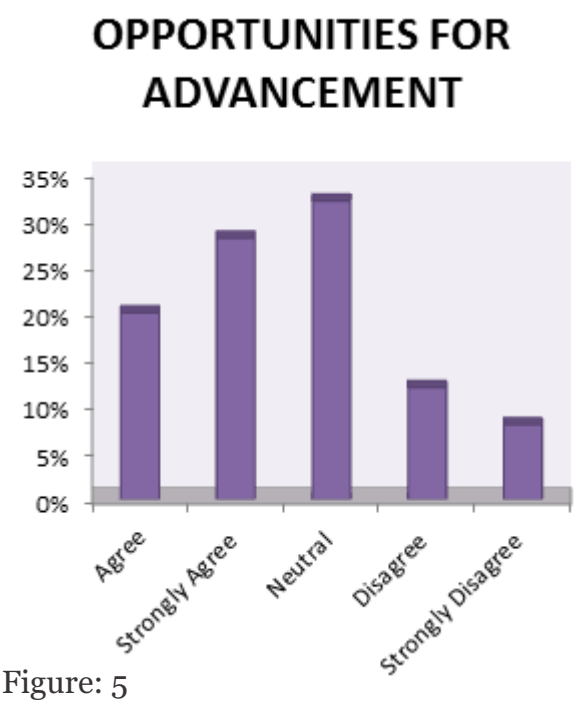


Figure: 5

Result: As per the response 28% of employees strongly agree that they are provided with better opportunities in job by their respective companies and only 8% of the employees strongly disagree that they are not provided with better opportunities in their job.

6. From a professional perspective, how satisfied are you with your position at your Department /Organization?

Details	No. of Respondents	Percentage
Satisfied	30	30%
Dissatisfied	10	10%
Minimal Satisfaction	35	35%
Very Satisfied	20	20%
Very Dissatisfied	5	5%
TOTAL	100	100%

Table: 6

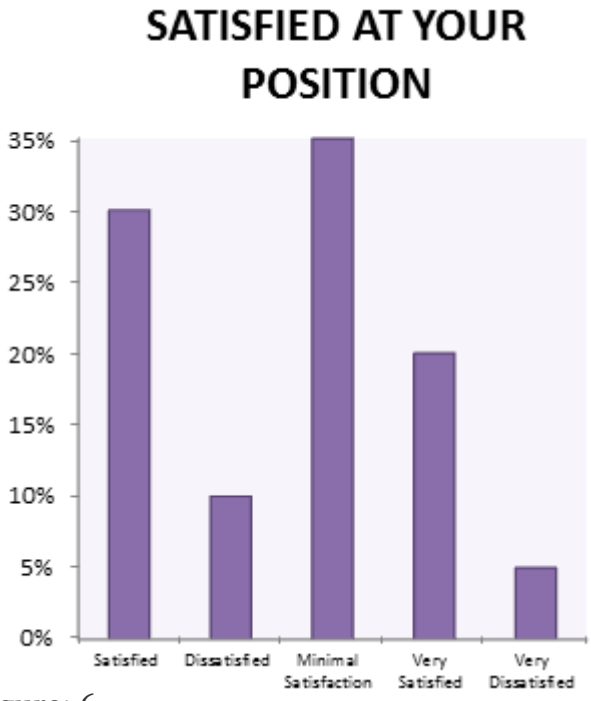


Figure: 6

Result: As per the response 30% of employees agree that they are satisfied with job position provided by their respective companies and 35% employees are minimum satisfied by the positions and only 5% of the employees are not satisfied with their positions.

7. The employees in the organization feel secured in their job?

Details	No. of Respondents	Percentage
Agree	40%	40
Strongly Agree	25%	25
Neutral	20%	20
Disagree	10%	10
Strongly Disagree	5%	5
TOTAL	100	100%

Table : 7

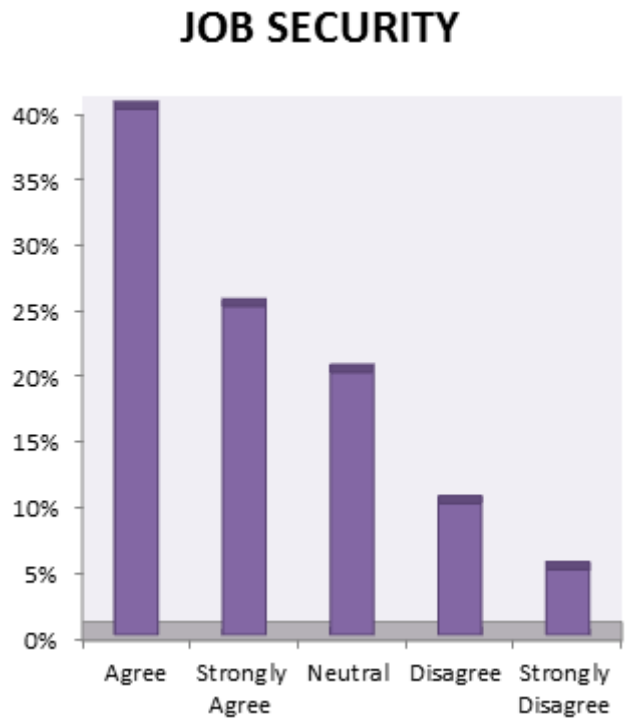


Figure : 7

Result: As per the response 40% of employees agree that they are satisfied with job security provided by their respective companies and only 5% of the employees disagree that their job is not secured.

EMPIRICAL INVESTIGATION OF VARIABLES OF LEARNING AND DEVELOPMENT AND EMPLOYEE MOTIVATION:

Variables of L&D on Employee Motivation	% of No of Respondents	Ranks by Employees	Ranks by Organization	D	D2
New skills to motivate	30%	1	1	0	0
L&D Opportunities	40%	2	4	2	4
Reason to stay in the job	20%	3	2	1	1
Job Security	10%	4	3	1	1
	100			$\sum d = 4$	$\sum d^2 = 6$

Rank Correlation $= 1 - 6\sum d^2 / n(n2-1) = 1 - 6(6)/4(16-1) = 1 - 36/60 = 1 - 0.60 = +0.4$

Conclusion: The ranks obtained for both IT organization and its employees give positive rank correlation as the Learning and development activities provided to motivate employees and retain them is effective and it also satisfies all the selected variables in the process of analysis.

References:

- Armstrong Michael, 1995, A handbook of Personnel Management Practices, Kogan Page Limited, London.
- Hamblin.A. 1974, Evaluation and Control of Training McGraw-Hill, Mindhead.
- Kenneth.D.B, 1995, Personnel Management, Himalaya Publishing House, New Delhi Manpower Services Commission, 1981, London.
- Journal of Public Administration and Governance Vol.1.No.2, 2011.