

ROLE OF ERP AND TOTAL QUALITY MANAGEMENT IN EDUCATION

Anurag Sinha¹ Anmol Singh²

Department of computer science and Engineering, Research scholar, Amity University Jharkhand
Ranchi, Jharkhand (India), 834001²

Department of Information Technology, Research scholar, Amity University Jharkhand
Ranchi, Jharkhand (India), 834001¹

Email: anmolsingh15499@gmail.com² anuragsinha257@gmail.com¹

Abstract

Quality education is a great concern in many societies across the world. In a highly competitive education sector, the success of academic institutions depends on the quality of education. Educationalists, policy makers, scholars, and researchers are showing their sincere interest towards the total quality management (TQM) as it is recognized as an effective management philosophy for continuous improvement, customer satisfaction, and organizational excellence. The purpose of the paper is to analyzing thoughts of the modern management paradigm "Total Quality Management" (TQM), and its application in the field of education. The basic theme of TQM is participatory approach to address the question(s) of quality in business as well as in the field of education, Enterprise Resource Planning systems are the new solution to business systems. These systems provide comprehensive business functionality in an integrated fashion using a state-of-the-art IT architecture. This trend towards enterprise systems in large and mid-sized organizations has a significant impact on IS careers paths. Enterprise systems essentially change fundamental business work processes thus implying that the system that supports these processes, and the design and development of these systems, also changed. The educational ERP of business activities in higher education go through a different modules. ERP in higher education should respond the real requirements of education system. Enhancements or mere adaptations of legacy solutions, which stemmed from the experience in business practice, are not always successful. The current paper shows the contents of the ERP that serve the education system successfully also shows the needs and future expectations of higher education institutions and the current business oriented ERP system.

Keywords: ERP in higher education, campus management, Total Quality Management (TQM), Education, Compatibility, Challenges.

INTRODUCTION

Relationship between TQM and ERP

This is an era of competitive world where each company or institution wants to achieve excellence in terms of product. To achieve customer's faith and loyalty towards their organization most of the companies exercise TQM (Total Quality Management) as an management approach which wraps the entire departments of an organization into one, bringing better ideas and quality products. To apply TQM in any organization ERP(enterprise resource planning) software has become an essential tool for achieving TQM. Without ERP software it would be difficult to achieve TQM because if there are no ERP software there would be islands of information that would lack efficiency in terms of time and money. Thus for a successful business and maximum return TQM and ERP goes hand in hand.

The quality product can be in the form of an individual coming out of an institution, goods, software, hardwares or services offered by the an organization. The philosophy of TQM originally originated from manufacturing companies and it is challenging to apply TQM in educational institutions. The main objective of this research is to establish a relationship of TQM and ERP software with education coming out a meaningful conclusion about the implementation and obstacles to implement and integrate these with the higher education system.

ERP in education

According to professors scholars teachers and many policies makers adoption of TQM with ERP can raise the level of education imparted to the students, smooth regulations of work between various departments, safety and security of students data and can provide satisfaction to the parents and students through their work. As we know the success of an educational institution is directly proportional to the quality of education and facilities provided by the institution

ERP software can now replace all the department such as accounts, library and management and integrating it into a single unit using a common source of information that is being shared to all. With the use of ERP in profitable enterprises, use of ERP software in higher education is challenging since its use is different from other profitable organizations. Educational institutions has various admission processes, scheduling of classes and meetings, assignment track of performance conducting examination and different academic activities. Various past researches show the common use and similarities in use of ERP software in educational institutions and higher education. Therefore it is necessary to study the application of ERP software and the obstacles that can come on the way to apply ERP software solutions in higher education.

TERMINOLOGIES

ERP

Enterprise resource planning software are strategic tools for managing information. Information management is organized collection of storage and use of information for benefit of an enterprise. Without ERP software business processes are not efficient in terms of data time and money. ERP centralizes all the information and connect the process of business end to end. Employees work with effectively because they have the information they need as ERP uses a single database used by all. ERP software are mobile cloud secure bringing maximum profit to the organization they are used in.

The ERP system grew rapidly due to the following reasons:

- It supports a common database supported by all the development environment.
- It optimizes all the industrial/institutional processes.
- On can access the accurate information on time.
- It removes the unnecessary data and information
- Redundancy is ignored by the system i.e. no duplicate data can be entered in the database.
- Keep track of interdepartmental workflow and activities of employees.
- It makes a company more competitive in an environment in which it operates.

TQM

TQM or total quality management means if an organization decides to produce an excellent product or service the act of planning, controlling and directing cannot be in bits and pieces or department wise, it has to be as a whole such that the quality product delivered satisfies the customers. One of the main element of TQM is customer involvement and focus. TQM has been seen as a process used to manage the change in the environment that will ensure that the company reaches the goal of TCI i.e. total continuous improvements in terms of product and services.

Total Quality Management and ERP

While preparing this article on the relationship between TQM and ERP, I first researched the current literature relating to this topic. I was surprised to find out that few articles exist about the relationship between the two concepts. Running mutually exclusive web searches on keywords "Total Quality Management (TQM)" and "Enterprise Resource Planning (ERP)" brings up numerous sources of definitive information. However, little content seems to be available where these two subjects are

treated together. Yet in practice, what may seem at first to be two separate concepts in fact go hand in hand. The reasons why these two concepts are still being treated separately could be the subject of another article. What I would like to emphasize in this article is that, for organizations applying or targeting Total Quality Management (TQM) in their businesses, Enterprise Resource Planning (ERP) software has become an essential necessity.

Let's explore the relationship between TQM and ERP by analyzing through comparison the fundamental principles at the roots of these two concepts

Customer Focus

Customer focus ranks first among the basic principles of total quality management. What customer focus connotes can be summarized as the understanding of customer needs and expectations, and the continuous effort to increase customer satisfaction. When we examine the advantages brought on by the use of ERP systems, we observe the same device occupying the first place. Some of the advantages resulting from a successful ERP implementation are minimization of disaccords by creating records of all communication with the customer, organization's enhanced ability to listen systematically to what the customer is communicating, faster response to customer requests, and increased quality in the services offered to the customer.

Teamwork

Again, according to total quality management basics, full participation in the business processes must occur in the organization, and those processes must be embraced through teamwork. In any ERP implementation, the starting point involves the definition of the processes and the formation of an interdepartmental project implementation team. The primary goal of teamwork is for the business to be grasped in whole as a single entity by all departments and personnel, and thereby being able to focus on the main processes, instead of getting lost in the disconnected sub-processes. In a successfully realized ERP implementation, all departments better understand the needs of each other. Because data exchange takes place through a central database, and does so mostly without manual intervention, the accuracy of the data and its reliability increases. As a result, the corporation is coerced to conduct its business not as a collection of independent departments, but as a unified team.

Continuous Improvement

Continuous improvement, another basic principle of total quality management, is an inherent consequence in an organization where ERP software is in use. For an organization that has made the appropriate choice in their ERP system, the associated best practices are, in a sense, acquired for free. The maintenance of the ERP software and installation of new releases on an orderly basis further assures that the system promotes the evolution of the organization in a continual fashion.

Relationships with Suppliers

Maintenance of up-to-date and reliable information on suppliers, and assessment and evaluation of suppliers also constitute important aspects of TQM applications. Most ERP systems provide support for associated functionality through dedicated modules.

Accurate and Reliable Data and Statistical Analysis

To achieve total quality management, it is critical to be able to collect, analyze and assess in a systematic method such information as production data (product trees and route information), quality

control criteria and associated values, customer complaint records related to products, and job order data. Within today's accelerated production environments, it is next to impossible to accurately and reliably achieve these tasks without the use of an advanced ERP system.

Literature Survey

Study of AI-JazIman(2006) under title: The impact of the modern system cost to control the overall quality in industrial farms.

The study aims for the proper tools and techniques which is necessary to apply in industrial enterprises for production of quality products. The study concluded that the enterprises are based on quality control systems and modern methods of costs.

Study of AI-Amin Taha(2005) under title : The impact of the application of the concept of total quality management TQM on the institutions of the state

The study aims at the relationship between application of TQM and increase in productivity which results in more profit from the production . The study concluded highlighting weakness in the official interest by the state administration and not giving it enough priority whereas most of the public institutions that have tried TQM was self-originated from within.

Study of No'man AI-Musawi (2003), entitled: Developed a tool to measure the total quality management in higher education institutions

The study found building measures included 48 paragraphs divided into 4 areas of quality management in institution of higher education .The study aimed at the application of these measures and tools in higher education institutions in Arab region.

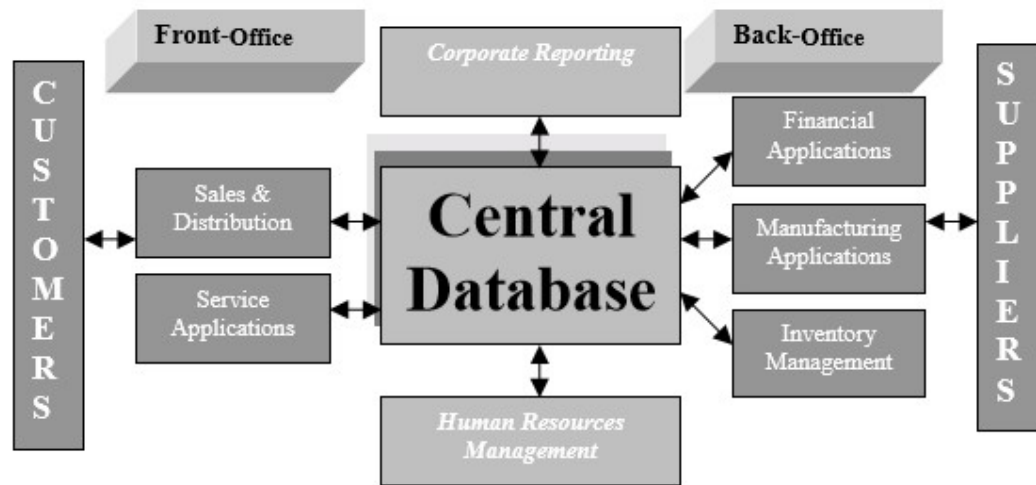
The Study Waks and Frank (1996) titled ((Entrance List of Total Quality Management :Principles and ISO standards(9000) in engineering education))

The study aimed at the principles and strategies of total quality management in engineering education and developing all tools which are necessary for quality education. It suggested a course of total quality management includes discussions, readings , case study and suggestions.

Study of Motwani (1995) entitled ((The application of total quality management in education efforts , modern and future trends))

The study aimed at the quality of educations which includes the definition , procedures ,normative studies conceptual models , application and evaluation. It also includes the application of total quality management in education , planning, commitment and implementation and future trends to those are being proposed.

The Evolution of ERP Systems

Figure 1: ERP systems concept

ERP systems are now prove in large businesses and the current move by vendors is to repackage them for small to medium enterprises (SMEs). This change has many consequences that have to be known through understanding the history and evolution of ERP systems and their current architectures. The pros and cons of the ERP systems will impact their implementation in this new market. The market position and common strategy of the major systems providers in preparation for this push are described. The chapter concludes that the growth and success of ERP adoption and development in the new millennium will depend on the legacy ERP system's capability of extending to Customer Relationship Management (CRM), Supply Chain Management (SCM) and other extended modules, and integration with the Internet-enabled applications.

The rapid growth of information and communication technologies (ICT) driven by these factors has influenced all areas of computing applications across many enterprises all together. Simultaneously the business environment is becoming complex with functional units requiring more efficient systems, which can handle all functionL AREAS SUCH AS FINANCE,HR,ACCOUNTS ,ACADEMICS AND BUISNESS AND PORTFOLIO MANAGEMENT . In this context, management of organizations needs efficient information systems to maximize growth of enterprise systems . It is universally recognized by large and small-to-medium-size enterprises that the capability of providing the right information at the right time brings tremendous rewards to organizations in a global competitive world of complex business practices.

The RAPID growth of computing power and the Internet is bringing ever more challenges for the ERP vendors and the customers to redesign ERP products, breaking the challenges of customization, and bringing the combined business over the the Internet in a seamless manner. The vendors already promise many "add-on" modules, some of which are already in the market as a sign of acceptance of these challenges by the ERP vendors. It is a never-ending process of reengineering and development bringing new products and solutions to the ERP market. ERP vendors and customers have recognized the need for packages that follow open architecture, provide interchangeable modules and allow easy customization and user interfacing.

Defination

Enterprise resource planning systems or enterprise systems are software systems for business management, encompassing modules supporting functional areas such as planning, manufacturing, sales, marketing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, transportation and e-business. The architecture of the software facilitates transparent integration of modules, providing flow of information between all functions within the enterprise in a consistently visible manner. Corporate computing with ERPs allows companies to implement a single integrated system by replacing or re-engineering their mostly incompatible legacy information systems. American Production and Inventory Control Society (2001) has defined ERP systems as “a method for the effective planning and controlling of all the resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company.

Figure 2: ERP evolution



EVOLUTION OF ERP SYSTEMS

During the 1990s ERP vendors added more modules and functions as “add-ons” to the core modules giving birth to the “extended ERPs.” These ERP extensions include advanced planning and scheduling (APS), e-business solutions such as customer relationship management (CRM) and supply chain management (SCM). Figure 2 summarizes the historical events related with ERP.

ERP SYSTEMS AND ORGANIZATIONS

It is generally a common misconception that implementing an ERP system will improve organizations productive overnight. The high expectation of acquiring all-round cost savings and service improvements is very much dependent on how good the chosen ERP system fits to the organizational functionalities and how well the tailoring and configuration process of the system matched with the business culture, strategy and structure of the organization. Overall an ERP system is expected to improve both backbone and front-end functions simultaneously. Organizations choose and end up

with ERP systems for many benefits and strategic reasons. In many cases the calculation of return on investment (ROI) is weighted against the many intangible and strategic benefits. The benefits that an industry standard ERP system .

COMMERCIAL ERP SYSTEMS

The five dominating ERP software suppliers are SAP, Oracle, PeopleSoft, Baan and J.D. Edwards. Together they control more than 60% of the multibillion dollar global market. SAP AG—Flagship Products R/3, mySAP.COM SAP AG or Systems, Applications and Products in Data Processing, was started by five former IBM engineers in Germany in 1972 for producing integrated business application software for the manufacturing enterprise (SAP, 2001). Its first ERP product, R/2, was launched in 1979 using a mainframe-based centralized database that was then redesigned as client/server software R/3 in 1992. System R/3 was a breakthrough and by 1999 SAP AG became the third largest software vendor in the world and the largest in the ERP sector with a market. Oracle (Oracle, 2001), founded in 1977 in the USA, is best-known for its database software and related applications and is the second largest software company in the world after Microsoft. Oracle's enterprise software applications started to work with its database in 1987. It accounts for \$2.5 billion out of the company's \$9.3 billion in 1999, which places Oracle second to SAP in the enterprise systems category with over 5,000 customers in 140 countries. Oracle's ERP system is known as Oracle Applications, having more than 50 different modules in six major categories: finance, accounts payable, human resources, manufacturing, supply chain, projects and front office. Oracle has other strong products in the software field including DBMS, data warehousing, work flow, systems administration, application development tools (APIs), and consulting services. A notable feature of Oracle is that it is both a competitor and a partner to some of the industry leaders in the ERP market such as SAP, Baan and PeopleSoft because of the use of Oracle's DBMS in their ERP systems. Oracle has integrated its ERP solutions with the Internet and has introduced several applications in the electronic commerce and Internetbased commerce areas. Oracle's Internet infrastructure is created around two powerful products: Oracle9i Database and Oracle9i Application Server. Another significant feature of Oracle is its OSBS, or Oracle Small Business Suite which provides consistent financials, payroll, inventory control, order entry, purchase orders, and CRM functionality—all delivered as a Web service. Oracle also offers an easy-to-activate Web presence that helps companies to sell their goods via the Internet.

PeopleSoft Inc.—Flagship Product PeopleSoft8 PeopleSoft is one of the newest ERP software firms started in 1987 in Pleasanton, California, with specialization in human resource management and financial services modules. PeopleSoft quickly managed to offer other corporate functions and attained a revenue of \$32 million in 1992. Enterprise

The Evolution of ERP Systems: A Historical Perspective 11 solutions from PeopleSoft include modules for manufacturing, materials management, distribution, finance, human resources and supply chain planning. SAP AG and Oracle—with longer experience, stronger financial base and worldwide presence—are the main competitors to PeopleSoft. Many customers comment that PeopleSoft has a culture of collaboration with customers, which makes it more flexible than its competitors. One of the strengths of PeopleSoft is the recognition by its customers that it is flexible and collaborative. The flagship application PeopleSoft8 with scores of applications was developed by PeopleSoft with an expenditure of \$500 million and 2,000 developers over 2 years as a pure Internet-based collaborative enterprise system. “Our revolutionary eBusiness platform is the first open XML platform to offer scalability and ease of use for all users. PeopleSoft 8 requires no client software other than a standard Web browser, giving you the ability to securely run your business anytime, anywhere” (PeopleSoft,

2001). “Our eBusiness applications and consulting services enable true global operations—managing multiple currencies, languages, and business processes for more than 4,400 organizations in 109 countries” (PeopleSoft, 2001). PeopleSoft with about 10% market share, is the third largest ERP vendor after SAP AG and Oracle.

Total Quality Management in Education: Compatibility and Challenges

Total Quality Management is a management approach that was instigated in the 1950s and has gradually become popular since the early 1980s. The term ‘quality’ is at the core of this philosophy. While defining total quality management, scholars took the opportunity to present their perceptions regarding this term in numerous ways; as a result, a good number of definitions appear before us with different connotations. Crosby states that quality management is a methodical way of ensuring that organized activities happen the way they are planned [3]. Short & Rahim define TQM is a proactive approach, to confirm quality into the product, service and design of the process and then to continually improve it [4]. According to these definitions, TQM is a plan, a systematic approach to ensure quality and continuous improvement. Deming describes TQM is a never-ending cycle of progress in the system of production should change into gaining better performance and quality standards for the product [5]. Yang perceives TQM is a set of practices that focuses on the systematic improvement, satisfying the customers’ needs, and decreasing rework [6]. TQM is a system and set of practices which are aimed at relentless quality improvement and better business performance. TQM views an organization as a collection of interrelated processes. It (TQM) is a method by which management and employees are involved in continuous improvement of the production of goods and services. Goetsch and Davis opine that TQM consists of relentless improvement activities, involving everybody in the business in a totally integrated effort towards improving performance at every level [7]. Vinni comments TQM creates such environment in which all the assets are used ingeniously and effectively in order to provide quality service the institution needs to adapt in this fast paced world [8]. According to Witcher, TQM is the combination of three terms—Total: meaning that one is involved, including customer and suppliers; Quality: indicating that customer needs are met exactly; and Management: indicating that senior executives are committed [9]. Oakland expresses TQM as an approach involving the whole organization for understanding each activity of each individual at each management layer [10]. TQM strives to integrate all organizational functions (marketing, finance, design, engineering, and production, customer service, etc.) to focus on meeting customer needs and organizational objectives. Escrig considers TQM as a strategic action that focuses on managing the total organization to provide products or services that fulfill their customer requirements by utilizing all resources [11]. TQM is the holistic management approach that incorporates all the organizational activities to satisfy customers’ needs and achieving overall organizational objectives as outlined by Kumar et al . [12]. Spanbauer identifies TQM as a pragmatic model focuses on service to others [13]. Yudof and Busch-Vishniac state that TQM embraces the norm that organizations should listen to their customers, continually evaluate how well they are responding to their needs and initiate change in order to meet or exceed the desires of the customers [14]. The message is clear that business is improved by the satisfied customers and it is ruined by the dissatisfied customers as expressed by Anderson and Zemke [15]. Lee and Hwan remark customer satisfaction is highly related to service quality and it is an important aspect for service organizations [16]. The observation of Wani and Mehraj is very much profound; according to them, TQM is a management philosophy which creates a customer-driven learning organization, devoted to total customer satisfaction through continuous improvement in the effectiveness and efficiency of the organization and its processes [17]. In TQM customer is an exclusive issue and customer satisfaction is considered as a major source of business success.

Compatibility of TQM with Education

Michael et al . comment that TQM can be defined as a general management philosophy and a set of tools which allow an institution to pursue a definition of quality and a means for achieving quality, with quality being a continuous improvement as determined by customers' satisfaction with the services they have received [23]. It indicates the flexible aspect of TQM, i.e . it is applicable to any organization and subject to adjustment as per merit of the situation. With the help of TQM, an academic institution would be able to develop its own definition of quality, benchmark, and quality improvement practices in the light of customers' requirement. Meirovich and Romar observe that the findings of the literature on the usefulness of TQM in education are differing [24]. There are some authors who are very much confident about the applicability of TQM in education. According to Srivanci, they believe that the values of TQM are similarly appropriate in higher education [25]. TQM principles are compatible with higher education as mentioned by Helms and Key [26] and Venkatraman [27]. The finding of James and James is very noteworthy; they opine that TQM is naturally relevant to higher education, because it is a process oriented approach that is designed in increasing productivity, decreasing costs and improving quality [28]. Deming enunciates that the adoption of TQM will help institutions of higher education to maintain their competitiveness, eliminate inefficiencies in the organization, help to concentrate on the market needs, attain high performance in all areas, and fulfill the needs of all stakeholders [29]. Tribus believes that education can be improved through quality management [30]. Peak maintains that TQM improves educational organizations in many ways, such as improving education process, making the educational environment motivating, improving educational curriculum, boosting the speed of training services and reducing costs [31]. TQM is a way of achieving and maintaining excellence in higher education as realized by Eriksen [32]. Dobyns and Crawford-Mason comment that whatever the determining incentive, where quality management has been implemented in education, it has made an enormous difference as mentioned [33]. According to De Jager and Nieuwenhuis, even though TQM developed within the manufacturing environment, the benefits are equally applicable to service organizations such as higher education institutions [34]. Murad and Rajesh perceive TQM is a general management philosophy and a blend of various tools which induce educational institutions to pursue a description of quality and the means to achieve it [35]. Others believe that TQM is to some extent applicable in education. TQM values are only somewhat useful in a dynamic and changing environment which is a characteristic of modern higher education as observed by Koch and Fisher [36], and Houston [37]. Although higher education institutions are not like companies but, some of the basic principles and tools are applicable as these are instruments at the service institutions and their governance and management boards subject to the institution's academic mission, goals and strategies as noticed by Dill [38] and Harvey [39]. In two different studies by Venkatraman and Peat et al . it has been found that TQM is a managerial instrument to resolve the issues associated with services as well as tactics in the academic industry and it can conform to the standard the education industry [27] [40]. According to Williams, continuous quality improvement; quality consistency; participation of academics, students and non-academic staff; satisfaction of the clients; and the existence of management procedures that reinforce quality are a number of quality management programs that nobody would consider irrelevant in the context of higher education [41]. Arcaro opines that quality can create an ambiance where educationalists, parents, government officials, community representatives, and business leaders work jointly to deliver students with the resources they need to meet current and future academic, business, and societal needs [42]. Bayraktar et al . reveal that a number of TQM elements have a critical role in process improvement including, "leadership", "vision", "measurement and evaluation", "process control and improvement", "program design", "quality system improvement", "employee involvement", "recognition and reward", "evaluation and training",

“student focus”, and “other stakeholder focus” in higher education [43]. A good number of scholars find that some TQM tools and techniques are convincingly suitable in education. For example, Sirvancimentions that the use of quality function deployment (QFD) which is used to incorporate the preference of customers and other stakeholders in program design [25]. Quinn et al . discuss the application of Six Sigma, Service Quality (SERVQUAL), ISO9000, and TQM in higher education [44]. It has the capacity to provide practical solutions, positive results in academic and administrative functions. From the abovementioned discussion, it is clear that TQM is credibly compatible with the education. Nevertheless, in this connection the remark of Sousa and Voss is quite thought provoking; they comment that TQM principles are not universally applicable across all contexts but are contingent on contextual factors [45] [46]. It implies that TQM tools and techniques are subject to fine tuning while applying in education.

Key Challenges in Implementing TQM in Education

There is no doubt that TQM has full potential to serve education. It must not be taken as granted that there are no challenges or barriers in implementing TQM in education. Some educators believe that philosophy which is developed for business may not be appropriate for service organization like educational institutions. The schools or other type of academic institutions are very much different with a different ethos and characteristics that made difficult, or even impossible to implement a philosophy which has been derived from industry [47] [48] [49] [50]. Rosa et al . state that the terms such as product, client, empowerment, or even strategy, reengineering do not easily correspond in higher education institutions [51]. The biggest obstacle could be the commitment from the parties involved with education system, especially the top management and teachers. Brown et al . notice that lack of top management commitment affects TQM efforts negatively, which is one of the main reasons of failure of TQM efforts [52]. According to Massy, the extreme resistance to quality process improvement comes from professors who consider it is just another business-oriented craze; a typical mindset may undermine the effectiveness of TQM in education[50]. The role of individual, particularly the teachers are often informal and less bureaucratic in traditional education system. On the other hand, Koch and Fisher observe that TQM approach seems to be more administrative and bureaucratic; there is a tendency to produce relentless meetings, generate enormous amounts of paper, and delay or escape critical decision making [36]. There is a long debate about the definition of quality in education. Sarrico et al . state that quality can have multiple meaning in higher education and this variety has considerable influences on the development of methods and instruments of measuring quality; and this variety also can create different stakeholders for the higher education institutions [53]. Houston mentions that the way the definition of quality is given based on the customers’ needs and expectations in business and industry environments is not totally appropriate for education [54]. Overall, this term (quality) may create a complex situation for the academic institutions. The term customer may be very easy to define in manufacturing or business organizations. However, defining and identifying customer is a challenge in education. Ali and Shastri comment that vagueness in customer identification also creates obstacles in TQM implementation [55]. According to Houston, the definition (customer) prevails in industry or business environment which based on the idea of satisfying customers’ needs and expectations, is a problematic one in education [54]. Education has multitude interested parties. In the case of elementary and high school level, it is relatively easy to define; parents are the customers and students are the consumers. Youssef et al . find that the customers of higher education are much more diverse and not so easily defined [56]. This situation is complicated in the case of tertiary level of education. A student can be both the consumer and customers if he or she pays his or her tuition fees. In the job market, employer organizations are also the customers. In the case of scholarship students, sponsors are the customers.

As a whole, the state is also a customer. According to Srivanci, without a precise definition of customer and a customer focus, quality efforts may be easily diffused [25]. Seymour identifies a number of reasons for unsuccessful application of TQM in higher education, such as resistance to change; lacking of administration commitment; high time investment due to personal training; difficulty in applying TQM tools to higher education institutions; insufficient experience of team leaders and staff in teamwork; the anxieties of higher education institutions have with their own results not being sufficient enough [47]. Koch acknowledges a wide range of reasons, these are: lost in focus, i.e. TQM tends to put more emphasizes on non-academic activities (e.g. bill collection, check writing, admissions applications, and physical plant inventory) rather than core academic activities (e.g. curriculum development; teaching and learning style, tuition fees, student welfare etc.); resistance from the faculty members as it (TQM) impedes their authority and freedom, violate the confidentiality related to assessment, promotion, salary and so forth and practice of teamwork in education process as these are not consistent with the traditional teaching process; and defining customers and measuring outcomes are two major difficulties in implementing TQM in education since a wide range of customers (like students, parents, researchers, alumni, business firms and so on) are involved in higher education so it very difficult who are the real customers in education, it is equally difficult to measure the outcomes of quality initiatives [57]. Rosa and Amaral also mention a number of barriers in implementing TQM in education: the absence of effective communication channels; the problem in measuring higher education institutions results; the co-existence of multiple purposes and objectives for higher education institutions; the emphases in the individualism and significant degree of internal competition; the bureaucratic decision-making process; and the lack of a strong leadership, highly committed to the ideas and principles it wants to apply and capable of involving all the institution's members [58]. Dale, et al. notice some critical obstacles such as: ineffective leadership; obstruction to change; contradictory policies; inappropriate organizational structure; and poor management of the change process are other shortcomings in implementing TQM [59]. Kosgeidetetsa number of challenges in this regard, too; these are: lack of commitment by the management and some workforce, school's organizational culture, poor documentation, inadequate training of staff, and ineffective communication [60].

ERP in Higher Education

ERP systems are used by large corporations around the world, recently replacing management, financial and administration computer systems in the higher education sectors (Pollock and Conford 2005). ERP has played a significant role in the IT management of higher education but it was –to some extent– far from the core discipline of the higher education. It is important to define ERP systems in higher education as being multiple in scopes, tracking a range of activities of including those of human resource systems, administrative student information systems and financial systems (Robert, 2004). Despite the challenges of implementing ERP systems, organizations in the corporate sector, which likely operate in more financially competitive environments than those in the nonprofit sector as most of higher education institutions, have experienced numerous benefits from ERP systems during the last two decades only on the management, financial and administrative level. Higher education has always been a sector that have unique organizational models and core processes as well as objectives compared to other business, the higher education system supports the academic activities in colleges including some basic process such as scheduling, learning process – advising and follow up and performance indicators–, and examination process. Previous studies have identified many similarities between implementing ERP system software in educational institutes and in other organizations (Pollock and Cornford, 2005). It is therefore important to study the implications of using ERP systems in higher education and the necessary information required to avoid the

problems caused by legacy systems, in order to address the role of ERP in changing educational organizations and the implications of its use in similar organizational cultures. As per the empirical research (Hussein 2014) The researcher selects 3 from 25 Saudi universities have an experience in ERP systems: 1. King Abdul Aziz university, its system name's is ODES plus 2. King Saud university, its system name's is MADAR 3. King Fahd University, its system e Moraslat. These systems serve administrative and academic sections in all of these universities and its branches. Researcher collects data about 3 previous universities ERP systems through interviewing three types of users in these universities, despite of the different systems name and design, but the result is 3 systems cover the following administrative sectors:

1. Human resource 2. Financial management 3. Procurement management 4. Where house (store) management 5. Student registration management 6. Library management

4. Higher Education ERP software misfit Due to poor ERP selection and evaluation process, ERP software can be found to be ill-fitting with the business requirements. For instance, if the ERP software is not in compliance with the legislative environment, the leasing companies will not be able to provide its users activities with the right legal framework assuming is a nonprofit environment with – to some extent- a bureaucratic methodology. The major cases of misfitting ERP in higher education. (Charisma 2014). High turnover rate of project team members In non profit organization as higher education institutions with the governmental payroll, if the project team members suffer from high work stress and workload when coping with the implementation, some member teams may resign from their job, which means insufficient ERP knowledge and skill transfer among project teams during the ERP implementation life cycle. In the end, users and project team members will have insufficient ERP knowledge for performing their daily tasks when using the ERP system. Over-reliance on heavy customization Due to software mismatch, heavy customization will be required in the areas of program customization and report customization. Customization could cause project delays, overspent budget and an unreliable system (due to poor quality of customization, unresolved system bugs and insufficient testing). Customizing the ERP to fit with specific leasing business processes might lead to sacrificing "best practices" embedded in the ERP system. Poor consultant effectiveness Some of the consultants can be considered to be inexperienced with ERP systems and unable to provide a professional level of advice on EPR project planning. Consultants that communicate ineffectively during the project phase and just suggest workarounds without applying professional skills to conduct BPR (Business Process Reengineering) to bridge the gap between ERP systems and business processes are considered inefficient. Poor IT infrastructure If the top management has insufficient financial resource provided for the implementation process, then a low performance IT infrastructure hardware will be proposed by the consultants and project manager (so as) to reduce the costs of ERP implementation. The poor IT infrastructure will most probably lead to a slow processing capability of the ERP system. Poor knowledge transfer Inexperienced consultants that are not aware about the specificity of the leasing industry and try to practice during training sessions will not deliver professional ERP training to the users. Also, if the training material is not written properly, all the information will be found to be too brief and unhelpful. Poor project management effectiveness If there is limited ERP knowledge, capability and poor project management skills, the ERP project will be considered to be challenging and demanding, as it involves managing systems, people (project team, users and external consultant) as well as re-designing business processes. It is important for the project manager to effectively manage the

consultants, for example, in evaluating their communication and training performance, when conducting BPR (Business Process Reengineering), and when testing the system performance. Poor quality of Business Process Reengineering (BPR) It is also possible that some of the project team members to have an unclear vision of why or how to conduct BPR because their consultants provided unprofessional advice for conducting BPR. It will be difficult for project team members to collaborate and contribute to BPR, and the poor quality of BPR will lead to incorrect system configuration problems. If the business processes are not successfully reengineered to fit with the ERP systems, and the project teams are not ready for the adaptation of new business processes, they will not have the mindset for implementing or using the ERP system. Moreover, during the BPR process, if the consultants will not conduct mapping analysis to map the software functionalities with business requirements, this will lead to a mismatch between ERP and business processes. Poor quality of testing An over-tight project schedule and an insufficient knowledge in testing ERP systems, will conduct in a rush and low quality. The ERP testing result is an indicator for revealing the readiness of the ERP system to “go live” (from the perspectives of examining IT infrastructure capacity, correct configuration of ERP system, if people - including users and project team - were equipped with sufficient knowledge and skills, and data was of good quality). Poor top management support Top management is expected to provide support in the areas of committing to the ERP project, sufficient financial and human resource, and the resolution of political problems if necessary. Limited financial support will contribute to a rushed ERP implementation process, project team members will be overloaded and high staff turnover rate, ineffective knowledge transfer, and political problems will occurred. Insufficient commitment will lead to political problems which will hinder the implementation process (causing poor BPR, widespread user resistance to change and low user satisfaction). Too tight project schedule If the top management and the project manager will like to reduce the budget of the ERP project and they will set the project schedule too tight, the implementation activities will be conducted in a rush (e.g., project planning, BPR, training, testing and so on) in order to meet the project deadline. The project team and users will overload the system. Unclear concept of the nature and use of ERP system from the users’ perspective Due to poor quality of training and insufficient education delivered by the top management and project team, users will not have a given clear idea of the nature and use of the ERP system. Conclusions: they will not understand the rationale for implementing the ERP system or the process of implementation and they will not be prepared for the implementation, they will take resistance to change, which will lead to political problems, poor quality of BPR and a resistance to using the system. Unrealistic expectations from top management concerning the ERP System If top management will assume that the ERP implementation will provide great solutions without considering the complexity of the ERP system, this will lead to possible implementation process complications and associated risks. This gave the whole project team and users unrealistic expectations. This misconception will lead to superficial project planning and an underestimation of budget and resource allocation, and will result in failure of ERP implementation from a project

ERP comparative modules for some of the vendors working in GCC in Table (1)

SAP	Oracle	PeopleSoft	JD Edwards
Sales & Distribution	Marketing, Sales	Supply chain	Order management
Materials Management MRP	Procurement	Supplier relationship	Inventory, procurement
Production Planning MRPII (with others)	Manufacturing		Manufacturing mgmt
Quality Management		Enterprise perform	Technical foundation
Plant Maintenance	Service	Enterprise service	
Human Resources	Human Resources	Human capital mgmt	Workforce management
Financial Accounting	Financials	Financial mgmt solution	Financial management
Controlling			Time & Expense mgmt
Asset Management	Asset Management		Enterprise asset mgmt
Project System	Projects		Project management

Apparently none of the above vendors solicitous the higher education ERP real functionalities, although the ERP space in higher education is moving rapidly. Vendors that have not spent much time understanding the needs of higher education are doing much better now than previously, though they can still do much better. Because of the growing competition, vendors are working at rolling out integrated suites of software that support the thin client Web interface and object oriented systems. New versions are now rolling out much faster, making it challenging to keep up with the ERP project that never seems to end. As soon as you are done with the implementation, you are working on the next major upgrade, of course the available ERP in the market is not matured enough to meet and satisfy the higher education requirements. This paper is supposed to be means to an end, that end being innovation for using ERP in higher education in full satisfaction, now a days the means become the End. There is a common misconception in the ERP market confirms that getting a state of the art ERP application is the end, on the contrary, having the ERP is not the end, but it is the means where the end is the ultimate user satisfaction. Obviously, this is the situation of ERP system in higher education. The ultimate user satisfaction always depends on the higher education functionalities availability in the ERP application. The real functional requirements describes what higher education ERP system should do, while non-functional requirements place constraints on how the higher education ERP system will do so, based on that it worth to differentiate between higher education ERP functional and non-functional requirements. An example of a functional requirements for the higher education ERP system are shown in Table (2)

Seq	Functionality	Seq	Functionality
1	Institution profile	16	Internal massaging
2	Staff profile	17	Alumni management
3	Student profile	18	Hostel management
4	Feedback mechanism module	19	Transportation management
5	curriculum	20	Stuff attendance
6	Performance analysis	21	Semesters Calendar
7	Attendance	22	Library management
8	Score card	23	Accounting
9	Online examination	24	Fees management
10	Online assignment	25	Academic advising
11	Admission	26	Ad hock reporting
12	Payroll	27	Asset Management
13	Time table	28	Job / requirements analysis
14	Event management	29	Labor market demand
15	Notice board	30	Education / labor market observatory

Table (2)

Technical Preview of ERP in higher education

This paper confirms that ERP is not only having the application, but it comes across a combination of other basic methodological items. The table (4) shows a part of the other side of integrated solution and what is being missed for getting a workable ERP solution for higher education.

Seq	Item	Description	Tasks covered by ERP	Tasks NOT Covered by ERP	Impact factor % **
1	Strategy	Vision , Mission , Strategic objective , Goals	No	√	15
2	Business	Corporate policies, Operating Model, Business processes, Bylaws. Important	No	√	10
3	Data structure	Data models: conceptual, logical, and physical	√	√	10
4	ERP Application	Application software pool of data and knowledge	√	No	35
5	Workforce	Employee Assessment	X	√	5
6	Facilities	IT Infrastructure assessment :			15
		Clients	X	√	
		Network	X	√	
		Storage	X	√	
		Application	√	X	
		Data	√	X	
		Security	X	√	
		Change	X	√	

During implementation of higher education ERP , a little attention used to be placed on strategic planning, organizational culture, and use of disciplined project management principles. Though these were successful case studies, they contained evidence of the immense difficulty of implementing ERP solutions. Strategic planning is central to online education (Lawrence T. Gilroy 2011). It was believe strategic planning for information technology in universities is in a state of crisis. There have been some good studies that address issues of strategic planning (Levy & Beaulieu, 2003). A researcher could design a management framework for setting up online software for commercially successful firms, as well as small and disadvantaged universities.

When reviewing a tripped or failed ERP implementation and determine the circumstances that led to its failure. Frequently, university management will conclude that the software doesn't work or it is too complex to implement in their unique environment. Management further compounds the failure by claiming that the wrong ERP system was chosen, and if they had the "right" software package they could recapture their initiative and achieve their original objectives. Yet, the paper shows that the software itself is rarely the source of failure. In fact, selecting the presumed "right" software package will most likely result in a second failure – this one even more costly than the first. Moreover the lack of proper ERP system integration would mean that the data would have to be manually exchanged between the current legacy system and the ERP system – although they already obtained a state of the art ERP solution.

This cause a number of troubles because data especially if the data is not being properly exchanged between the two solutions. Loss or mutilation of data at the time of export would mean that a lot of complications would arise and the company may even have to suffer a lot of losses. The other side of deploying ERP may come more important rather than acquiring more hardware , software , network , etc.. Always SOW of any ERP solution does not cover the following:

i. Internal Control Getting controls "right" during the initial ERP software implementation is often less expensive than retrofitting controls. System implementers tend to focus on issues of functionality rather than control - perhaps spending more time making sure orders can be processed, for example, than on security issues. The internal control includes: Segregation of duties; following policies; the integrity, ethical values; and competence of an organization's employees. ii. Current policies and procedures (bylaws) Policies and procedures are important resources which govern the operation of any ERP and specially in higher education. They provide belief statements and operating guidelines for stock holders and staff regarding the administration of program, property, student, staff and board matters. iii. Workforce assessment

ERP implementations are difficult and most of ERP vendors are not in their concern the workforce assessment. in benchmark studies (Gartner 2013) suggest nearly 66% of companies realize less than 50% of anticipated business benefits from their ERP implementation. So what does this mean? It means organizational change management is important. It means ERP projects are about people, NOT technology. The new system will impact roles, responsibilities and how business is conducted within an organization. A clear understanding of the impact of change allows the business to design a plan and address the different levels of changes accordingly. This approach creates user acceptance and buy-in of the new ERP system. When people use the system, benefits will be achieved.

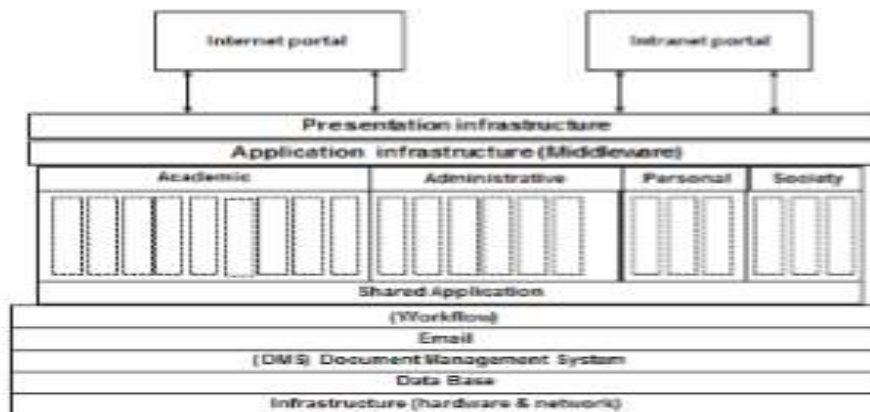
iv. Security Policy for the whole operation environment. The right security, appropriately tailored to take proper account of the very wide range of different jobs we do, assets we handle and environments we work in, is a critical pre-requisite for meeting many of these challenges. It ensures we can keep and develop the public's trust that we will handle their information properly

The purpose of this preview was to optimize across implementation ERP the often fragmented legacy system processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy of the university and to confirm ERP is not only software enjoy all the non-functional items shown in table (3) in this paper

KAU ERP Framework

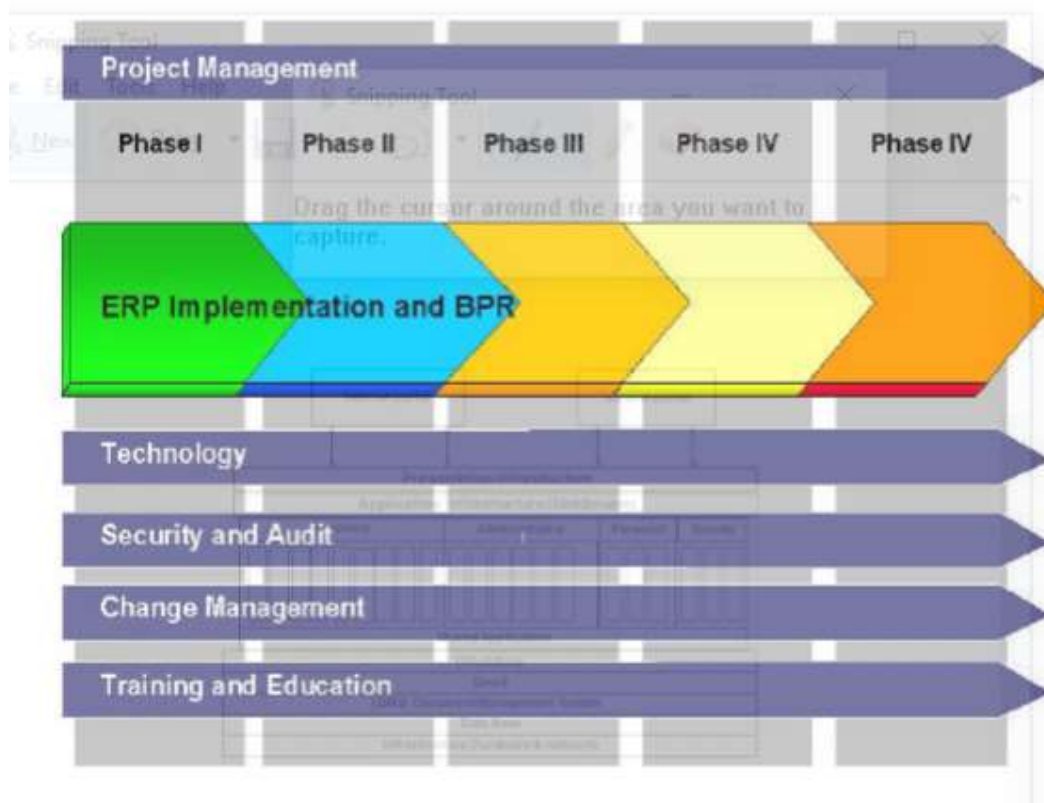
The survey was conducted in 30 small to medium sized manufacturing enterprises with a range from 6 to 3500 employees. The objective of this survey was to gather information about the following issues: - a specific knowledge of employees about the ERP system (familiarity with the meaning and functions of the ERP system) - the frequency of using a particular ERP system (or modules) within enterprise - the characteristics of ERP system the enterprise uses (language, ERP vendor, “made to measure” or general adjustable solution...) - employees’ motivation to introduce the ERP system - the training of employees - maintaining the ERP system - what are the advantages and disadvantages of a particular ERP system - the most common reasons for failure of the ERP system implementation.

In the following paragraphs, the processed data of the research are presented and discussed. The ERP system is used in 90 % of respondent enterprises, which is quite promising. 19 % of these enterprises use standard "closed system", and 81 % of them a specially designed (made to measure), i.e. modular one. The ERP system designed in Croatia is used in 59 % of related enterprises, while the rest of enterprises (41 %) use the ERP system produced out of Croatia.



First, implementation strategies and methodologies are studied. ERP systems are modular in design. For example, the Financials Module can be implemented first, followed by the Procurement module, and then the Manufacturing Module. etc. Also, ERP systems are designed for multi-national organizations. So there are many different strategies used for unrolling an ERP system throughout an organization. There are no hands-on exercises associated with this module but this discussion is generally enhanced if students have had hands-on exposure to an ERP system. The traditional approach to ERP implementation gained the reputation of being reengineering intensive in large part due to the early target audience of ERP vendors: large, multi-national firms with annual revenues exceeding 2.5 billion dollars. When the large firm market for new implementations dwindled and smaller firms complained that ERP was too costly, ERP vendors were forced to reduce cost. Cost cutting was accomplished by creating lean implementation methodologies that are based on the experiences and best practices of previous implementations and that permit less process reengineering and more ERP

system conformance. These new methodologies often are associated with names that imply fast, rapid, or accelerated implementations. Students study various ERP implementation strategies that have been adopted by consulting firms and by the vendors themselves. For example, they study the implications of the accelerated implementation approach on various implementation threads (project management, technology, security and audit, change management, training and education (see Figure 6)), and the over-all ERP/BPR effort and the impact on the organization. The second part of this KnowDule takes a more hands-on approach by first looking at the available ERP implementation tools and then by engaging in the mechanics of configuring the ERP system based on user requirements. A project management tool is available to initiate, facilitate, and maintain the information flow between organizational units during an implementation.



This paper presents summary of the Deming's fourteen points in the next pages:

1. Generate Reliability of Function for Perfection of Merchandise and Service Develop a system for the up gradation and betterment of the teaching learning processes. The focus should be on the intention that product of the system would be valuable and be capable to participate and fulfill the societal needs and desires in a purposeful manner. Organizations must develop a long-term view and program to sustain in the field for a range of goals and objectives. Novelty is created and measures are adopted to guarantee the sustainability of wares and services for long term. Traditional models of management focus only in defining the purpose of the organization where as Deming (1991) suggests more than that: reliability of function.

2. Implement Innovative Ideas

Adopt new philosophy of finding facts through data. Clinch new management ideas; awaken the leadership for their responsibilities and challenges for change. For the new economic age, management needs to take leadership for change into a learning organization. New methods like participation and discussion method, problem solving method, project method, and experimental work is used in teaching at all levels.

3. Stop Dependence on Mass Inspection According to Deming (1991), without improving the system the dream of quality can't turn up into reality. Inspection services can not result into improvement of the service or product. The quality can live achieved only through learning experience to masses, which towards quality assurance.

4. End Grading Practice

TQM, philosophy focuses on the fact that the grading practices in organizations should be stopped because ratings of people create harmful results. Attention should be paid to learning processes rather than the rating processes.

5. Develop Persistent and Everlasting System of Production and Service

In education the focus should be on the improvement of teaching learning processes Deming (1999). This can be done by using the findings and results of the latest researches in these areas. The best techniques, strategies and methods should be adopted and evaluated accordingly. This process of improvement of production or services would be constant in nature.

6. Institute Training

Establish a mechanism of continuous training on the job for members of the faculty, allied staff and administration of educational institutions. Each of them should follow the vision and mission of the organization through their commitment and improvements in the institutes.

7. Develop Leadership

School leadership's role should be shifted from inspection to supervision. These supervisory practices should be to help and guide the members of the staff for adopting new paradigms of quality assurance. Supervisors may be so smart to help the colleagues how to use the new materials and technologies in their teaching and make learning a joyful activity for the young learners. Supervisors are to lead people not to punish. Ho (1999) proposed that leading should consist of serving work force for better performance to learn by objective methods.

8. Drive out Fear

Fear is enemy of creativity, which is a key factor in continuous improvement. Therefore, Deming (1991) suggests driving out fear in all walks of the organizations both industry and education. This is how everyone will perform bettering the system. This can be done by preparing and encouraging people for taking risks boldly. Fear can be thrown out from the organization by creating an environment of dignity and respect. If we behave with respect and dignity then the members of the organization will provide innovative ideas for improvements.

9. Maximize the Effort of Team Work

Quality of the educational organization can be optimized by developing a sense of cooperation and collaboration among the members of the institutional groups. Therefore, Deming (1991) argued to break down barriers between departments. Strategies for the improvement of collaboration as a team work should be adopted. This dynamics can be ensured by time management.

10. Remove Slogans and Catchphrases

Slogans and buzz words have the assumption that the staff members can perform better if they will try harder and harder. This makes angry rather than to inspire the members of the staff. Such targets and catch words for educators and learners in the educational institutes for ideal achievement and new echelon of efficiency should be eliminated. This is to do so because slogans create adverse effects on the performance of the teachers and the students. The causes of low quality of productivity and achievements belong to the organizational system of education rather than the educators and learners.

Conclusion

Today, for organizations that embrace total quality management as a management approach that goes beyond simple certification and for those that actively apply it in their businesses, investment in ERP software is an essential necessity. Not using an ERP system will result in a much costlier task to implement total quality management in the organization. For those businesses that have not yet started TQM and ERP implementations, starting both simultaneously and treating them as integrated projects will allow organizations to attain the best returns. For businesses that are at the ERP selection stage, I suggest making a choice under the guidance of TQM principles. It is not sufficient for the system they choose to meet the present needs of their organization. In light of continuous improvement, they must be convinced that their ERP system of choice will be able to meet their future needs as well. The software must also be flexible, and have the infrastructure that will allow it to keep pace easily with revisions in the business processes. Additionally, working closely with a consulting team that is well versed in TQM and ERP requirements is key among factors for success.

References

1. Ahmad, M. M., & Cuenca, R. P. (2013). Critical success factors for ERP implementation in SMEs. *Robotics and Computer-Integrated Manufacturing*, 29(3), 104-111.
2. Ahmadi, S., Papageorgiou, E., Yeh, C. H., & Martin, R. (2015a). Managing readiness-relevant activities for the organizational dimension of ERP implementation. *Computers in Industry*, 68, 89-104. Ahmadi, S., Yeh, C. H., Martin, R., & Papageorgiou, E. (2015b).
3. Optimizing ERP readiness improvements under budgetary constraints. *International Journal of Production Economics*, 161, 105-115. Ahmadi, S., Yeh, C. H., Papageorgiou, E. I., & Martin, R. (2015c).
4. An FCM-FAHP approach for managing readiness-relevant activities for ERP implementation. *Computers & Industrial Engineering*, 88, 501-517. Antoniadis, I., Tsiakiris, T., & Tsopogloy, S. (2015).
5. Business intelligence during times of crisis: Adoption and usage of ERP systems by SMEs. *Procedia-Social and Behavioral Sciences*, 175, 299- 307. Armstrong, B. C., Ruiz-Blondet, M. V., Khalifian, N., Kurtz, K. J., Jin, Z., & Laszlo, S. (2015).
6. Brainprint: Assessing the uniqueness, collectability, and permanence of a novel method for ERP biometrics. *Neurocomputing*, 166(20), 59-67.

7. Deshmukh, P. D., Thampi, G. T., & Kalamkar, V. R. (2015). Investigation of quality benefits of ERP implementation in Indian SMEs. *Procedia Computer Science*, 49, 220-228. Efe, B. (2016).\
8. An integrated fuzzy multi criteria group decision making approach for ERP system selection. *Applied Soft Computing*, 38, 106-117. Galy, E., & Saucedo, M. J. (2014).
9. Post-implementation practices of ERP systems and their relationship to financial performance. *Information & Management*, 51(3), 310-319
10. Hsu, P. F., Yen, H. R., & Chung, J. C. (2015). Assessing ERP post-implementation success at the individual level: Revisiting the role of service quality. *Information & Management*, 52(8), 925-942.
11. Lee, J. C., Shiue, Y. C., & Chen, C. Y. (2016). Examining the impacts of organizational culture and top management support of knowledge sharing on the success of software process improvement. *Computers in Human Behavior*, 54, 462-474.
12. Nwankpa, J. K. (2015). ERP system usage and benefit: A model of antecedents and outcomes. *Computers in Human Behavior*, 45, 335-344.
13. Sara Orougi "Recent advances in enterprise resource planning" Accounting homepage: www.GrowingScience.com/ac/ac.html
14. Kanwal Nasim Arif Sikander Xiaowen Tian "Twenty years of research on total quality management in Higher Education: A systematic literature review" wiley online library.
15. Malcolm Tight, Research into Quality Assurance and Quality Management in Higher Education, Theory and Method in Higher Education Research, 10.1108/S2056-375220200000006012, (185-202), (2020).
16. Vivien Surman, Zsuzsanna Eszter Tóth, Investigating Service Quality Issues in Higher Educational Context, *Zagreb International Review of Economics and Business*, 10.2478/zireb-2019-0025, 22, s2, (11-37), (2019).
17. Al Muamer, W. (2014). The relationship of total quality with the performance of employees in the Palestinian universities Gaza Strip, unpublished Master Thesis, Al-Azhar University.
18. Nasser Abdul Ghani Al- Saffara and Abdallah Mishael Obeidatb* "The effect of total quality management practices on employee performance: The moderating role of knowledge sharing" *Management Science Letters* homepage: www.GrowingScience.com/msl
19. Mohd Zaid Malik., Rajiv Banerjee and Syed Aqeel Ahmad.2018, A Review Paper on Implementation of Total Quality Management (tqm) in Construction Industry. *Int J Recent Sci Res*. 9(5), pp. 26515-26517.DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0905.2074>
20. Ms Aiswaryan.K.LalajiI, Ms Sivgami.M, "Total Quality Management Practices In Construction Companies (KERALA)", Volume 5, Issue 12, pp. 230-234, © IAEME: www.iaeme.com/Ijcieta.asp Journal Impact Factor (2014): 7.9290 (Calculated by GISI) www.jifactor.com.
21. Anantha Subramaniam, "A Study on Challenges Sin Implementing Total Quality Management in C, construction Firma at Coimbatore", ISSN 2348 – 8034, GJESR, May 2014.

22. Saurin Kakkad, Pratik Ahuja, "Implementation of Total Quality Management in a Construction Firm" Volume 3, Issue 10, IJSETR, October 2014. 14.
23. Umair Mazher et.al "A Study on the Factors Affecting Total Quality Management in the Saudi Arabian Construction Industry" International Journal of Business and Social Research Volume 05, Issue 03, 2015.
24. P.P.Mane, J.R.Patil "Quality management system at construction project: a questionnaire survey" ISSN: 2248-9622, Vol, Issue 3, (Part-3) March 2015, pp.126- 130, www.ijera.com.
25. Priyanka Hirave, Rahul S. Patil, "Needs of total quality management in Indian construction industry" ISSN (O)2319-8354, ISSN(P)2319-8346, Vol.5, issue no.09, www.ijarse.com, September 2016
26. Asif Iqbal, Rajeev Banerjee, Zeeshan Raza Khan and Raj Bandhu Dixit, Construction Disputes in Construction Work Sites and Their Probable Solutions. International Journal of Civil Engineering and Technology, 8(3) March, 2017, pp.74-81.
27. Farhan Ahmad, Rajeev Banerjee, Zishan Raza Khan, and Raj Bandhu Dixit, SWOT Analysis of Arbitration Awards in Indian Construction Contracts. International Journal of Civil Engineering and Technology, 8(3), pp. 64-73
28. Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R. and Childe, S. J. (2016), "How to improve firm performance using big data analytics capability and business strategy alignment?", International Journal of Production Economics, Vol. 182, pp. 113-131.
29. Arunachalam, D., Kumar, N., and Kawalek, J. P. (2018), "Understanding big data analytics capabilities in supply chain management: Unravelling the issues, challenges and implications for practice", Transportation Research Part E: Logistics and Transportation Review, Vol.114, pp. 416-436.
30. Bag, S., Wood, L. C., Mangla, S. K. and Luthra, S. (2020a), "Procurement 4.0 and its implications on business process performance in a circular economy", Resources, Conservation and Recycling, Vol. 152 No.January,104502.
31. Bag, S., Wood, L. C., Xu, L., Dhamija, P. and Kayikci, Y. (2020b), "Big data analytics as an operational excellence approach to enhance sustainable supply chain performance", Resources, Conservation and Recycling, Vol.153No.February,104559.
- Foidl, H. and Felderer, M. (2015), "Research challenges of industry 4.0 for quality management", In International Conference on Enterprise Resource Planning Systems, pp. 121-137. Springer, Cham.
32. Frank, A. G., Dalenogare, L. S. and Ayala, N. F. (2019), "Industry 4.0 technologies: Implementation patterns in manufacturing companies", International Journal of Production Economics, Vol. 210 No. April, pp. 15-26.

33. Gunasekaran, A., Subramanian, N. and Ngai, W. T. E. (2019), "Quality management in the 21st century enterprises: Research pathway towards Industry 4.0", Vol.207 No. January, pp. 125-129

- Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S. F., Childe, S. J., Hazen, B. and Akter, S. (2017), "Big data and predictive analytics for supply chain and organizational performance", *Journal of Business Research*, Vol. 70, pp. 308-317.

34. Gupta, S., Drave, V. A., Bag, S. and Luo, Z. (2019), "Leveraging smart supply chain and information system agility for supply chain flexibility", *Information Systems Frontiers*, Vol. 21 No. 3, pp. 547-564.

35. Hyun Park, S., Seon Shin, W., Hyun Park, Y. and Lee, Y. (2017), "Building a new culture for quality management in the era of the Fourth Industrial Revolution", *Total Quality Management & Business Excellence*, Vol. 28 No. (9-10), pp. 934-945.
36. Bradford, M., Earp, J., Grabski, S.: Centralized end-to-end identity and access management and ERP systems: a multi-case analysis using the technology organization environment framework. *Int. J. Account Inf. Syst.* 15, 149–165 (2014)
37. Yin, R.: *Case Study Research: Design and Methods*. Sage Publications, Thousand Oaks (2014)
38. Nuno Melão and Joaquim Loureiro "ERP in the Education Sector: Evidence from Portuguese Non-higher Education Institutions" march 2017 *Advances in Intelligent Systems and Computing* DOI: [10.1007/978-3-319-56535-4_59](https://doi.org/10.1007/978-3-319-56535-4_59) Conference: World Conference on Information Systems and Technologies.
- 39.
40. Nirmal Iyengar, Dr. Pushpkant Shakdwipee, IMPACT OF DEMOGRAPHIC FACTORS GENDER AND NUMBER OF YEARS OF ERP POST IMPLEMENTATION OPERATIONS ON USER PRODUCTIVITY: AN EMPIRICAL STUDY IN HIGHER EDUCATION SETTINGS, IN INDIAN CONTEXT , *International Journal of Research - GRANTHAALAYAH*: Vol. 7 No. 11 (2019): Volume 7 Issue 11: November 2019

41. Michaël Le Duc "Adoption of Enterprise Resource Planning (ERP) systems in university education curricula – a case study".

42. Davis, Charles H. and Comeau, Jana (2004) "Enterprise Integration in Business Education: Design and Outcomes of a Capstone ERP-based Undergraduate e-Business Management Course," *Journal of Information Systems Education*: Vol. 15 : Iss. 3 , 287-300. Available at: <https://aisel.aisnet.org/jise/vol15/iss3/8>

43. Albarghouthi, M., Qi, B., Wang, C. & Abbad, M. (2020). ERP Adoption and Acceptance in Saudi Arabia Higher Education: A Conceptual Model Development. *International Journal of Emerging Technologies in Learning (iJET)*, 15(15), 110-120. Kassel, Germany: International Journal of Emerging Technology in Learning. Retrieved November 24, 2020 from <https://www.learntechlib.org/p/217992/>.
44. Uddin, M.A.; Alam, M.S.; Mamun, A.A.; Khan, T.-U.-Z.; Akter, A. A Study of the Adoption and Implementation of Enterprise Resource Planning (ERP): Identification of Moderators and Mediator. *J. Open Innov. Technol. Mark. Complex.* **2020**, *6*, 2.

45. Cineca. (2019). Cineca Project. Retrieved from <https://www.cineca.it/en>
46. Vertiv. (2018) Vertiv Case Study. Retrieved from https://www.vertivco.com/globalassets/documents/case-studies/vertiv-case_study-cineca-it2018_engb_249727_0.pdf

47. Almajalid, R. M. (2017). A survey on the adoption of cloud computing in education sector, Cornell University library. Retrieved from <https://arxiv.org/abs/1706.01136>
48. Hubner, U., Duda, I., Merz, Natusch, M., D., & Weckmann, H. (2008). HISinOne - Development and early adoption partnerships. Proceedings of EUNIS 2008: The 14th Congress in a Series of Conferences within the Framework of the European University Information Systems Organization, Aarhus C, Denmark.
49. Liu, M., Hansen, S., & Tu, Q. (2014). The community source approach to software development and the kuali experience. *Communications of the ACM*, 57(5), 88-96.
50. Courant, P. N., & Griffiths, R. J. (2018). Software and collaboration in higher education: A study of open source software. Retrieved from https://www.campussource.de/opensource/docs/OOSS_Report.pdf
51. Feldstein, M. (2014). Community Source is Dead. Retrieved from <https://mfeldstein.com/community> *Journal of Computers* 46 Volume 15, Number 2, March 2020 *Journal of Computers* 47 Volume 15, Number 2, March 2020 source-dead
52. Arie Wibowo Khurniawan & Illah Sailah & Pudji Muljono & Bambang Indriyanto & M. Syamsul Maarif, 2020. "An Analysis of Implementing Total Quality Management in Education: Succes and Challenging Factors," *International Journal of Learning and Development*, Macrothink Institute, vol. 10(2), pages 44-59, June.
53. LingLi Carol Markowski LiXu Edward Markowski "TQM—A predecessor of ERP implementation" *International Journal of Production Economics* Volume 115, Issue 2, October 2008, Pages 569-580.
54. Zhou H., Li L. "The impact of supply chain practices and quality management on firm performance: Evidence from China's small and medium manufacturing enterprises" *International Journal of Production Economics*, Volume 230, 2020
55. Chiarini, A. (2020), "Industry 4.0, quality management and TQM world. A systematic literature review and a proposed agenda for further research", *The TQM Journal*, Vol. 32 No. 4, pp. 603-616. <https://doi.org/10.1108/TQM-04-2020-0082>.
56. Shui-xia Chen¹ · Jian-qiang Wang¹ · Tie-li Wang "Cloud-based ERP system selection based on extended probabilistic linguistic MULTIMOORA method and Choquet integral operator" *Computational and Applied Mathematics* (2019) 38:88 <https://doi.org/10.1007/s40314-019-0839-z>
57. Moreira NJM, Duarte LT, Lavor C, Torezzan C (2017) A novel low-rank matrix completion approach to estimate missing entries in Euclidean distance matrix.
58. *Comput Appl Math* 4:1–11 Nie R-X, Tian Z-P, Wang J-Q, Hu J-H (2019) Pythagorean fuzzy multiple criteria decision analysis based on Shapley fuzzy measures and partitioned normalized weighted Bonferroni mean operator.

59. Int J Intell Syst 34(2):297–324 Ogunrinde RR, Jusoh YY, Pa NC, Ab Wan, Rahman WN, Abdullah A (2016) Cloud enterprise resource planning selection model for small and medium enterprises.
60. Adv Sci Lett 22(8):1939–1943 Pang Q, Wang H, Xu Z (2016) Probabilistic linguistic term sets in multi-attribute group decision making. Inf Sci 369:128–143
61. Parthasarathy S, Sharma S (2014) Determining ERP customization choices using nominal group technique and analytical hierarchy process. Comput Ind 65(6):1009–1017
62. Peng H, Wang J (2018) A multicriteria group decision-making method based on the normal cloud model with Zadeh's Z-numbers. IEEE Trans Fuzzy Syst 26(6):3246–3260
63. Peng H, Zhang H, Wang J (2018a) Cloud decision support model for selecting hotels on TripAdvisor.com with probabilistic linguistic information. Int J Hosp Manag 68:124–138
64. Peng J, Wang J, Hu J (2018b) Multi-criteria decision-making approach based on single-valued neutrosophic hesitant fuzzy geometric weighted Choquet integral Heronian mean operator. J Intell Fuzzy Syst 35(3):3661–3674
65. Weng, F, Hung, MC (2014) Competition and challenge on adopting cloud ERP. International Journal of Innovation, Management and Technology 5(4):8.
66. Zhang, J, Wang, R (2013) Applied research on a cloud-based ERP service system within the SOA framework. Fifth International Conference on Computational and Information Sciences (ICCIS), Shiyang, China, 21– June, pp.1401–1404. IEEE.
67. Seethamraju, R (2014) Adoption of Software as a Service (SaaS) enterprise resource planning (ERP) Systems in small and medium sized enterprises (SMEs). Information Systems Frontiers 1–18.
68. Schwarz, C, Schwarz, A (2014) To adopt or not to adopt: A perception-based model of the EMR technology adoption decision utilizing the technology-organization-environment framework. Journal of Organizational and End User Computing (JOEUC) 26(4):57–79.
69. Ram, J, Corkindale, D, Wu, ML (2013) Implementation critical success factors (CSFs) for ERP: Do they contribute to implementation success and post-implementation performance? International Journal of Production Economics 144(1):157–174.