ROLE OF INFORMATION TECHNOLOGY / SYSTEM IN TQM IMPLEMENTATION: IN INDIAN HIGHER EDUCATION INSTITUTIONS’ CONTEXT

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[1] INTRODUCTION

Total Quality Management (TQM) refers to management methods used to enhance quality and productivity in business organizations. TQM is a comprehensive management approach that works horizontally across an organization, involving all departments and employees and extending backward and forward to include both suppliers and clients/customers to ensure long term customer loyalty and customer satisfaction. To understand the meaning of TQM let us first know what does Quality mean? Quality refers to a parameter which decides the superiority or inferiority of a product or service. Quality can be defined as an attribute which differentiates a product or service from its competitors. Quality plays an essential role in every business. Business marketers need to emphasize on quality of their brands over quantity to survive the cut throat competition. Why would a customer go for one if other competitor is also offering the same product? The difference has to be there in quality. The brand needs to be superior for it to stand apart from the rest. Quality can be measured in terms of durability, reliability, usage and so on. TQM is a structured effort by employees to continuously improve the quality of their products and services through proper feedbacks and research. Ensuring superior quality of a product or service is not the responsibility of a single member.

W. Edwards Deming, Joseph M. Juran, and Armand V. Feigenbaum jointly developed the concept of TQM and originated in the manufacturing sector, but can be applied to almost all organizations. It ensures that every single employee is working towards the improvement of work culture, processes, services, systems and so on to ensure long term success. The action plan can be divided into four categories: Also referred to as PDCA cycle.

- Plan – The phase where employees have to come up with their problems and queries which need to be addressed.
- Do – Employees develop a solution for the problems defined in planning phase. Strategies are devised and implemented to overcome the challenges faced by employees. The effectiveness of solutions and strategies is also measured in this stage.
- Check – Checking phase is the stage where people actually do a comparison analysis of before and after data to confirm the effectiveness of the processes and measure the results.
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- Act – In this phase employees document their results and prepare themselves to address other problems.

Total quality is a description of the culture, attitude and organization of a company that strives to provide customers with products and services that satisfy their needs. The culture requires quality in all aspects of the company’s operations, with processes being done right the first time and defects and waste eradicated from operations.

To be successful implementing TQM, an organization must concentrate on the eight key elements. TQM has been coined to describe a philosophy that makes quality the driving force behind leadership, design, planning, and improvement initiatives. For this, TQM requires the help of these eight key elements.

1. Ethics
2. Integrity
3. Trust
4. Training
5. Teamwork
6. Leadership
7. Recognition
8. Communication

Elements can be divided into four groups according to their function. The groups are:

I. Foundation – It includes: Ethics, Integrity and Trust.
II. Building Bricks – It includes: Training, Teamwork and Leadership.
III. Binding Mortar – It includes: Communication. IV. Roof – It includes: Recognition.

Training is the key by which the organization creates a TQM environment. Leadership and teamwork go hand in hand. Lack of communication between departments, supervisors and employees create a burden on the whole TQM process. Hence communicate effectively and, lead by example, train employees to provide a quality product and create an environment where Knowledge, Skill and Attitude (KSA) can be discussed shared.
Information technology (IT) is the application of computers to store, study, retrieve, transmit, and manipulate data, or information, often in the context of a business or other enterprise. IT is considered a subset of Information and Communications Technology (ICT). ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. For example, personal computers, digital television, email, robots. Taking even broader sense when its scope extends to a combination of software, hardware, infrastructure and trained personnel (SHIP) organized to facilitate planning, control, coordination, and decision making in an organization is known as Information System (IS). The interaction of these components is used to collect, filter, process and distribute data to produce information. Thus generated information used by a business organization in different ways say Management Information System (MIS), Decision Support System (DSS) etc to provide efficiency and effectiveness of strategic decision making. Though there is a substantial overlap between backgrounds of all these technical terms IT, IS and MIS, Information systems diminutively different from business processes. Information systems help to control the performance of business processes.

Some examples of such systems are:

- enterprise resource planning
- enterprise systems
- expert systems
- search engines
- geographic information system
- global information system

It is often observed that term IS and IT is used interchangeably. In a literal sense, IT is a subset of IS. Where system is Input > Process > Output, Information systems consist of people, machines, processes and information technology (PMPI). The great advancement in information systems is due to development in information technology and introduction of computers. Several industries are associated with information technology, including computer hardware, software, electronics, semiconductors, internet, telecom equipment, and e-commerce.

Information systems research is generally interdisciplinary concerned with the study of the effects of information systems on the behavior of individuals, groups, and organizations.

Scope analysis of IT/IS aided TQM application in academics

<table>
<thead>
<tr>
<th>Phase</th>
<th>Feature</th>
<th>Production organization</th>
<th>Academics</th>
<th>IS/ IT Possibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aims and objectives</td>
<td>Organization’s interest – (Short term and medium term goals as the part of process)</td>
<td>Quality Management ensures increased revenues and higher productivity for the organization.</td>
<td>To equip with domain skills for livelihood on ethical grounds.</td>
<td>Yes</td>
</tr>
<tr>
<td>Input</td>
<td>Quality inputs (effective 5M management)</td>
<td>Quality supplier and raw material</td>
<td>Focused aspirants</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>Proper resource allocation</td>
<td></td>
<td>• Well informed faculty</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Role of Information Technology / System in TQM Implementation: In Indian Higher Education Institutions' Context

<table>
<thead>
<tr>
<th>Process</th>
<th>Quality management helps organizations to reduce waste and inventory.</th>
<th>Continuous and comprehensive evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholders</td>
<td>Quality management is essential for customer satisfaction which eventually leads to customer loyalty.</td>
<td>Employability skill</td>
</tr>
<tr>
<td>Output</td>
<td>Quality management tools help an organization to design and create a product which the customer actually wants and desires.</td>
<td>Customized courses to meet present and future organizational and social needs.</td>
</tr>
<tr>
<td>Creativity and Innovation</td>
<td>“Quality management” ensures superior quality products and services.</td>
<td>Value aided KSA development – Employability skill with life skills</td>
</tr>
</tbody>
</table>

The above table is a scope analysis of TQM’s applicability to academics with the involvement of IT taking references of its successful implementation in productions. The basic guiding principle to TQM is that quality is viewed from customer point of view, not from manufacturer. It is a continuous process targeting the ultimate beneficiary of the whole process the Customers’ needs and expectation. The end beneficiary to academics is students. An institutions’ core objective should be to strive for their aspirations. Well equipped with Knowledge, Skill and Attitude (KSA) to survive in this competition world with Values. Quality education should be delivered to the aspirants. Quality has two aspects – quality control (QC) and quality assurance (QA). Quality control may be defined as the systematic control of all the variables influencing the quality of the final product. It is a system through which products are made to measure up to the specification determined from customers’ requirement and manufacturing capabilities. QC is a *Strategy of Detection*. Quality assurance is any systematic *process of checking* to see whether a product or service being developed is meeting specified requirements. It is measured by the level of defects in the end product. QA is a *Strategy of Prevention*. In academics, record keepings (accounts, admissions, attendance, time tables, class records, exams, exam records, results visit records, archives etc.) are the means of QC where as the daily updates and periodic inspection of all these records is QA. Dynamic corporate demanding professionals with more and more focused and specialized domain knowledge with multi tasking capabilities. Institutions being the supplier faced many problems when all these works are supposed to be
done manually; the problem of engaging Human resources in other support activities that consumed most of their effort and time. Delays in documentation in all means elongated the process.

Exhibit - 1

Today a large proportion of the young generation is enrolled in higher education. Universities have become mass institutions in modern societies, at least in the highly developed countries, though this is less true of developing countries and newly industrializing countries like India. Information technology in India has increased its contribution to India's GDP from 1.2% in 1998 to 7.5% in 2012. In contrast to this a report by Economic Times says - "A survey by the British Council has shown that 51% of companies hire only from the top 20 Indian institutions, and less than a quarter of these firms hire only from the top 10 in any discipline". An increasing proportion of India’s youth are unemployed. A look at the World Development Indicators data of the World Bank shows that only one in three people in the 15-24 years was employed in 2014. That is a 13 percentage point drop from the 45% employment rate in 1991 when economic reforms were initiated.

The reason for the fall in youth employment is that a greater proportion is seeking higher education. Data from the ministry of human resource development show that enrollment in higher education among 18-23 year olds has increased from 8.1% in 2001-02 to 21.1% in 2012-13.

The second most significant problem in academics is best discussed in the above exhibit; the unemployment. Unemployment of university graduates can be seen in two ways. Firstly, more and more university graduates are coming out every year. Secondly many graduates are lacking with employability skills. The survey report on youth employment and unemployment, 2012-13, shows disappointing trends in employment. Estimating the youth employment among various age groups, it stated that: “With increase in education level, the unemployment rate is also increasing for all age groups.” This includes the age group between 15 and 29 years. The report further explains that the “decline in skilled jobs in manufacturing sector together with increased demand for professional specialists and unskilled jobs in secondary and tertiary sector has led to a situation where a large segment of youth either do not possess the requisite skills and experience for the new opportunities or are employed on part-time and temporary contract basis.” The reason for the fall in youth employment is that a greater proportion is seeking higher education. Data from the ministry of human resource development show that enrollment in higher education among 18-23 year olds has increased from 8.1% in 2001-02 to 21.1% in 2012-13. Why? It’s the unskilled graduates. Why so? It’s more towards lacking required Quality Education and Training by Higher Education Intuitions. The young enter the job space with less experience and very specific expectations. So it takes them longer to find jobs. With declining job opportunities, the youth take up multiple informal jobs to make ends meet or fall out of labor force.

Employability skills are general skills that are needed to get most jobs, but they also help one to stay in a job and work their way to the top. While there will always be some job-specific skills that an employer is looking for, most employers will also wants to have some general skills. It talks about two areas one being the job-specific skills (Domain) and the second general skills (Interpersonal). To me why students lack job-
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specific skills is because of these two reasons – Our education systems is more academic oriented. It gives more thrust on acquiring bookish knowledge rather than understanding and using its application. The picture is slowly changing, but there needs to be a perfect balance in these two. Secondly there is Myth - in our Indian culture we have strong beliefs that - acquire a degree and you will get a job. What degree? It doesn’t matter just become a graduate. While pursuing the degree aspirants seldom give thought about what job specific skills they must acquire so that they have a better chance of employment.

Another bitter underlying truth about unemployment of graduates is unclear objectives of life. Rat race of competition has influenced most of the youth’s decision making process. They decides a career options successfulness based on earning capabilities of those who opted for that and are successful or unsuccessful. Somehow the essence of Human values, knowing self and own intellect and its orientation is getting diluted with cut throat competition culture. League thoughts made decline in out-of-box thinking style, where there is no competition actually even till date. Very few dare thinking as such and proceed that way. An awaken youth, spiritually aware, socially responsible and professionally sound can survive and contribute to sustainable growth of the society and nation.

The advent of computers has provided us with very effective solution. The just in time approach, instant, reliability, validity, time saving and economic benefits can easily be recognized. The first two problems that been discussed above are best addressed by computers. Humans have been storing, retrieving, manipulating, and communicating information since the Sumerians in Mesopotamia developed writing in about 3000 BC. It was their effective system that made their culture accessible even now days but was not efficient enough to travel through channels and instantly accessible at some other junction. Storing, retrieving and manipulating of huge data and information in all possible formats (scripts, pictures, audio, video etc.) have become handy with the involvement of technological devices like hard discs etc. communication and accessible from a point other than its saved place been possible with advancement of scientific technologies in the form of Internet.

For our study here we are taking two examples of institutions as benchmarks one from Jharkhand and another at national level that uses IT / IS in imbibing value education process. Benchmarking is more than giving marks. It is a way of measuring a firm’s strategies and performance against "best-in-class” firms, both inside and outside the industry. The aim is to identify best practices that can be adopted and implemented by the organization with the purpose of improving a company’s performance. Exhibit 2 is a briefing of BIT Mesra’s proactive measures taken to provide administrative solutions to the internal stakeholders of the institution on time. Involvement of IT can easily be seen where database update, store, access and delivering has become possible with its ERP in a go.

Exhibit – 2

For over five decades, BIT Mesra (near Ranchi, the Jharkhand state-capital) has been engaged in nurturing minds through a rich heritage of academic excellence. Established in 1955 is today one of the most premier engineering destinations in India. Keeping up with the times has never been enough at BIT as it has mostly been either at the top of ranking surveys or the first among initiators of path breaking ideas. From the introduction of new academic programmes to re-structuring the current ones, from improving infrastructure to upgrading teaching skills, the students' welfare has always been the focal point in BIT’s larger picture. The institute has its own ERP that is been linked to its website accessible to
every student and alumni across the world. Access can be done with one unique ID and password through which every formal communication say applications, attendance, assignments, semester reports, weekly schedules, self services, academic progress, alumni group, feedback and many more made possible 24 X 7 and at any point of this world. Just-in-time approach of this ERP made the utilization of time of aspirants and human resources of the college in more efficient manner. Students from anywhere can see the activities and can apply for their favorite course too. This ERP made one point self serviced solution for all administration kind of works for which one was supposed to visit the office and spend more time for it. No digital device can replace a Guru but it can be used to support the value adding process by making teaching–learning process more effective.

The second higher education institution “Sri Sathya Sai University” is a deemed university exhibited in exhibit 3. SSSIHL has excellent infrastructure and facilities for teaching, research and co curricular activities. This includes cutting-edge research laboratories, classrooms and multimedia rooms with video conferencing facilities, high speed broadband connectivity, superb IT equipment, well-equipped libraries and world-class sports facilities. In the past five academic years, 2011/12 to 2015/16, the university invested a total of `47 crores on equipment and infrastructure alone. This investment is across all the four campuses. For example, a new hostel building at the Muddenahalli Campus (Bangalore) was inaugurated on 2 April 2016. The hostel’s thirty-seven rooms will accommodate 300-plus students, over twice the current strength. To give an enormous boost to research infrastructure, the new building for the Sri Sathya Sai Advanced Centre for Research and Development is also nearing completion. It will house the latest equipment to facilitate need-based research in the areas of Materials Science, Physics, Chemistry, Biosciences, Food Sciences, Mathematics, Management and Humanities. It will be operational in early 2017. Research collaborations in five science departments, namely Chemistry, Physics, Biosciences, Food & Nutritional Sciences (FNS) and Mathematics & Computer Science (DMACS) with premier external Institutions like IISc., IITs are rapidly increasing. Collaborative research projects with Sri Sathya Sai Institute of Higher Medical Sciences (SSSIHMS) are testimonial to the rise in the quality of education and research in the University. The Institute has been making its presence felt at both the National and the International levels in a number of frontier areas of Science and Technology, Management and the Social Sciences.

Exhibit – 3

Sri Sathya Sai Institute of Higher Learning also called Sri Sathya Sai University (Deemed to be University) is an Indian university founded by Sri Sathya Sai Baba, under Section 3 of the University Grants Commission Act of 1956. The university is based on the gurukula system of ancient India wherein education is provided free from kindergarten to postgraduation. All students, from first grade to postgraduate studies, stay in the hostel.

The Sri Sathya Sai University in Prashanthi Nilayam was the only college in India in the past to have received an "A++" rating by the National Assessment and Accreditation Council (NAAC). In January 2011, NAAC granted Sri Sathya Sai Institute of Higher Learning (Deemed to be University) re-accreditation with ‘A’ Grade and a Cumulative
Grade Point Average (CGPA) of 3.625 (on a scale of 4.00) as per the new accreditation procedure. This means that SSSIHL continues to be in the top bracket of Indian universities.

SSSIHL provides free education to students in all programmes of study. This includes waiver of all fees- tuition, examinations, laboratory, library, sports and medical. Most students typically spend between two to five years pursuing an education at SSSIHL. As a result, what differentiates them from graduates of other universities is the transformation of their hearts, not just the training of their minds. Values-based Integral Education is designed in such a manner that between the times an 18-year old student joins the university and when she or he graduates (at the age of 21 or 23) there is a deep inner transformation that takes place. This concept is very unique at the university level. The outcome of the system of Values-based Integral Education at SSSIHL is threefold. It prepares all graduates to be spiritually aware, socially responsible and professionally sound.

Here a new horizon of IT definition can be seen that actually is as old as our Indian culture. The term information technology in its modern sense first appeared in a 1958 article published in the Harvard Business Review; authors Harold J. Leavitt and Thomas L. Whisler commented that "the new technology does not yet have a single established name. We shall call it information technology (IT). Whereas here, the intellectual techniques used to learn, study, memorize and recall by our ancient gurus are more scientific and can be called as Biological Software. Daily contemplation on ones actions and taking guidance from human values (Ethics) is the means of cleaning unnecessary stuffs in our minds (auto detecting antivirus). Technology is nothing but a scientific mean to perform tasks instantly, efficiently and effectively. The technology should be used more wisely for development of intelligence quotient (IQ) and emotional quotient (EQ) equally. Here the emphasis of education system is to develop the Intuitive, Interrogative, Informative and Introspective quotients (4I’s) of the scholars. And the modern information technology is used as supporting aid in accomplishing these objectives. But Involvement of modern IT can be seen in all academic and non academic activities of this institute.

Another big concern of TQM aided with modern information technology should be Educare. Only if education is blended with culture will it shine forth as true education. What is culture? It is the cultivation of discrimination between good and evil, sin and merit, and truth and untruth that we experience in our daily life. It is also removal of one’s evil thoughts, feelings and qualities, and cultivation of good thoughts, feelings and qualities. Not only this, culture makes one broad-minded by getting rid of one’s narrow-mindedness.

What is the meaning of education? Education is not mere knowledge, it includes action too. Education that originates from within has a sound basis and is permanent. It is referred to as sathyam. A step higher than sathyam is ritam, as proclaimed in the Vedas. What we normally refer to as truth in daily life is merely a fact. – Sathya Sai baba Today’s education is aimed at merely eking out a livelihood. The essence of education is the concentration of the mind and not the collection of facts. Mere collection of facts will not serve any purpose. Definitely there is an end to what we study from books. The end of education is character. Education without character is useless. Earlier in gurukulas the sages took the students along with them wherever they went and taught them without conforming to any time schedule. This education was a continuous learning process. This is Educare, taking care of the entire personality. This comprises of
all internal and external elements like Intellect, value, knowledge and outlook targeting a healthy product the healthy mind.

**Exhibit - 4**

The Sri Sathya Sai Vidya Vahini program is aimed at integrating values in an innovative way into the school curriculum. It seeks to reflect Education in Human Values and connects the same to the school curriculum. Sri Sathya Sai Vidya Vahini is an open-ended project (Technological collaboration with TCS) to harness IT as the key enabler to replicate on a national scale, the success of the model of Integral Education – combining value based education with academic excellence.

A systematic and progressive intervention is made to empower the teachers with the needed skill sets, content and motivation to bring about gradual and sustainable changes in the school atmosphere and facilitate learning across all domains of interaction – Classroom, Corridor, Campus and Community (4C’s). Sri Ratan Tata and Sri N. Chandrashekaran, offered the software to Sri Sathya Sai Baba during the launch of the Sri Sathya Sai Vidya Vahini Programme, 23rd November 2010

Overall Academics supported with modern information technology should aim in quality product of the entire process that will facilitate the societies well being in both the ways; internal to external and external to internal. “External to internal” is collecting facts and figures, gaining more and more experiences through work, books and modern IT devices like internet. Whereas “Internal to external” is transmitting the knowledge from inner self to the outer world that actually is within in the form of inherent knowledge of an individual. This is nothing but knowing self; the own capabilities and can be named as “Inner net”.

Here I addressed the third problem; the unclear objectives of students that I mentioned before in this article. Exhibit 4 is a school curriculum project and higher education institution may resort to such IT innovations in the process of driving excellence through TQM application.

**Conclusion**

Computers play important role in quality function. They perform very simple operations at fast speeds with an exceptionally high degree of accuracy. A computer must be programmed to execute these simple operations in the correct sequence in order to accomplish a given task. Education process starts with imbibing values to information sharing and using our own discrimination power based on these information backed with values for life and livelihood. Proven effectiveness of IT in information sharing process is evident since last two decades in India but is only one part of the education. Developing EQ of aspirants is still a challenge for IT.
REFERENCES