

An Empirical Study on Business Excellence in Indian SME's Through Adoption of ISO 9001:2008 QMS

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Abstract:- The ISO 9001:2008 QMS standard has significantly impacted most organizations world wide. The purpose of this paper is to make a critical analysis, as to how Indian companies especially, Small & Medium Enterprises (SME'S) can use ISO 9001 Quality Management System (QMS) as a basic business excellence Model.

The principles of quality management system's relationship with financial and economic benefits leading to business excellence have largely been ignored. This paper is a study of various associated international standards published for fully understanding the intent and purpose of the ISO 9001:2008 QMS, and taking the practical feed back from the SME'S while consulting and auditing by the authors. Questionnaires used are detailed in the tables.

The findings are limited to the authors' consulting & auditing experiences and feedbacks taken during the Internal & External auditing.

The paper explores how ISO 9001 Quality Management System can be made effective as a basic business excellence model by analysing the following:

1. Assessing the maturity level of the organization by the adoption of QMS Principles and visualizing through RADAR Chart.
2. Identifying the Gaps/ Draw Backs while implementation of the QMS Standards.
3. Integration of Various Tools and techniques along with the clausal requirements for further improvement to outgrow the saturation effect.[12]

This paper provides an overview of the extent of usage of ISO 9001:2008 Quality Management System in an SME as a practical guide for business excellence models.

This paper provides a new outlook on using an international quality standard ISO 9001:2008 as a Basic Business excellence MODEL with the development of a QMS Tool Kit which on application would bring measurable improvements and tangible benefits.

Keywords— ISO 9001:2008, QMS, Business Excellence, Strategy, Total Quality Management (TQM), QMS Tool Kit.

I. INTRODUCTION

More than 1 million business enterprises worldwide have embraced ISO 9001 Quality Management Systems in their quest for excellence, business growth and sustainability. In India, Small & Medium Enterprises (SMEs) have been an integral part of this growth story, thanks to active encouragement and support from the government. The underlying philosophy of ISO while developing this standard had been to set a common minimum framework which can be universally adopted by organizations in any business sector regardless of size, complexity and nature of business. This minimalist and all inclusive approach has come under criticism from certain stakeholders who argue that while ISO 9001 stresses on continual improvement, it is not prescriptive enough as to how an organization can move towards excellence. A survey was carried out on 50 Indian SMEs having more than 1 cycle of ISO 9001 QMS implementation experience to assess their level of satisfaction on the effectiveness of this tool and to identify their perceptions on the critical dimensions required for achieving business excellence. The paper finally makes an attempt to explore how best these business excellence tools can be seamlessly superimposed on the existing framework of ISO 9001 for organizations who want to become globally competitive.

II. EVOLUTION OF QUALITY STANDARDS

The present standards of ISO 9001:2008- Quality Management systems requirements have evolved over a period of 56 years (approx).

Sr. No.	Year	Standard
1	1945	MILQ 9858A
2	1960	NATO A QAP
3	1963	MILQ 9859A:1963
4	1972	DEFSTAN 05-21
5	1975	BS 4891

6	1979	BS 5179
7	1981	BS 5750
8	1987	ISO 9000, 9001, 9002, 9003, 9004 Standards,
9	1994	First revision of the above standard
10	2000	Integration of all the 9001, 9002, 9003 into one ISO 9001:2000 Standard
11	2008	First revision of the above standard

ISO 9001 QMS is widely recognised all over the world to have made tremendous impacts on business towards gaining customer confidence by the application of the 8 QMS principles, Namely 1) Customer focus, 2) Leadership, 3) Involvement of people 4) Process approach, 5) Systems approach 6) Continual Improvement 7) Mutually beneficial supplier relationship 8) Factual approach to decision making.

III. LITERATURE SURVEY

Adoption of these Management Principles is a strategic top management decision. It affirms the relationship between effective management and realization of financial and economic benefits. Deployment of appropriate methods and tools fosters the development of a consistent approach for addressing financial and economic benefits. [1]

ISO 9001 and ISO 9004 were created as a “consistent pair” of standards so that businesses that wanted to exceed the requirements of 9001 could use the principles of 9004 to move towards business excellence. A comparative analysis of Malcolm Baldrige National Quality Awards (MBNQA) Core values and Concepts, Canadian Frame work for Business Excellence (CFBE)- Principles for business excellence European Foundation for Quality Management (EFQM) – Fundamental concepts of excellence has been studied by Kathryn Boys et al [2].

Strategic quality management, Malcolm Baldrige and European quality awards and ISO 9000 Certification, core concepts and comparative analysis for business excellence has been carried out by Tummalla et al [3].

A study of literature reveals the impact of ISO 9001 QMS in various countries;

- An empirical analysis of management attitudes towards ISO 9001:2000 in Egypt [4]
- An empirical study of the motives and benefits of ISO 9000 certification: the UAE experience [5]
- An integrated framework for ISO 9000 motivation, depth of ISO implementation and firm performance The case of Taiwan [6]
- An investigation of ISO 9000 adoption in Saudi Arabia[7]
- Best practices of selected Greek organizations on their road to business excellence The contribution of the new ISO 9000:2000 series of standards [8]
- Development of management philosophy for Chinese business environment [9]

- Evolution towards excellence: use of business excellence programs by Canadian organizations [10]

Integrating quality to environment and Occupational health and safety (OH&S) are also discussed for achieving business excellence along with various standards and models / Methods and tools namely Balanced Score card (BSC), Single Minute Exchange of Dies (SMED), Just In Time (JIT) , Kaizen, TQM/EFQM, Business Process Reengineering (BPR), Total Productive Maintenance (TPM), Lean Production, ISO 9000 [11].

Nevertheless ISO 9001 with Total Quality Management and the effects on business performance and diffusion all over the world and the saturation effect has been studied and the behaviour is analysed by diffusion forecasting model by F. Franceschini et al [12].

Exhaustive Study has also been made on the Impact of ISO 9000 on the organizational climate in Indian organization. Results reveal that as a result of ISO 9000 implementation the dysfunctional organizational climate motives such as control, dependency, and affiliation undergo a u-turn transformation giving way to the functional and conducive climate motives such as achievement, expert influence, and extension [13]

Further the effects of quality on supply change management has also been studied and findings reveal From the obtained results, it is interesting to point out that not only those indicators which show clear improvements in the SCM have been found but also those aspects in which the companies themselves recognize their limitations. [14]

Integrating quality ISO 9000 to Corporate Social responsibility ISO 26000 is also discussed by Pavel Castka et al. for achieving business excellence. The finding also reveal that the quality field can significantly contribute to the deployment and uptake of the corporate social responsibility agenda yet needs to reinvent and rejuvenate in key areas such as management systems; integration of strategy, operations, technology, CSR and quality; incorporation of corporate governance; and improvements in third-party certification and internal auditing practices. [15]

IV. SURVEY OF SMES

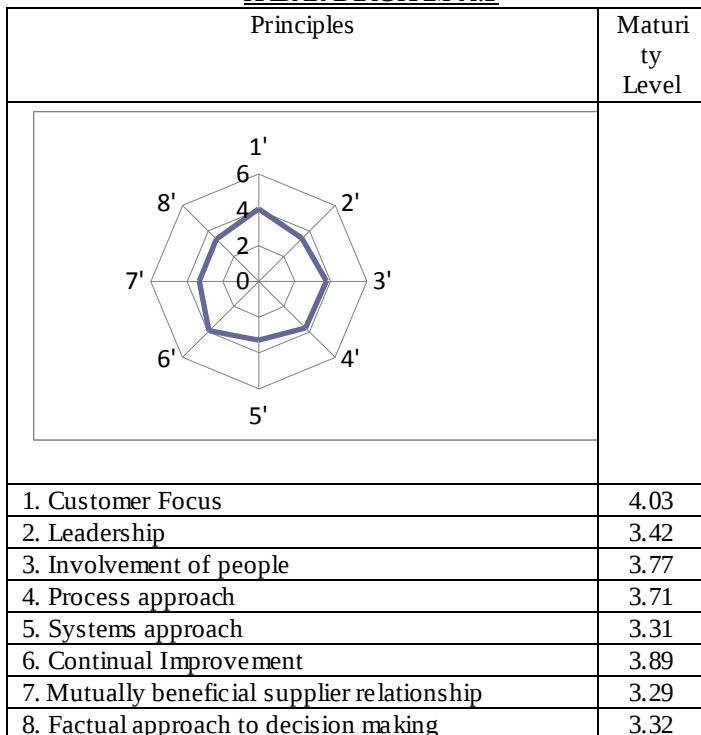
From the various models / Standards / Techniques, ISO 9001 Quality Management Systems has been a certifiable standard by independent third party certification across the globe, and has been widely accepted and recognised towards establishment of a quality management system and drive the organization towards Business Excellence [12] and has been particularly beneficial to Indian industry in particular Indian SME’S. ISO 9001 QMS has been actively supported by the Ministry of MSME, GOI for Micro Small Medium Enterprises, by way of providing financial subsidy for training, consultancy and certification expenses. The details of the same are available on Quality Council of India Website, www.qcin.org, or from MSME Website www.laghu-udyog.com.

Through consulting and auditing experience, it is found that the adoption of QMS Principles through various Tools & Techniques, while implementing ISO 9001 Quality Management System is not entirely satisfactory especially with regard to the India SME'S.

A questionnaire as per the ISO 10014:2006, (Refer Table A.3 & A.4) has been used for assessment of maturity levels with regard to the principles of QMS.

The findings from 50 Heads of SME'S are summarised below through RADAR Diagram.

RADAR DIAGRAM-A.1



Finding reveals the application of highest used principle is Customer Focus & least used principle is Factual Approach to decision. Therefore, it is relevant to focus on the toolkits which can strengthen the level of implementation in this area.

V. GAPS & RECOMMENDATIONS

The clausal application of the ISO 9001:2008 has been studied, mainly by detailing the Requirements in brief, Gaps & Draw backs, recommended tools

- 5 Management responsibility
- 5.1 Management commitment
- 5.2 Customer focus
- 5.3 Quality policy
- 5.4 Planning
- 5.5 Responsibility, authority and communication
- 5.6 Management review

Requirements in Brief: These clauses are talking about the vision of the organization, commitment of the top management, policy and objective framing, responsibility allocation, and review of the QMS.

Gaps/ Draw Backs: The drawback of existing guidelines of ISO is no methodology of strategic planning of the business which may help for setting vision of the organization to establish the quality policy and objectives in an appropriate way. Apart from this the guidelines is also silent about the methodology of responsibility allocation and proper business planning. The result of which most of the organization facing problems in setting appropriate business objectives and responsibility allocation which ultimately are reducing the effectiveness of ISO implementation and the trial and error in objective taking is making the overall business performance very poor.

Applicable Tools: The methods and tools like Balance Scorecard, KAIZEN, BPR, Statistical Process Control (SPC) mainly 7QC Tools, Failure Mode Effect Analysis (FMEA), Strength, Weakness, Opportunity & Threats (SWOT) analysis besides other methods as per the standard can be used as the source of opportunities for improvement plans. From the above various actions like action plan for development, allocation of resources, prioritization, set and cascade objective through Quality Function Deployment (QFD), and actions reviewed through management reviews periodically.

A. Resource Management

Requirements in Brief: Top management should ensure that the resources essential to the implementation of strategy and the achievement of the organization's objectives are identified and made available. This should include resources for operation and improvement of the quality management system, and the satisfaction of customers and other interested parties. Resources may be people, infrastructure, work environment, information, suppliers and partners, natural resources and financial resources.

Gaps/ Draw Backs / Applicable Tools: The standard is not providing any guidelines how to optimize the resource requirements through Activities Based Costing (ABC), Activities based Management (ABM), Life cycle costing (LCC), Payback period analysis (PP). Human Resource planning through Management by Objectives (MBO), Open Business Culture/ Open Book Management (OBM), Organizational Development (OD), Succession Planning (SP) Trend Building (TB), and focus on competency building through systematic training and development, and assessment through BSC, Benchmarking (BM), Performance Appraisal (PA), Employee Satisfaction Survey (ESS), Trend Analysis (TA).

Infrastructure and work environment can be improved by adopting Various Tools and Methods namely, TPM, KAIZEN, SMED, FMEA, JIT, BPR- Business process reengineering, LEAN, Six Sigma, Taguchi Method, Kansei Engineering.

- 7 Product realization
- 7.1 Planning of product realization
- 7.2 Customer-related processes
- 7.3 Design and development
- 7.4 Purchasing
- 7.5 Production and service provision
- 7.6 Control of monitoring and measuring equipment

Requirements in Brief: Top management should ensure the effective and efficient operation of realization and support processes and the associated process network so that the organization has the capability of satisfying its interested parties. While realization processes result in products that add value to the organization, support processes are also necessary to the organization and add value indirectly. Any process is a sequence of related activities or an activity that has both input and output. Management should define the required outputs of processes, and should identify the necessary inputs and activities required for their effective and efficient achievement. The interrelation of processes can be complex, resulting in process networks. To ensure the effective and efficient operation of the organization, management should recognize that the output of one process may become the input to one or more other processes.

Gaps/ Draw Backs / Applicable Tools: The shortcoming of ISO 9001 standard is that, no methodology has been prescribed to ensure the effective and efficient operation of processes. Planning tools Namely, Advanced Product Quality Planning (APQP), Bottleneck Management (BM), Design of Experiment (DOE), Electronic Data Exchange (EDI), Materials requirements planning (MRP), Product Part Approval Process (PPAP), Value Management (VM), Lean Manufacturing (LM) techniques involving identification of Takt Time, Level Production, Pull system etc.

B. Measurement, analysis and improvement

Requirements in Brief: Measurement data are important for making fact-based decisions. Top management should ensure effective and efficient measurement, collection and validation of data to ensure the organization's performance and the

satisfaction of interested parties. This should include review of the validity and purpose of measurements and the intended use of data to ensure added value to the organization.

Gaps/ Draw Backs: The standard is talking about fact-based decisions by effective and efficient measurement, but there is no methodology given for the effective and efficient measurement which will help for proper decision making, so ultimately the organizations are suffering with wrong decision of top management.

Applicable Tools: The basic tools / methods that can be used for data collection Planning are BSC, DOE, Enterprise Resource Planning (ERP), MRP, Return on Investment (ROI), SWOT Analysis, Trend analysis, Value management besides standard methods. Use of data monitoring & measurement methods and tools such as capability studies, Dashboards, DOE, EDI, LM Techniques, SPC. Data analysis and evaluation such as Audits, Benchmarking, Customer satisfaction surveys and feed backs, Market survey analysis, Pareto Analysis, Suppliers performance evaluation. Further improvement activities shall be carried out by the team responsible for implementation of QMS.

A brief summary of applicable methods & toolkits is provided as Table A.5.

VI. CONCLUSIONS:

The results of the survey indicate that the most and least achieved quality management principles from which it is easily understood that there is substantial gap between achievable performance and present status of Small & Medium Enterprises in India. To improve operational performance, enhance financial and economic benefits and progress towards business excellence, organisations have to think beyond ISO 9001:2008 QMS by the strategic incorporation of various tools and methods discussed above (refer Table A.2) into the existing QMS framework. This paper also has the potential for further in depth research / study on industry sector specific tools and methods, increasing sample size and analysing the implementation experience of large scale industries in their quest for business excellence.

TABLE A.2
SUMMARIZATION OF VARIOUS TOOLS AND METHODS TO THE APPLICABLE PRINCIPLES.

Sl No.	Principles of ISO 9001 QMS →	1	2	3	4	5	6	7	8
	Methods / Tool Kit for Business Excellence through ISO 9001:2008 ↓								
1	Balance Scorecard (BSC)	✓						✓	
2	KAIZEN					✓		✓	
3	Business Process Reengineering (BPR)	✓							
4	Statistical Process Control (7 QC Tools)							✓	
5	Failure Mode Effect Analysis (FMEA)		✓		✓				
6	SWOT analysis	✓						✓	
7	Quality Function deployment (QFD)	✓							
8	Activity Based Costing (ABC)		✓					✓	
9	Activity Based Management (ABM)		✓					✓	
10	Life cycle costing (LCC)		✓					✓	
11	Payback Period Analysis (PP)		✓					✓	
12	Management by Objectives (MBO)				✓			✓	
13	Open Business Management (OBM)	✓							
14	Organizational Development (OD)		✓	✓					
15	Succession Planning (SP)		✓						
16	Trend Building (TB)		✓	✓					
17	Benchmarking (BM)				✓				
18	Employee Satisfaction Survey (ESS)		✓	✓				✓	
19	Total Productive Maintenance (TPM)					✓			
20	Single minute Exchange of Dies (SMED)					✓			
21	Just IN time (JIT)								✓
22	Lean Manufacturing (LM)	✓				✓			
23	Six Sigma / Process Capability Studies							✓	
24	Taguchi Method						✓		
25	Advance Product Quality Planning (APQP)				✓			✓	
26	Bottleneck Management (BM)	✓						✓	
27	Business Continuity Management (BCM)	✓							
28	Design of Experiment (DOE)							✓	
29	Electronic data Exchange (EDI)	✓							
30	Material Requirement Planning (MRP)								✓
31	Product Part Approval Process (PPAP)	✓							✓
32	Value Management (VM)				✓				
33	Critical Path Method (CPM)					✓			
34	Flow charting and Process mapping				✓				
35	Risk Analysis (RA)				✓				
36	Enterprise Resource Planning (ERP)	✓							
37	Return on Investment (ROI)								✓
38	Dashboard								✓

1. Customer focus, 2. Leadership, 3. Involvement of people, 4. Process approach, 5. System approach to management, 6. Continual improvement, 7. Factual approach to decision making 8 Mutually beneficial supplier relationships

Note: Brief explanation of tools/ Methods are provided in Annexure- A.

TABLE A.3
DESCRIPTION OF MATURITY LEVELS [1]

1	No or not true, 0 % occurrence, the practice is not found or not yet started, not much happening at all. No evidence of implementation. No systematic approach is evident, no real objectives. No measurements, poor or unpredictable results. Inadequately addressing customer complaints or needs. Perhaps some good ideas but not progressed much beyond the wishful thinking stage
2	Marginally true, approximately 25 % occurrence, practice is only seen in some areas. Implementation evidence available. Reactive approach, mainly to correct problems. Limited evidence of corrective action approach. Limited information or understanding of improvements required, few objectives, some good results available. Customer satisfaction reasonably addressed but small progress on satisfaction of other interested parties. Some recognition of process approach, minor evidence that something useful is really happening. Occasional reviews or assessments resulting in some improvements and enhancements.
3	Partially true, approximately 50 % occurrence, the practice is commonly found, but not in the majority of areas. Improvement evidence visible. Process-based approach is evident, more proactive than reactive. Establishing root causes with some good corrective actions and systematic improvements. Information available on objectives and performance against those objectives, some good improvement trends. Satisfaction of interested parties generally being addressed. Evidence that subject is being addressed with moderate success, with some targeted reviews and actions. Sporadic evidence of clear improvements or enhancements, although still many concerns that subject is not addressed to its full extent.
4	Mostly true, approximately 75 % occurrence, the practice is very typical with only some exceptions. Interrelated process approach is well established in the system. Continual improvement process is well embedded within organization and key suppliers. Consistent positive results and sustained improvement trends, clear evidence that subject is well addressed. Satisfaction of interested parties mostly addressed. Proactive where appropriate, corrective action evidence that recurrence has stopped, preventive actions/risk assessments clearly evident. Regular and routine reviews with clear improvements and enhancements, some subjects are not being addressed to their full extent. Evidence of sustained improvement over an extended period, for example, at least 1 year.
5	Yes, true everywhere. Near or at 100 % occurrence. The practice is deployed throughout the organization with virtually no exceptions. Recognized as best-in-class, well benchmarked, strongly integrated information and improvement process (from the market end-user and throughout the supply chain). Best-in-class on all results readily demonstrated, with sustainable business assured, all interested parties satisfied. A successful, agile and innovative learning organization. All approaches relevant, successful and addressed to the full extent in all areas and in all aspects. An excellent role model. It is difficult to visualize significant improvement, but regular reviews are conducted. Evidence of sustained improvement over an extended period, for example, at least 3 years

TABLE A.4
QUESTIONNAIRE USED FOR ASSESSMENT OF MATURITY LEVELS ON QMS PRINCIPLES WHILE INTERNAL & EXTERNAL AUDITS BY THE
AUTHORS. [1]

Sl. NO.	QM principle	Maturity level	Average
1	Customer focus		
a)	Has the organization identified the appropriate customer groups or markets for best financial and economic benefit to the organization?		
b)	Has the organization fully understood customer and related supply chain needs and expectations, and identified the necessary resources to fulfil these requirements?		
c)	Has the organization established measurements for customer satisfaction, and if complaints arise, are they settled fairly and in a timely manner?		
2	Leadership		
a)	Does top management establish and communicate the direction, policy, plans and any important information relevant to the sustainability of the organization?		
b)	Does top management establish and communicate effective financial and economic objectives, providing necessary resources and feedback performance information?		
c)	Does top management create and maintain the necessary environment in which people can become fully involved in achieving the organization's objectives?		
3	Involvement of people		
a)	Are people at all levels recognized as an important resource of the organization that can strongly impact the achievement of financial and economic benefits?		
b)	Is full involvement encouraged to create opportunities to improve their competence, knowledge and experience for the overall benefit of the organization?		
c)	Are people willing to work collaboratively with other employees, customers, suppliers and other relevant parties?		
4	Process approach		
a)	Are activities, controls, resources and outputs managed in an interrelated manner?		
b)	Are capabilities of key activities and/or processes understood through measurement and analysis to achieve better financial and economic results?		
c)	Does top management enable evaluation and/or prioritization of risks and address potential impacts on customers, suppliers and other interested parties?		
5	System approach to management		
a)	Are interrelated processes identified, understood and managed effectively to provide a system that will enable the realization of financial and economic benefits?		
b)	Are resource and process capabilities and constraints understood, taking account of process interdependence?		
c)	Is a systems approach employed to enable the holistic use of specific processes for the benefit of the system?		
6	Continual improvement		
a)	Does top management encourage and support continual improvement in order to achieve objectives for financial and economic benefit?		
b)	Does the organization have effective measurements and monitoring in place to track and evaluate financial and economic benefits?		
c)	Does top management recognize and acknowledge the achievement of financial and economic benefits?		
7	Factual approach to decision making		
a)	Are decisions effective, based on accurate factual analysis and balanced with intuitive experience where appropriate?		
b)	Does top management ensure appropriate access to data, information and tools that enable effective analysis to be performed?		
c)	Does top management ensure decisions are based on achieving optimum value-added benefit, avoiding improvements in one area that produce deterioration in another?		
8	Mutually beneficial supplier relationships		
a)	Do effective processes exist for evaluation, selection and monitoring of suppliers and supply chain partners to ensure overall financial and economic benefits?		
b)	Does top management ensure development of effective relationships with key suppliers and partners that balance short-term gains with long-term considerations?		
c)	Is sharing of future plans and feedback encouraged between the organization and its suppliers/supply chain partners to promote and enable mutual benefit?		

TABLE A.5
BRIEF SUMMARY OF METHODS AND TOOLKIT'S

Sr. No.	Methods / Tool Kit for Business Excellence	Brief summary
1	Balance Scorecard (BSC)	Measurement tool that uses four perspectives (financial, customers, internal business processes, and learning and growth) of both past and future performances to provide a basis for strategic measurement and management. Other scorecards exist (e.g. one uses results categories from business excellence models as the four perspectives). Cascaded levels are used.
2	KAIZEN	This is the philosophy or practices that focus upon continuous improvement of processes in manufacturing, engineering, supporting business processes, and management.
3	Business Process Reengineering (BPR)	Philosophy or practices that focus upon continuous improvement of processes in manufacturing, engineering, supporting business processes, and management.
4	Statistical Process Control (7 QC Tools)	Statistical process control (SPC) is the application of statistical methods to the monitoring and control of a process to ensure that it operates at its full potential to produce conforming product.
5	Failure Mode Effect Analysis (FMEA)	Method for risk prioritization and taking of preventive action aimed at risk reduction.
6	SWOT analysis	Process to identify the strong and weak points of an organization, along with external threats and opportunities (often portrayed graphically).
7	Quality Function deployment (QFD)	Method that seeks to relate the design of products and services to customer needs.
8	Activity Based Costing (ABC)	Cost accounting system that accumulates cost-based data on activities performed and then uses cost drivers to allocate these costs to products or other bases, such as customers, markets, projects.
9	Activity Based Management (ABM)	Management system that uses an accounting system as the managing factor to allocate costs to products based on resources used to produce the product.
10	Life cycle costing (LCC)	Expense tracking for a span of time from the product's creation to the end of its intended use and destruction.
11	Payback Period Analysis (PP)	Review of the amount of time it will take to recover the initial investment of a project.
12	Management by Objectives (MBO)	Method mainly focused on improvement opportunities through measurable employee involvement to ensure business plans are fulfilled effectively. Management establish top-level objectives that are Specific, Measurable, Appropriate, Realistic and Timely (SMART). These are cascaded and developed through and across organizational levels. Objectives performance reviews take place on a regular basis to ensure progress, completion, necessary modifications to actions/objectives and rising of new appropriate objectives to address change. Some organizations link objectives performance to rewards/appraisals.
13	Open Book Management (OBM)	Management activity that "opens" the organization's financial information to its employees. The organization may also provide instruction in interpreting the information. The objective is to enable employees to better understand their role and impact on the organization.
14	Organizational Development (OD)	Strategic activity aimed at increasing organizational effectiveness through the development and reinforcement of organizational strategies, structures and processes.
15	Succession Planning (SP)	Planning, training and mentoring potential successors for replacement of the present job holders within an organization.
16	Trend Building (TB)	Practice to select and motivate a group of individuals to work together to accomplish a purpose and specific performance objectives.
17	Benchmarking (BM)	Method to compare the processes and features of the products and services of an organization with those of recognized leaders to identify opportunities for improvement.
18	Employee Satisfaction Survey (ESS)	Method of receiving feedback from an organization's employees on their satisfaction.
19	Total Productive Maintenance (TPM)	TPM is a maintenance process developed for improving productivity by making processes more reliable and less wasteful.
20	Single minute Exchange of Dies	Single-Minute Exchange of Die (SMED) is one of the many lean production methods for reducing waste in a manufacturing process. It provides a rapid and efficient way of

	(SMED)	converting a manufacturing process from running the current product to running the next product. This rapid changeover is key to reducing production lot sizes and thereby improving flow
21	Just IN time (JIT)	Just-in-time (JIT) is an inventory strategy that strives to improve a business's return on investment by reducing in-process inventory and associated carrying costs . Just In Time production method is also called the Toyota Production System .
22	Lean Manufacturing (LM)	Tool focusing on reducing cycle time and wastage to improve operations. Lean thinking is the dynamic, knowledge-driven, and customer-focused process through which all people in a defined enterprise continuously eliminate wastage with the goal of creating value.
23	Six Sigma / Process Capability Studies	Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes .
24	Taguchi Method	Statistical method for the study, analysis and comprehension of the variability of processes and data to enable improvement and more rapid developments.
25	Advance Product Quality Planning (APQP)	Method to develop a product quality plan that will support development of a product or service with the main objective of customer satisfaction. Phases include plan and define programme, product design and development verification, process design and development verification, and product and process validation.
26	Bottleneck Management (BM)	Method to identify bottleneck activities within an activity, process or system with the smallest capacity relative to the demand, thereby controlling the speed of the entire system/organization. See also "Theory of constraints".
27	Business Continuity Management (BCM)	Management used to counteract interruptions to business activities and to protect critical business processes from the effects of disasters (natural or man-made) and to ensure timely resumption of business activities.
28	Design of Experiment (DOE)	Statistical method for the study, analysis and comprehension of the variability of processes and data to enable improvement and more rapid developments.
29	Electronic data Interchange (EDI)	Process to exchange standardized document forms between computer systems of different companies (or between customers and suppliers) for business use. EDI is part of electronic commerce, where customers can place orders directly with a supplier and the supplier provides confirmation (including ship date and price) through electronic means.
30	Material Requirement Planning (MRP)	Method that assists a company in the detailed planning of its production.
31	Product Part Approval Process (PPAP)	A parts approval process that is required for suppliers to manufacturers as well as tier one suppliers.
32	Value Management (VM)	Systematic application of recognized techniques, which identify the functions of the product or service, establish the worth of these functions, and provide the necessary functions to meet the required performance at the lowest overall cost.
33	Critical Path Method (CPM)	An activity-oriented project management technique that uses arrow diagramming to show the cost and time necessary to complete a project. Only one time estimate is used: normal time.
34	Flow charting and Process mapping	Graphical representation of the major steps in a process, product realization or service.
35	Risk Analysis (RA)	Tool used to identify and control risks associated with any item, activity, process or system of an organization. This should ideally be proactive in nature although unfortunately serious events can trigger the analysis.
36	Enterprise Resource Planning (ERP)	Software program that integrates all departments and functions across an organization onto a single computer system that can serve all those different departments' particular needs.
37	Return on Investment (ROI)	Activity to evaluate the investment potential by comparing the magnitude/timing of expected gains to the investment costs: $[(\text{gains} - \text{costs}) / \text{costs}] \times 100 \%$
38	Dashboard	Tool used for colourful pictorial representation of critical performance measures. Typically, green means: all is well, no action needed; amber means: warning may need action; red means: action needed. Often used in combination with scorecards and to improve meeting efficiency.

REFERENCES

- [1] ISO 10014:2006 Quality Management – Guidelines for realizing financial and economic benefits. – International standard
- [2] Kathryn Boys, Stanislav Karapetrovic, Anne Wilcock, Is ISO 9004 a path to business excellence? Opinion of Canadian standards experts, *International Journal of Quality & Reliability Management*, Vol. 21 No. 8, 2004, pp. 841-860
- [3] Louise Boulter, Tony Bendell, How ISO 9001:2000 help companies achieve excellence? What the companies think, *Measuring Business Excellence* 6, 2 2002, pp. 37-41.
- [4] Hesham Magd and Adrienne Curry, TQM in Egypt: a case study, An empirical analysis of management attitudes towards ISO 9001:2000 in Egypt, *The TQM Magazine*, Volume 15 · Number 6 · 2003 · pp. 381-390
- [5] Walid Zaramdini, An empirical study of the motives and benefits of ISO 9000 certification: the UAE experience, *International Journal of Quality & Reliability Management*, Vol. 24 No. 5, 2007 pp. 472-491
- [6] Woan-Yuh Jang, Ching-I Lin, An integrated framework for ISO 9000 motivation, depth of ISO implementation and firm performance The case of Taiwan, *Journal of Manufacturing Technology Management* Vol. 19 No. 2, 2008, pp. 194-216.
- [7] Hesham A.E. Magd, An investigation of ISO 9000 adoption in Saudi Arabia, *Managerial Auditing Journal*, Vol. 21 No. 2, 2006, pp. 132-147
- [8] Fotis K. Vouzas, Katerina D. Gotzamani, Best practices of selected Greek organizations on their road to business excellence The contribution of the new ISO 9000:2000 series of standards, *The TQM Magazine*, Vol. 17 No. 3, 2005, pp. 259-266
- [9] Tat Y. Lee, Development of management philosophy for Chinese business environment, *Management Decision*, Vol. 43 No. 4, 2005, pp. 542-550
- [10] Kathryn Boys, Anne Wilcock, Stanislav Karapetrovic and May Aung, Evolution towards excellence: use of business excellence programs by Canadian organizations, *Measuring Business Excellence* Vol.9, No.4 2005, pp 4-15
- [11] M. Bobrek, V. Majstorovic, M. Sokovic, *Design approach in management towards business excellence*, *Journal of achievements in materials and manufacturing engineering*, AMME, Volume 16, Issue 1-2, May-June 2006,
- [12] F. Franceschini, M. Galetto and P. Cecconi, A worldwide analysis of ISO 9000 standard diffusion Considerations and future development, *Benchmarking: An International Journal*, Vol. 13 No. 4, 2006, pp. 523-541
- [13] James Thomas Kunnanatt, Impact of ISO 9000 on organizational climate, Strategic change management experience of an Indian organization, *International Journal of Manpower*, Vol. 28 No. 2, 2007, pp. 175-192
- [14] Marti Casadesu's and Rodolfo de Castro, TQM IMPLEMENTATION How improving quality improves supply chain management: empirical study, *The TQM Magazine*, Vol. 17 No. 4, 2005 pp. 345-357
- [15] ISO 9001:2008 – Quality Management System Requirements – International standard.
- [16] Nigel Croft, ISO 9001:2008 Small Changes Big Opportunities, *Quality Council of India Publication*, May 2009.
- [17] John L.W. Beckford, *Quality – A critical Introduction*, 3rd edition – 2010.