
Quality Management Systems in Education

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Abstract

This chapter stretches the characterisation of quality management systems and models that is abundant in literature by assessing the capability of the most common of the systems and models. Multiple data gathering and processing techniques were used within the context of a constant comparative approach in which data, theories and cases were plugged into each other. Based on the performed research, obtained outcomes suggest the presence of numerous opportunities and benefits in using quality management systems. Based on the findings, further work needs to be done to create the conceptual, managerial and behavioural competences that should facilitate the embedment of the quality management models into the daily lives of education institutions. A critique of quality management through the lenses of the disciplines of team learning, systems thinking, shared vision and mental modelling and of the Six Sigma, roadmaps should engender a new approach to improving quality in education. It should be of interest to explore the potentials of hybridising quality management models in education.

Keywords: quality management systems, Six Sigma roadmaps, creative tension, systems thinking, mental

1. Introduction

Quality management systems (QMSs) abound in literature with much of it focusing on describing them and the contexts of their inceptions. Performed research indicates that a number of scholars have described social imageries of World Class Universities (WCU), Better Schools Programs (BSP), Star Schools Projects (SSP) and other versions of the imageries of types of best-performing education institutions. Literature has however, reported on numerous ingredients for high quality performance but remained ambivalent about whether there is a singular methodology of accomplishing high-level customer satisfaction in education. This chapter uses a synthetic-evaluative approach to critique the capability of the various QMSs used in education. It also explores how institutional quality performance can be bettered by paying attention to the

context in which the model is adopted. The next section starts by dissecting the concept of QMS, detailing the three constituent elements: quality, management and system. Understanding each component of a QMS in its individuality should help in building a picture of how a QMS can be at the service of a student-focused and market-oriented education delivery system. The chapter presents a comparative structural analysis of the various quality management models and critically analyses the meanings and implications in each category.

2. Quality management systems

There are three perspectives to QMS which will be discussed below so as to appreciate the scope of what a QMS should sound like in its philosophical perspective, methodological outlay and performativity implications. The perspectives are quality, management and system. Each acts as a gear engaging with the others and yet powered each by an overarching question about its purpose in a QMS infrastructure.

- a. Quality—What is the institution’s conception of quality and the methodology of doing ‘quality’?
- b. Management—Is the institution’s strategy plan on quality integrated and aligned with its vision of quality?
- c. System—How does the institution’s strategy, culture, structure, rewards, behaviour, etc. support its own model of quality?

A QMS is as useful as its ability to serve as a coherent framework for systematically integrating, aligning and focusing institutional and business processes. The focusing of business processes should help the institution in accomplishing its network of objectives and infrastructure of goals effectively and efficiently. Effectiveness and efficiency of processes ensure maximisation of customer satisfaction. Such a scope of QMS has intriguing implications on the structure of the organisation, its culture, knowledge management practices and customs. It has further implications on the technological co-efficiency of the organisation at all levels of the processes deployed across the institution.

2.1. Quality

Literature variably refers to quality as ‘slippery’, ‘mobile’, ‘elastic’ and ‘elusive’ [1]. Notwithstanding, the chapter conceives quality as referring to an expression of satisfaction with the constitution, form and performance of a good based on the beholders’ conditionality of time and space. The value or worthy a person assigns to a good can appreciate or depreciate dependent on time and environment or space in which one finds himself. Nonetheless, quality is generally perceived as a representation of complex mix-and-match of qualities and variables embodied in products and services. The functional relationship has been captured by [2] in Eq. (1).

$$EduQuali = \sum_{j=i}^k (P_{ij} = E_{ij}) \quad (1)$$

where EduQUAL is perceived education quality of student 'i', k is the number of education attributes/items, P is perception of student 'i' with respect to performance of an attribute 'j' of institution, E is the education quality expectations of student 'i' for an attribute 'j'.

It should be noted that customers do not always assign the same importance to any characteristic or feature permanently. The ever increase in the numbers and peculiarity of substitute and complimentary products/services and even features complicates the Education system's comprehension of the package of features that would best meet customer needs and wants. Thus, the measure of quality education depends on the skill with which the various stakeholder voices are integrated, processed and escalated into features of the institution and its related deliverables such as courses and programs. Such features include, but are not limited to:

- a. institutional structure,
- b. institutional facilities,
- c. program and course content,
- d. delivery modes and
- e. instructional interaction at the student-teacher interface.

Defining quality in terms of the integration of different 'voices' disarms higher education institutions (HEIs) of the prerogative to define quality in their 'own terms' and the quality assurance agencies from single-handedly imposing the yardsticks of quality assurance (QA) [3].

2.2. Management

Management has been focused through the lenses of a planning process, provision of leadership, staffing, organising, monitoring and controlling, all with the aim of achieving effectiveness and efficiency across the institution. Good management is about boundary spanning and gluing people of same and different dispositions around the institution's vision, mission and operations. The proclivity for turf-warring, group-think and de-generation into clinches is high in multi-stakeholder and multi-layered institutions [4]. In such contexts, management needs to be good at dealing with political game-playing and the emergence of power-seeking mates. It therefore must be effective and efficient on two main strategies: encouraging and resourcing favourable ideas and actions and weeding elements of negative monolithic politics. Balancing the two strategies creates the space for maturation of quality management infrastructures. QMSs are more effective and efficient in the hands of experts and those willing to become better by de-learning, (re)learning and supporting alternatives to their own proposals as long as such alternatives are more sound and productive [5]. The personal quality of allowing personal positions to be contested and fecund by others (constructive vulnerability) is a critical success factor in consulting for and co-creating institutional values, missions and visions [6]. This disposition to defencelessly and proactively feel at ease with 'constructive vulnerability' however takes long to develop. There are some 14 Best Practice Principles (BPPs) that [7] argue that they smoothen the management for quality in institutions:

- a. Being disciplined: this BPP refers to the application of a strong systems perspective in all structural, functional and behavioural aspects of the institution. The systems perspective must be vision-driven and buttressed by policy and standards.
- b. Being time-based: this BPP means the institution values time as a competitive tool and resource of critical developmental value. Therefore time should not be wasted, for instance, in pursuing non-value creating ideas and activities.
- c. Being up-front: a BPP that expresses employees' high moral probity in their valuing of honesty, humility and sincerity in all their interactions and relations.
- d. Creating customer value: a BPP expressing the strength of the institution's mental model of customer needs and wants, and how management, products and services delivery should be derived therefrom. The implication is that management, teachers and everyone in the institution must treat the other as their customer and understand what the other treats as value at their role level.
- e. Creating strategic capabilities: a BPP that expresses how institution-business capabilities are defined, understood and shared as key determinants of continuous improvement (CI) and customer satisfaction performance plans.
- f. Embracing change: this BPP defines the institution's disposition to evolve and generate new ideas and built resources for continually pursuing customer satisfaction performance. The implication is that individuals, teams and roles need to be open, vulnerable and malleable in order to change from within their hearts and souls.
- g. Ensuring integration of effort: a BPP expressing the institution's focus on value creation, management and delivery over functional needs and hierarchies.
- h. Establishing a learning culture: this BPP expresses the robustness of the institution's developmental orientation as focusing on knowledge and skills updating through a shared customer satisfaction performance-driven knowledge management infrastructure.
- i. Gaining alignment: a BPP that seeks vertical and horizontal congruence among strategy plan, key performance indicators and critical success factors.
- j. Having the desire to be out front: a BPP that describes the institution's structural, functional and behavioural disposition to live well above and ahead of industry-business standards, norms and practices.
- k. Linking the micro to the macro: a BPP, an expression of how employees manage their personal mastery in the understanding of how their individual efforts contribute to the wholesome business success.
- l. Measuring, reporting and learning; a BPP that exhorts institutional sectors to measure, report on performance so that teams learn and better perceive the institution's atlas of improvement.
- m. Resourcing for the medium-term measures the institution's ability to excel at accomplishing short-term objectives and turning them into resources for medium- and long-term goals.
- n. Supporting distributed leadership: in this BPP employees take up roles with commitments to make careful decisions that fecund their own and others operational effectiveness and efficiency.

Good as they are, these BPPs need to be in vinculum with quality excellence principles upon which education is premised. In fact the BPPs must help in creating a context for optimisation of policies, procedures and standards used to deliver high quality education in institutions.

2.3. System

A system is an organised, purposive structure consisting of interdependent components that perpetually, but variably influence one another. Education and QM infrastructures are both deliberate purpose-driven systems. Any education is bestowed with a number of goals and objectives just as any quality management model is charged with a number of goals and objectives. A QMS applied to education should consist of a corpus of integrated, aligned, complex elements that relate in some sophisticated way. Educational systems consist of personal or human elements and impersonal or non-human components like buildings, machines, etc. While the 'hard elements' dealing exclusively with impersonal categories of systems are easy to measure, the personal issues or soft elements of a system (sociological, behavioural and relational aspects) are somewhat not measureable in simple quantitative terms. Because of this shortcoming, whatever standards are assigned in attempting to measure them will remain subjective, relative and therefore highly prone to contestations. Elements of a system can be further dichotomised into either quantitative or qualitative. The critical issue is that a systems perspective sees education as a collection of institutional-business processes focused on achieving quality policy and quality objectives designed to meet customer requirements and needs.

3. Making a quality management system serve education

A meta-synthetic analysis of research in both the private and public sectors indicate that the generic focus of QMSs is on the planning, directing, organising, monitoring and controlling of the education provision system or processes. At the input stages, the focus is on the selection of input factors of the highest quality. At the throughput stages, the focus is on the correct match-and-mixes that will provide the highest quality processes aligned with producing the correct and accurate outputs and outcomes. The throughputs routes and their inherent transformative activities must show concerns on wastage, increasing business opportunities, effectiveness and efficiency. At the output stages, the focus is on outputting products and services that satisfy and delights the customer. A clear institutional paradigm on quality education should determine the quality of inputs selected and how they get transformed in ways that approximates hypothesised quality as close to perceived quality as possible.

It is the author's view that the route to high quality education should be designed down from the institution's vision which must be explicitly clear on quality objectives and metrics. Subjecting educational outputs to the scrutiny and validation of the customers helps in setting and sharing meaning and standards against which to design a corpus of criteria for success. Modern industry-based QMSs like Six Sigma, Total Quality Management and quality function deployment among others have, since the 1980s, become widely used in education. The success of such adoptions depends partly on the ability of protagonists to make the focus of the QMS overlap with the focus of their education. Examining the alignment of the assumptions of a quality model with the key performance indicators in education would tell whether a

model suits the expected array of results. The quality management model must embody the sub-systemic issues that matter to quality education. Thus, an encompassing QMS must be hinged on a system-based mental model in which individuals accept responsibility to learn with others and to partake in a shared vision about how to create, manage and deliver quality. Models previously used in education are now stunted as they focus on small-scale aspects of the education system:

- a. The four-level model and the goal-free evaluation model both focus on measurement.
- b. The behavioural objectives approach focus on results.
- c. The responsive evaluation model, the consumer-oriented approach and the empowerment evaluation model focus on the customer.
- d. The organisational learning model focus on knowledge management while.
- e. The participatory/collaborative approach focus on partnerships.

The author acknowledges that there is something of each model or approach in every other model but what matters is a clear mental model of how they integrate and sustain the effort for quality education. Because educational institutions are complex interactions of sub-systems, a model that improves a singular part of the entity will not accomplish the goal of overall institutional quality performance. The meaning and implications in managing the various aspects of educational delivery will be discussed in much greater profundity in the following sections.

3.1. Management of educational assessment: meaning and implications

There is need for a focused strategic approach to choosing assessment methods and in implementing them. This is because the mix-and-match of assessment techniques should respond to the age, curriculum contexts and teacher qualities among other factors. The assessment methods need to be the most appropriate and be accurately operationalized. An array of assessment methods, exemplified below, can be used on the same students, same programme and within same or staggered periods. An educational institution's assessment methodology should encompass direct and indirect strategies, techniques, tools and instruments for the collection of information that strategists use to measure the level, scope and depth of learning experienced by the student. The concurrent use of multiple data gathering and processing techniques in assessment of teaching and learning improves the quality of information assessors will gather from the students and other sources. The triangulation approach strengthens the relevance, validity and reliability of strategies derived from such data. Among direct assessment methods are:

- a. Capstone course (projects)
- b. Certification exam
- c. Comprehensive test
- d. Embedded techniques
- e. Entrance interviews, etc.

Among the indirect assessment methods are:

- a. Focus group
- b. Institutional data
- c. Reflective student essays
- d. SWOT analysis
- e. Syllabus review
- f. Surveys (course evaluation, graduate, alumni and employer).

Assessment that asks students to demonstrate (direct) is as critical as those asking them to reflect (indirect) on their learning.

3.2. Management of quality control and quality assurance infrastructure: meaning and implications

Managing of the educational quality assurance infrastructure encompasses seeking the best fit among the various assessment methods and the rest of the activities that in their own ways determine quality of educational outputs and outcomes. Educational QA (quality assurance) has various activities, including assessments and quality controls (QCs) that are designed to track and resolve deficiencies, optimise inputs and processes to ensure that emergent customer needs and requirements are met continually. While QC (quality control) tends to focus on comparing inputs, throughputs and outputs against some scheme of criteria and specifications, quality assurance goes a little further in recognising that customer needs are complex, diverse and mobile [8]. Thus, in a fast-pacing world the need for focusing on quality assuring than QC is imperative. Because of globalisation, changes in resources types, processes and skillsets are giving rise to floods of styles and fashions. New Business Models have become more invasive in HEIs (higher education institutions) than in primary and secondary education institutions.

3.3. Management of resources/inputs: meaning and implications

The relation among inputs, processes and outcomes is not uncommon in educational management literature. The generic perception is that it is needful to ensure that the quality of inputs is as high as we would like the quality of outputs to be. Two assumptions come into play in this instance:

- a. The quality or how well the processes will work out will be determined by the quality of the resources input into the transforming processes.
- b. Assuming the input resources are favourable, the quality of outputs will be determined by the appropriateness and quality of the transforming operations.

But further to these assumptions is the need to ensure that the recruitment and selection of the inputs is subordinated to the framework of customer satisfaction performance. It basically means that the inputs and outlay of processes must be built from an analysis of the demands,

needs and wants of the student, industry-commerce and society. A framework by which output requirements can inform input requirements through the Six Sigma Roadmap can be referred to as 'designing down'. Among the touted inputs are:

- a. Quality of teachers often defined by their level of certification rather than by their ability to make their students acquire and perform particular skills;
- b. Quality of the buildings often rated by the imagery in them than their appropriateness as facilitators to a process of learning and transformation and
- c. Quality of students often perceived through lenses of some assessment system that is little aligned to what the student will develop along the institutional experience.

In essence the inputs in both quantity and quality must be derived from the 'voice of customer' and institutional vision on quality than anything else.

3.4. Management of educational processes: meaning and implications

Management of educational throughputs is a complex program because it calls for vertical alignment as well as horizontal integration of modes of thinking as of action. There is need to link the Strategy Plan from top-level goals to shop-flow operations and across the sectors and departments of the institution. It is therefore of paramount importance that strategists, managers and those at the operational-technical level appreciate the criticality of connecting every micro-activity with the bigger (macro-) picture of the institution. Linking the micro- to the macro- is a critical success factor in strategy implementation as it keeps every action looped with the strategy's objectives and goals. The positions of classroom practitioner, level head, head of department and upward have different job descriptions and assumed person competences that are, often in principle, 'proven' to facilitate good learning in the institution. These assumptions are combined to an array of standing and emergent policy regime that is meant to support or positively exploit the human skills. The delivery of high quality education may be constrained by inconsistencies in the policies and in their implementations.

3.5. Management of outputs: meaning and implications

'Management of outputs' may sound a rather inappropriate terminology for how the institution deals with the results of the learning-teaching processes. Educational outputs include the extant, the near and medium range results of an instructional experience. This includes the reflections undertaken by the teacher after encounters with the students and these focus on the reactions and responses of the learners. There is a need to differentiate educational outputs from educational outcomes. Educational outputs are more of the immediate and fairly near-term results of the education delivery system. Outcomes of an educational system and experience are rather difficult to winnow and claim in an exclusive fashion. Outcomes are a much delayed feature and their manifestation embodies the influence of other learning from society and the environment that the individual brushed with since the last instructional relationship. Outcomes reflect the deeper learning that resulted in the transformation of behaviour. It is important that the institutional process in the classroom does not limit itself to impacting content. It must as well focus on developing critical thinking skills, systems thinking and personal mastery. This transformative approach has implications on subject didactics and

school pedagogy [9]. The next section compares six quality management models, evaluating their biases and thus, assesses their capability of improving quality of educational delivery.

4. Comparative analysis of quality management systems

A comparative analysis of QMSs should help in assessing and evaluating why and how QM models fail or survive their brush with the gang aft agley of operational reality. A structural analysis of seven mostly used QMSs are ISO—International Standards Organisation; EFQM—European Foundation for Quality Management; MBNQA—Malcolm Baldrige National Quality Award; SQAF—Singapore Quality Award Framework; CFfBE—Canadian Framework For Business Excellence; ABEF—Australian Business Excellence Framework and TQM—Total Quality Management) show that (strategic) planning and a focus on both internal and external customers are of paramount importance (100% presence in the models).

Leadership, process management and business results came second with 83% presence among the seven models. Knowledge management, partnerships and information rate at 33% presence across the seven models. Measurement, policy, improvement, innovation and resources stand at 17% presence among the seven models. The five focus areas in Section 3 are in fact categories of the models shown in **Table 1**. In summary, the nine quality management models under Section 3 call on the education delivery system to respond to the needs of the student and the market of future employers (including self); the robustness of the metrics for success; the empowerment of the learner and the teacher to determine what constitutes a real learning chain or environment and the growth through collaborated engagement of the society, the institution and the student. The failure of most QMSs ubiquitous in education is based on their miniaturisation of education and focusing on small-scale issues of education [10]. Sections 4.1–4.11 will explain how the new public management (NPM) embrace these quality management models as categories within them.

4.1. Leadership in quality management systems

The content and processes of leadership at any institution is determined by the balance of interaction between top management and the led or followership, and the stage in evolution of the institution. Literature is awash with castigations of top-down, hierarchical and authoritarian leadership styles [11, 12]. Despite the castigations, these styles of leadership will continue to find relevance at various stages of institutional development. These styles may be used where resistance is anticipated and where quick fixes are required. Thus, a QMS while it may not exhort the use of such styles as a permanent mode of interaction between the leaders and their followership it should not repudiate their service to high quality performance at any level of the institution, at some (rare) occasions/time. Except for radical business process redesign (BPR), most quality models tend to encourage a mixture of bottom-up and top-down management system, with many authors arguing that a team-based structure would greatly favour success of most QMSs. Most strategic plans view education as an ongoing program of multiple subprograms and projects with each having multiple activities and objectives. Therefore, a QMS would work better if everyone was fully committed to work with and recognise the value of everyone else. Leaders, managers and strategists in QMS should facilitate in defining and

	Leadership	Strategic planning	Customer focus	Process management	Business results	Knowledge management	Improvement	Measurement	Partnerships	Information	Policy	Innovation	Resources	Number of categories
ABEF	X	X	X	X	X	X	X			X		X		09
CFBE	X	X	X	X	X			X					X	06
EQFM	X	X	X	X	X			X		X			X	08
ISO	X	X	X	X	X	X	X							08
MBNQA	X	X	X	X	X	X	X							07
SQAF	X	X	X	X	X					X				06
TQM	X	X	X			X	X							05
	100%	100%	100%	89%	89%	57%	43%	29%	29%	29%	14%	14%	14%	

Table 1. Comparing QMS models by their key categories.

clarifying the different project priorities; inspire sufficient collaboration and participation; manage and catalyse change and deal with conflict. The transformation towards locally based, distributed or participative leadership is important [13, 14]. Inclusion of institutional members in modelling decisions multiplies their power to act on those decisions.

4.2. Strategic planning in QMSs

Strategic planning is a disciplined effort to produce fundamental decisions and actions that shape and guide what an institution is, what it does, where it wants to be and how it intends getting there. A strategic plan must clarify the 'what', 'why' and 'how' of the institution's life. The fundamental output of strategic planning is a strategy plan which is a documentation of what the institution is, what is undesirable about it and what it wants to be in some specific time. It also shows how it will traverse from current to the desired and why each of the 'how' is the best option as well as why the change is deemed desirable. The outcome of good strategic planning and implementation is institutional survival, growth and sustainability. Institutional growth may not always be measured in financial terms as there are many non-financial pursuits of the institution. Any desirable change, for instance, profound understanding of stakeholder requirements, substantial reduction in the frequency and content of customer complains can be interpreted as growth. Scholars [15] refer to five fundamental disciplines that form the bedrock of profound change:

- a. systems thinking
- b. mental model
- c. shared vision
- d. personal mastery and
- e. team learning.

Framing strategy planning and implementation on the five disciplines improves the breadth and depth of understanding of related key performance indicators and critical success factors. With such understanding, the institution will be able to continually narrow its risk envelop [16]. The following sections focus on the meanings and implications of the five disciplines as relating to education.

4.2.1. *Systems thinking in QMSs*

Systems thinking in education are a mental tool of understanding how sub-components of a whole influence one another so that resolving problems within one part of education should neither negatively impact the performance of other areas nor create unforeseen consequences. Generating and maturing a systemic and complete vision of education or the institution can be enriched and perfected by use of such techniques as causal loop diagrams, links and loops, stock and flow modelling, archetypes and computer models among others. These tools help the institution examine and exchange hypotheses about institutional performativity. There is very little inclusion in masters' level curriculum of what managers and technicians will require

on the ground [17] and little taught in education are the core elements of Senge et al.'s five disciplines [18]. These are shown in **Figure 1**.

The five CSFs for cross-stakeholder engagement are co-creating a vision, learning together to co-create projects and programs and self-governance impact QM in a significant way. However, most education managers develop and diffuse systems thinking skills through casual experiences far late in their careers. Management that focus on quick fixes and quick results are less likely to sustain a quality culture. Notwithstanding, most management show high disposition to bring change by dealing with rules, work processes, information flows, physical facilities, material flows, control mechanisms and reward systems. Systems thinking create the vocabulary and language that help members see events, patterns of behaviour, systems and mental models in strong vinculum.

4.2.2. Mental model in QMSs

Mental model refer to the images, assumptions and stories which people carry in their minds about themselves, other people, institutions and every aspect of their environment. Because people are differently attracted by different details of any one system, they are bound to pay unequal attention to same issues. Consequently, they will have different intensities of emotions about the same components of a system. To have a complete picture of the ever-changing world, people need to be more reflexive and truthful about how they feel about what surrounds them. Reflecting and perpetually enriching and updating perceptions of the world and how these influence people behaviourally and psychologically improves humans' chances of taking correct developmental decisions. Mental models and attitudes are the make, maintain

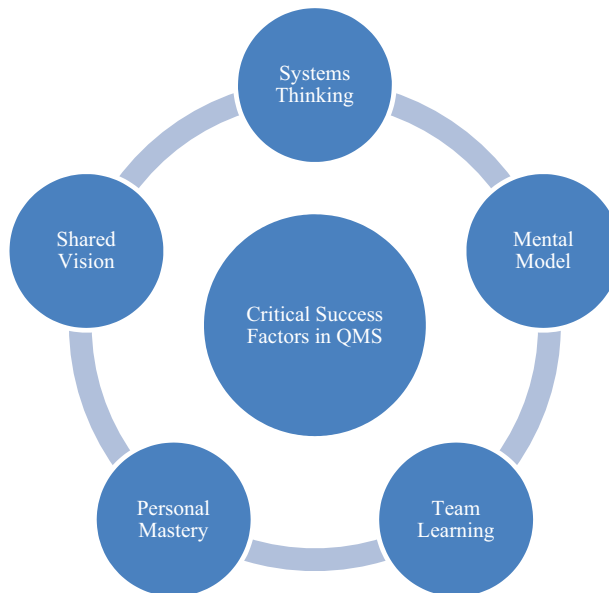


Figure 1. The five critical success factors in a quality management system.

and break of QMSs in education because they shape people’s actions, reactions and responses to others, policy, rules and regulations. Institution-wide tendencies to fragment and compete ‘for no sake’ are not unusual [19]. Some of the factors likely to impede the institution’s quality performance include therefore the inability to deal with divided staff that goes to ‘war’ over every small issues, the lack of skill to engage those at cross purpose as well as failure to diagnose beyond symptoms of conflict and dysfunction in institutions.

4.2.3. *Personal mastery in QMSs*

Personal mastery means the capability of learning to expand individual, team or institutional capacity to create own strategic capabilities in pursuance of personal, team and institutional goals. The individual is the basic unity of structure and function in the deployment of quality. It is therefore important that individuals in the institution appreciate the gaps in their behaviour, knowledge and skills so that they can map out an atlas of personal developments and improvement. The tools of personal mastery help to measure and analyse the gap between where one stands and where one want to be. Once people have a correct and accurately detailed picture of the scope of the gap people get to the thresholds of a creative tension. The creative tension now becomes the motivator for improvement. The power to resolve the creative tension arises from the relationship among the different elements of the institutional context. Institutions thus, need a workforce and strategists that help one another clarify and understand the current reality and chemistry of the creative tension. Creative tension means the felt gaps among components of a system and the gap between the current and the desired futures. **Figure 2** depicts the creative tension as a dynamic system of the context, the desired future and the pathway thereto.

Personal mastery relates to quality management in that if people are able to reflex truthfully they should be able to tell themselves how they are causing poor quality performance. They too should be able to say how they can contribute to quality education.

4.2.4. *Team learning in QMSs*

Lest people confuse team learning with team building, the latter’s focus is about improving communication and team members’ skills. Team learning is about how the organisation can

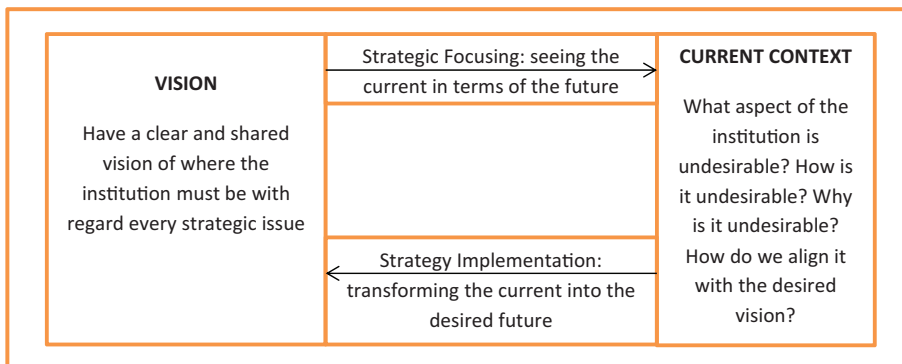


Figure 2. Creative tension: understanding the current in terms of the future and mapping how to get there.

work with internals and externals to create and share a coherent and relevant vision, think strategically on even the minor issues and build a mental model of a continuously improving institution. The crux of the discipline of team learning is to help teams re-create themselves in ways that sustain and self-reinforce gained strategic capabilities. In most pedestrian level it may seem that 'stakeholders' in education are at cross-goals. In reality, quality assurance agencies, industry, students and governments have as top of their agenda—high quality education. Applying the Six Sigma roadmaps should help stakeholders appreciate that working in some co-ordinated manner creates the strategic capacity of thinking, learning and acting in synergy. In a team, each needs the other to accomplish a result. The intricate relationship among the disciplines and each of them and the whole to strategic thinking and the strategic planning process itself cannot be overemphasised. The assumption of the model depicted at **Figure 1** is more complex than the schematic representation is.

The manner in which individuals conduct themselves in relationship to others and their contexts (personal mastery) determines their disposition to learn and grow themselves and others (team learning). The more they interact and converse about their experiences and the more they understand their contexts and the broader universe. The more people comprehend their contexts and incorporate such understanding systematically in their decisions the more they improve the quality of their universe and incorporate such understanding in their decisions (systems thinking). Profound personal mastery and a disposition for team learning and systems thinking help build strong and informed mental models that help people accomplish enlightened strategies of accomplishing win-more-win-more outcomes (shared vision). It benefits institutions to think and adopt strategic planning for quality education guided by the five disciplines. Much of the failure with the adoption of quality assurance measures are not in the models but in the incapability of conceptualising how workforce and stakeholders can draw up vectors of learning and improvement within the five disciplines. As long as this incapability persists, it is the author's view that there will not be improvements in the quality of education and institutions providing it.

4.2.5. Shared vision in QMSs

Sharing a vision about quality and its management into daily institutional practices is about connecting with the rest of the workforce and stakeholders, understanding what they are doing now that is constraining or improving quality of education. Open deliberations help people be truthful about their contexts and helps too in people talking frankly about what futures they desire and how much they are willing to give to achieve that future. The Six Sigma roadmaps shown in **Figure 3** is one such strategy of putting together different voices in building shared visions.

4.3. Process management: meaning and implications

Process management is the set of methodological and management practices used in ensuring that business and institutional activities accomplish their allotted performance targets. Information technology (IT) enhances process management and continuous improvement thus turning processes into assets. Indeed the basis of quality assurance is in assuring that processes are optimised without compromising their focus, effectiveness and efficiency in pursuing

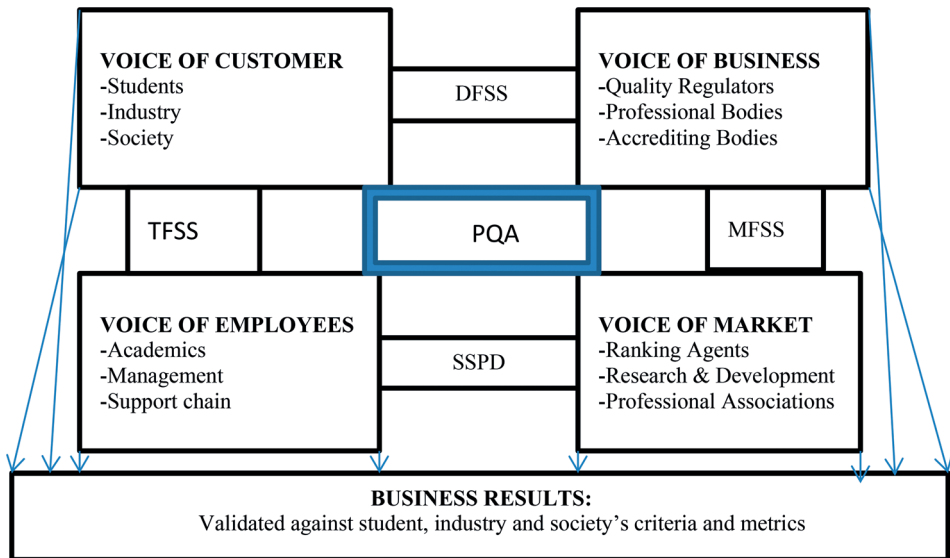


Figure 3. The combination of voices for program quality assurance.

customer satisfaction performance. Quality can only be assured with appropriateness of processes. Business process management systems can benefit the quality effort in a number of ways including pinpointing interface noise. Interface noise cause quality to decline. The Six Sigma roadmaps (Figure 3) in various ways improve quality of products and services by:

- a. Firstly, focusing institutional design and processes (DFSS) on operational target goals and objectives.
- b. Secondly, by aligning and integrating system-system, system-person and person-person processes (SSPD).
- c. Thirdly, by using technology in optimising utilisation of core and complementary resources (TFSS).
- d. Fourthly, by working only on value-creating processes (MFSS).

Processes that may have detrimental effects on value or do not add any are a liability to the institution. Setting-up a process improvement infrastructure should start from interviewing and surveying people throughout the institution to find out what they do, how they do it and why they like or dislike the experience. This however, needs honed skilful discussion competences on the part of management and the workforce. Well-developed competences in skilful discussion help to mine truth from behind workforce's fears, mistrust and doubts. People are more prone to hiding information and data when they are in fear, mistrust and doubtful. In times of poor quality performance, the temptation for corporate isomorphism or adoption of radical process and structural redesign or the use of consultants to fix the messy is high.

It is the author's view that neither of these strategies is likely to embed a permanent and relevant solution to poor institutional quality performance. In fact the institution may suffer a

duplication of activities, clogging of interfaces and exhaustion of workforce on valueless activities. This leads to overall decline in amount and quality of processes that directly create customer value. District offices and schools complain of too much work which would be greatly reduced were processes that created that work aligned, integrated and right-sized. Time saved can be re-arranged to encourage focus, concentration and intensive work or even afford workers 'free' or unstructured time. Quality of work depends somewhat on the amount of such unstructured time people spend ruminating about their roles and the assignment in their charge.

4.4. Customer focus: meaning and implications

In education the many customers to an institution may be allotted into one of the four categories below:

- a. Voice of Customer (students, society and industry).
- b. Voice of Business (quality regulator, accrediting agents, professional agents).
- c. Voice of Employee (academics, supply chain staff, non-pedagogic staff).
- d. Voice of Market (ranking agents, professional bodies, Research & Development).

Figure 3 illustrates the interaction of the four voices and they ultimately confluence into business results as measured by yardstick of student, society and industry satisfaction. In the ultimate instance, the Voice of Market, Voice of Business and Voice of Employee must focus on meeting requirements in Voice of Customer (students, society and industry) as in **Figure 3**. A focus on the customer should translate into a robust market-oriented philosophy or mental model and a pragmatic methodology of hearing, understanding, learning and responding to the four voices. Profiling and understanding the customer has a strong impact on how well the institution will develop and refine their processes, mission, values and consider development of their own vision sketch. A mental model of customer requirements informs the whole framework of training, skilling and refining of the institution's vectors for continuous improvement (CI). Vector of CI is meant a specification of how much and what direction a process, skill or competency needs to be improved so as to meet a customer requirement. The amount of change may be quantitative or qualitative. The direction of improvement may be negative (removal or reduction) or positive (addition or innovation). These three types of improvement vectors can be operated singly or may be executed within the same program. The important thing is that they are driven from the 'voice of the customer' and validated through a Six Sigma roadmaps approach.

The validation should be based on the impact the skills will make in DFSS, SSPD, TFSS and MFSS. Most institutions have strong and vociferous claims of customer-orientation yet the features of their product /service are determined by the institution or some other organ rather than derived from the voice of their customer [20]. In their isolation, these voices will not lead to much long-lasting change towards customer-focusing. To avoid reactivity to multiple and fragmented customer demands the voices can be combined, forming four Six Sigma Roadmaps as illustrated in **Figure 3**. Most institutions receive or do provide training and some sorts of skilling on customer care. The value of such budgets become questionable if the trainers, the content and

the purpose is alien to the contexts of the four Six Sigma roadmaps. Customer-focused training and skilling must be premised on creating strategic capabilities in the form of substitute quality characteristic (SQC) or technical competences (TC) and target values (TV). These three terms are meant conceptual, managerial, behavioural or practical capabilities that close the gap between P_i (intended performance) and P_o (observed performance) as illustrated in Eq. (2)

$$SQC_{gap} = P_{intended} - P_{observed} \tag{2}$$

Note that the terms target value can be applied to non-human resources like tools and machines while the terms SQC and TC are often used in Ref. to human performance competences. In the ultimate instance, the strategic concern is for all the voices to feed into the needs and wants of the student, society and industry-and-commerce. This point is further illustrated in the comparative analysis of the structure of the different QMSs. In **Table 2**, it is shown that business results are measured in terms of customer satisfaction performance, wherein the customer is students, society and the institution. There are many techniques used to gather information and data from education’s customers. These include interviews, student evaluation of teaching effectiveness (SETE) forms, observation schedules, records of complains, training needs analysis, learning needs analysis, etc. The data and information can be processed by use of brainstorming, tree diagrams, Kano diagrams, etc. Research has shown that copious amounts of data are collected by institutions but very little is done to process the data and make it influence hiring, procurement, budgeting and other management decisions [21]. Least done is the process of making the customers validate the information extracted from the data. Representatives from within the four voices can be used too in constructing and contenting the different data gathering instruments. Representatives from within the four voices can further be used to validate the list of needs and wants.

4.5. (Continuous) Improvement

Strategic planning must identify the improvement vectors within the disciplines of systems thinking; team learning; personal mastery; mental model and shared vision. With improvements

Focus of results Ficalora and Cohen [21]	Six Sigma customers Matorera [1]	EFQM-based results	Short-hand expected results Matorera [3]
Voice of customer	Student Society Industry	Customer results	Offered Quality supersedes expected Quality: $Q_o > Q_e$ therefore $Q_p > 1$ meaning positive CSP
Voice of employee	Academics Support staff Management	People results	Work-life balance, effective and efficient systems and institution
Voice of business	Quality regulator Accrediting agent Professional agent	Business results	The teachers, course outlines, courses, programs and the institution meet a threshold of criteria on quality as the constituents define it
Voice of market	Ranking agent Professional bodies Research & Development	Society results	The teachers, course outlines, courses, programs and the institution outsmarts the generic criteria of quality & creates unique competitive competences

Table 2. Relations among the different voices, EFQM and expected business results.

in these disciplines, there come earnest improvements in the institution’s breadth and depth of the strategy plan. Improving skills in the five disciplines should increase relevance of the Change-Project Management schedule and appropriateness of the Framework of Implementation Strategies as well as comprehensiveness of the Strategy for Risk Management as shown in **Figure 4**.

The basis of continuous improvement is a creative tension that correctly and accurately details the undesirability of the current institutional context(s) and the aspired future state(s) (**Figure 2**). The creative tension itself sets the atlas of institutional change. Expert strategists, through intra-inspection (personal mastery), systems thinking, team learning and sharing visions of their institutions build mental models of what their customers really desire. Based on these mental models, the institution must be able to precisely define the desirable behaviour change indicators (BCIs), key performance indicators (KPIs) and critical success factors (CSFs) that improve quality performance of individuals, teams and the institution as a whole. Different institutions adopt different strategies of doing strategic planning. The third strand of the strategy focus wheel (SFW) is Change-Project Management which is supported by five BPPs (Best Practice Principles):

- a. Being time-based
- b. Creating customer value
- c. Creating strategic capabilities

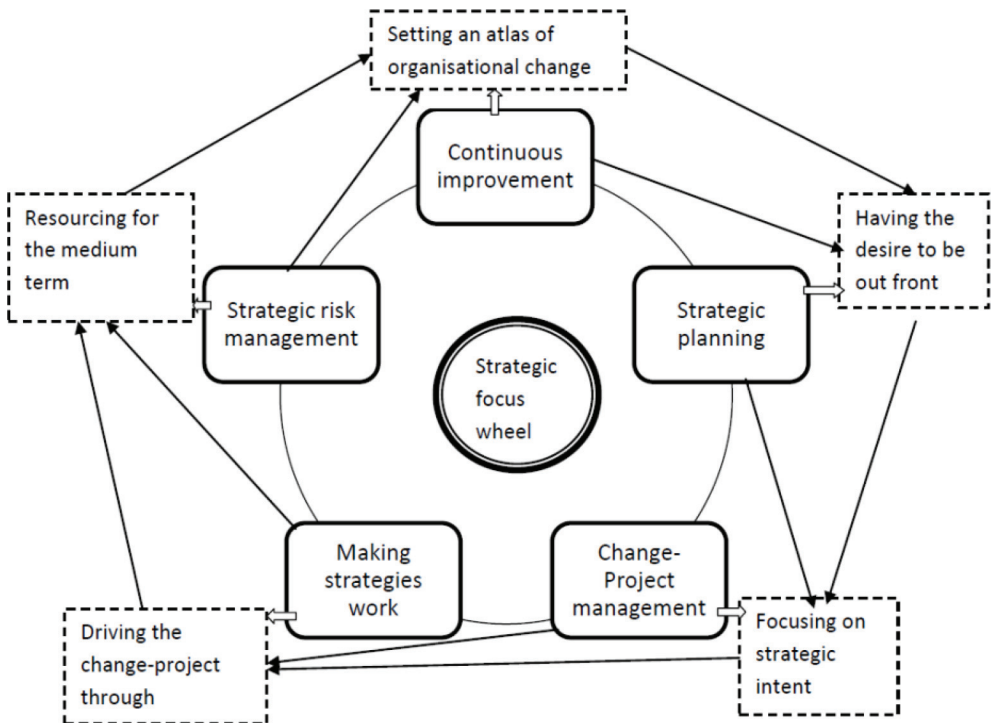


Figure 4. Strategy focus wheel applied to QMSs [3].

- d. Gaining alignment
- e. Linking the micro to the macro.

In this stage, special emphasis is brought on assessing the environment to identify strengths, weaknesses, opportunities and challenges; identifying and framing strategic issues; formulating strategies to manage the strategic issues; reviewing and adopting the Strategy Plan. It is logical that in seeking to manage quality, institutional members, at all cost, work from institutional contexts otherwise the strategies will not respond to the institution's quality necessities. One of the shortfalls is coming up with SWOT analyses as being an end unto itself. In quality management, a SWOT analysis is just but a tool for designing a set of strategic plans that should use institutional resources to deal with institutional challenges. The prime focus of the SWOT analysis should be to help the institution see how on a cost-benefit analysis the institution can utilise opportunities and its strengths to mitigate threats and weaknesses and drive change and projects through. Making strategies work is directed at driving change-projects through and hinges on the functionality of the seven BPPs:

- a. Being disciplined
- b. Being up-front
- c. Embracing change
- d. Ensuring integration of effort
- e. Establishing a learning culture
- f. Measuring, reporting and learning
- g. Supporting distributed leadership

Done well, the main gains to the QMS would be an effective implementation process, and the establishing of an effective organisational vision for the future. While both radical and revisionist BPR (business process redesign/re-engineering) versions assume process owners can steer and direct implementation, TQM and Six Sigma assign this role to statistical tools. In educational QMSs, this role can be protagonised by Vice Chancellors right to front-line workforce helped by mathematical and statistical tools such as those used in descriptions of costs, enrolments, etc. Descriptive and predictive analyses can be used to identify future opportunities and challenges. This also constitutes strategic risk management whose focus is ensuring that strategies and the strategic planning process are reassessed continually. This ensures that every objective attained becomes a means or tool for accomplishing future goals and objectives. This is referred to as 'resourcing for the medium term'.

The revisionist BPR, TQM and Six Sigma models are based on the BPP of 'resourcing for the medium term'. Resourcing for the long-term confer moderate risk to activities of QMS. This is mainly because the idea of 'resourcing for the medium-term' examines the present in terms of the future. It further ensures that an objective achieved now should be a resource and means for achieving future institutional objectives. In contrast, radical BPR confers high risk to quality strategies as its habit of starting from scratch forfeits it of the historical success of the institution. Radical approaches to institutional difficulties and problems often quickly run out of steam, budgets and support as people are bound to feel short-changed.

In interviews with school managers, it emerged that at the moments of strategic planning the main huddle was focusing on strategic issues because there always would be arguments between ‘theorists’ and ‘pragmatists’. Others sited problems of individuals being unresponsive to suggestions on their learning needs or performance deficiencies. A principal explained how after agreeing on performance improvement plans with teachers ‘two full terms down, no action, no response and things remained the same if not worse’. A district manageress had an intervention visit to a school labelled in a complaint letter from a union a ‘witch-hunting expedition’. But to help another one needs to understand where the deficiency is first. The aforementioned instances show how even when people share a vision of quality improvement their mental models about how to do quality improvement may be quite different. Even when improvement strategies were crafted from the institution, some felt their operationalisation would be swamped by regulations and requirements. Implicitly, this would compromise the institution’s home-grown strategies as they are left without monetary, psychological and time budgets. Thus, locally grown change needs and projects would always be scantily driven through. By implication it means that much of institutional budgets are spend on chasing issues that are valueless in terms of continuous institutional improvements. It also implies that the risks (positive or negative) perceived by the institution or part thereof are not exploited as they are left to compete with those dictated from above by top management. It was not always that dictates from top-management are irrelevant at the middle or lower institution echelons. Despite the alignments there are many chances that the requirements are felt by both but enjoy different priority levels with each group. Differences in priority result in either over-budgeting or under-budgeting on each activity. Either way, over-budgeting or under-budgeting exemplifies lack of strategic risk management.

The priority given to the improvement of a target value must correspond with the amount of value the target value or CSF (critical success factor) will leverage towards customer satisfaction performance. Kano diagrams (Kano model) should accomplish this. Focusing on an improvement vector and target value and the prioritisation of related budgets is an important part of system thinking-based strategic categorisation activity. Strategic categorisation should see the institution build its critical strategic capability on a continual basis. The magnitude of ‘improvement ratio’ on any improvement vector depends on the strategic capabilities deployed on that vector.

4.6. Knowledge management: meaning and implications

By knowledge management is meant a process of generating, sharing, managing and using the know-hows and information of an institution. Great amounts of knowledge can be generated where there is strong teamwork culture and managers and leaders acting as knowledge nodes and knowledge distributors. The tools for knowledge management include among others:

- a. on-the-job discussions,
- b. mentorship,
- c. discussion forums,
- d. corporate libraries and
- e. professional training,

Knowledge management continue to be hampered by individual idiosyncratic make-ups or personal mastery and the structural and cultural peculiarities of certain institutions. If an individual feels that they can use information and knowledge for personal progression or other individualist benefits, they are more likely to hoard it and stop its flow even to persons who actually would use it more and better. The use of knowledge management technologies continue to be low among roles in the education system and the content of the communications, where it exists, tends to sway towards social relations and commentaries than professional growth. This may be caused by that social media platforms are the main forums through which professionals continue to interact [22]. In western-world literature and practice, the following technologies of knowledge management seem to be commonplace such as groupware, workflow, content management, enterprise portals, e-learning, Microsoft Outlook and Project (scheduling planning) and video conferencing, these may not be the case for the majority of African educational institutions. Technology-driven communication is important in the delivery of data and in its application in improving quality of education. A well-constructed knowledge management infrastructure should have robust knowledge management software that allows it to innovate, build and share knowledge that should help in improving customer experiences and satisfaction.

Large volumes of knowledge sources and information can be transacted via visual search models like: matrix search; tag cloud search; tree traversal; taxonomy navigation, etc. Low-developed nations with marginal electric power infrastructures would be least able to use these technologies. In some of the institutions, the reasons for low usage range from the strategic (top) through management down to the technical level of the institution. The institution-wide impediments can only be overcome when people learn to be frank in discussing what potentials they see in these knowledge management technologies and how their contexts constrain the adoptions of the technologies. At the strategic/institutional level, knowledge management systems may be considered expensive or a luxury and therefore top management lacks commitment to related budgets. Function-based, closed institutions with their propensity for tuff-warring, fragmentation, competitiveness and dysfunction may not have a 'good' reason to share with their 'rivalries'.

At the management level [23] talk of the absence of Knowledge Management in the Strategy Plan and therefore absence of incentives, recognition, managerial direction and leadership as key impediments. Particularly at school and other operational levels, lack of skill and therefore the threat of exposure of those lacking skills to deal with vast amounts of knowledge may create avoidance or explicit resistance to adoption and diffusion of knowledge management technologies. The criticality of knowledge management in institutions cannot be overemphasised, with [24] lamenting that schools and local education authorities are notoriously poor knowledge sharers albeit being in the learning business.

4.7. Measurement, reporting and learning from business results: meaning and implications

Business results are characterised by the outputs and outcomes from the operation of sets of performance management and analytic processes across the institution. Such results can be at any point along the '*disappointing-to-delightful*' continuum where the Q_p (quality of business output perceived) depends on the difference between Q_e (expected quality) and Q_o (offered quality).

$$Q_{\text{perceived}} = Q_{\text{expected}} - Q_{\text{offered}} \tag{3}$$

Various assessment and measurements techniques can be used to measure business performance mid-course or at the end of an instructional period. **Table 2** indicates expected results if the Six Sigma roadmap was applied on the EFQM model. The value in deriving expected targets from the institution’s key stakeholder groups is that the results analysis will impact strategic planning, the strategy plan and the many processes (QMS) that result in the (re) configuration of a strategy implementation infrastructure that created the sets of results. The impact will be twofold: reflection and feedback on how the QMS was rolled out and reflexion and feed-forward, that is, informing what can be done to make the future experience with QMS more fruitful. **Figure 5** illustrates this flow reasoning which however is far from being so structured and an exemplar of cause–effect relationship in real life.

4.8. Partnerships

The term partnership defines the ‘relationship either, contractually supported or otherwise, between two or more parties, each of whom shares joint and several liabilities for the actions of the whole’ say [25]. During examining, the potential benefits of partnering managers must look at and completely understand what is driving them into choosing partnering. They must run a similar assessment of the target partner and understand the positive and negative risks based on their own and others’ vision. Understanding the others’ drivers for partnership with your institution is a critical success factor not only for the project you are partnering in but also for the sustenance of your vision as well. In education, partnerships may be at the following levels:

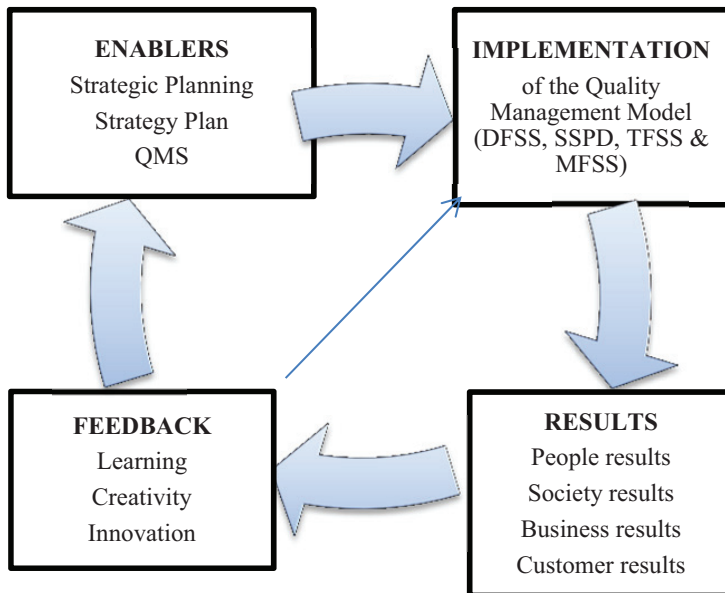


Figure 5. Relation among enablers, implementation, results and feedforward in QMSs.

- a. institution – institution;
- b. institution – department;
- c. department – department;
- d. department – individual(s);
- e. individual – individual level, etc.

Important in any such partnership is the gaining of a benefit in terms of improving quality of expected results. It becomes good practice then that in the gestation of the partnership parties review, feedback and feed-forward with an eye to improve management of quality. It is worth noting at this point that most partnerships in education are based on exchange and sharing of competencies and expertise.

4.9. Resources

Resources are a critical element in quality management. Quality education depends on the presence of a supply of resources at the strategic, management and operational levels of the institution. Learning resources are a critical success factor for quality scholarship just as are teaching resources. A number of factors variably influenced the quality and relevance of resources in institutions. These ranged from procurement (purchased or donated) of irrelevant resources, incompatibility of resources with the mentality of proposed users and/or with the extant infrastructure of the institution. Management were blamed for investing in facets that increased institutional visibility and image at the neglect of less impressive resources however important they would be in improving quality of teaching and learning.

4.10. Information management

Information management is defined as the planning, organising, processing, structuring, evaluation, controlling and reporting on activities relating to acquisition, dissemination and disposal of information. One of the cornerstones of quality management is management by facts and this makes the flow of information of high importance in strategy formulation and implementation. In quality management, it is also important that data transforms into information that is worked into knowledge usable for effective decisions. Decisions in turn, are effective to the extent they guide appropriate actions that in turn impact delivery of customer, business and societal results. Excellence in information management in the education sector should see institutions better aligning the volume and quality of acquired technologies with the institution's quality strategy. This deliverable is covered in the Six Sigma roadmap—Technology for Six Sigma. Schools that refuse students to use smartphones as learning resources are depriving their own students of a chance to get more information and presented in more animated and interactive forms than it would be in textbooks and on chalkboards. Early familiarisation with knowledge and information management technologies should expedite students' metacognitive skills as well as the institution's ability to catalyse and enable it. There is nothing that exemplifies information management than the learning process and TFSS becomes of immense importance to institutions as to students. i-Pads, smartphones, notepads should move into the centre of the instructional relationship in and out of the classroom. Most

critical learning conversations for the young 'digital natives' generation of learners are occurring online, anytime at any place with virtual mates thousands of kilometres away.

5. Conclusions

Understanding each component of a QMS in its individuality should help in building a coherent picture of how a QMS can be at the service of a student-focused and market-oriented education delivery system. However, efforts to build an infrastructure for quality management and quality assurance are often constrained by the apparent inability of the stakeholders to share at least a near-common vision of how to do 'quality' in education. One way forward would be starting at the level of personal mastery and change the deep-sited attitudes and developing skills in strategic thinking so that the cause for team learning and reconfiguring our mental models becomes more urgent. The chapter worked on seven quality management models showing how they converge on nine categories. For effectiveness, these categories must be implemented in the framework of the 14 BPPs discussed herein. Important would be for the institution to create strategic capabilities in each category and thereon has roadmaps for continual skills updating as the institution co-adapts with changing customer needs and wants. Profound co-adaptive change calls for consistent changes in strategic focus, set of key performance indicators, behaviour change indicators and the institution's bundle of critical success factors.

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