Integrating Total Quality Management and Knowledge Management

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ABSTRACT

In the early 1980s when total quality management (TQM) was first introduced in companies as the way to achieve organizational success/excellence, it did not receive an immediate support and universal acceptance. Gradually the benefits of quality and quality management programs became evident and controversies disappeared. Twenty years later, organizations are facing precisely the same dilemma with Knowledge Management (KM). The aim of this paper is twofold: Firstly it suggests that there are many commonalities between TQM and KM and discusses how the latter can benefit from the former. Secondly, it presents the relationship and differences between TQM and KM goals and objectives. To this end, we address issues such as: are TQM and KM two independent disciplines? Are they complementary? Do they interfere or do they facilitate and nurture each others’ capabilities?

Keywords: Knowledge Management, TQM, ISO 9000:2000, Six Sigma, National Quality Award

INTRODUCTION

This paper identifies commonalities between Total Quality Management (TQM) and Knowledge Management (KM) and capitalizing on this common denominator discusses how KM, being a relatively young discipline, can benefit from highly mature and well established TQM practices. For instance, TQM is process-oriented, customer-centric and requires a cultural change (Kolarik, 1999). Precisely the same attributes can be assigned to KM. For more than two decades TQM has been the guiding principle for various organizations, both private and public, to produce high quality products (tangible and intangible) and attain high customer (internal and external) satisfaction (Crosby, 1979; Deming, 1986; Ishikawa, 1985; Juran, 1988; Taguchi, 1986). In the early 1980s the focus of TQM was to continuously improve processes by reducing variation and improving the mean of a quality characteristic (e.g., performance). Initially, manufacturing quality was the main aim. However, during 1990s, with the advent of global markets and digital economy, TQM priorities also shifted. TQM now focused mostly on services (rather than tangible/physical goods) and was utilized as a competitive weapon for product/service differentiation in the newly borderless markets where, for the most part, fierce competition made price and quality a non-differentiating factor. It is worth mentioning that during this e-Commerce era, the true spirit of TQM and its main slogan—i.e., Customer is King/Queen—was practiced. This was mainly due to fierce global competition among the firms as well as availability of various kinds of product related information to the customers.

The following sections define and describe Knowledge Management and presents the technical considerations and managerial factors that contribute to the successful implementation of KM and how TQM practices can assist in this endeavor.
Knowledge Management Definition

Knowledge Management has been defined in different ways by different authors. We selected the following definition which we think clearly define the purpose of KM:

“Knowledge management is the process of capturing a company’s collective expertise wherever it resides - in databases, on paper, or in people's heads - and distributing it to wherever it can help produce the biggest payoff” (Hibbard, 1997)

Some of the most popular KM practices include:

- Communities- of- Practice/Purpose
- Asynchronous Communications (e-mail, message board/broadcasting, subscriptions and alerting, discussion threats)
- Synchronous Communications (instant messaging/white boarding, application and screen sharing, video and audio conferencing)
- Collaborative Services (calendar and scheduling, task management, survey voting and polling, workflow)
- Document and Content Management
- Knowledge Engineering, Taxonomies, Mapping
- Knowledge discovery (Data warehousing, Data mining, Expert systems)
- Lessons Learned and Best Practices Repositories
- E-learning, training, mentoring
- Expertise Locator/Organizational Yellow Pages
- Change management, Change Agent, BPR
- Culture change, Incentives, Leadership
- Intellectual Capital/ Property

KM practices are numerous and can be categorized in different ways. However, a certain agreement on a typology defining two main KM approaches exists: codification versus personalization (Hansen, Nohria, & Tierney, 1999). The “codification approach” or “people-to-documents approach” is intended to collect, codify and disseminate information. It relies heavily on Information Technology (IT). One of the benefits of the codification approach is the reuse of knowledge. “The aim of codification is to put organizational knowledge into a form that makes it accessible to those who need it. It literally turns knowledge into a code (though not necessarily a computer code) to make it as organized, explicit, portable, and easy to understand as possible” (Davenport & Prusak, 1998). In contrast, the personalization approach or "people to people approach" focuses on developing networks for linking people so that tacit knowledge can be shared. It focuses on dialogue between individuals, not knowledge in a database. “Knowledge that has not been codified - and probably couldn’t be - is transferred in brainstorming sessions and one-on-one conversations” (Hansen et al., 1999). An investment is made on building networks of people, where knowledge is shared not only face-to-face but also over the telephone, by email, using instant messaging applications and via videoconference.

If we contrast these two KM approaches with quality approaches, most quality approaches mainly focus on “codification” (Data collection, Measurements, Quality certifications, Quality procedures,… ). However, most of the employees’ know-how, expertise, experience and “savoir faire” are currently not captured and not codified due to their tacit nature (people can know more than they can tell (Polanyi, 1966)). The question then becomes: Could we increase the effectiveness and efficiency of current quality practices by better managing employees’ knowledge? The emphasis on the “personalization” approach - which permits tacit knowledge sharing to occur - remains limited in quality practices. An example of personalization approach was the concept of “Quality circles”. We believe that in this manner KM can play an important role in improving quality and customer satisfaction. Another drawback of over emphasizing on codification practices is that they have a tendency to kill innovation and creativity.
Problems and Issues in KM Implementation and Practice

We can categorize KM related issues into the following: Organizational/Managerial, Cultural, Technical, and People related. As we review these problems, one can notice the parallelism between KM and TQM problems/issues and challenges.

Technology is the easiest part of KM. Perhaps the most significant technical consideration for KM systems is information quality. Poor information quality has been and still is the major concern of decision makers and business managers and it has a direct impact on the bottom line of any business. In addition, processes must be established for information quality to ensure integrity and consistency of knowledge and knowledge presentation. This applies to both the information/knowledge that enters into KM system from various sources and the knowledge produced by applying knowledge discovery techniques (data mining, expert systems, intelligent agents, data warehouse …) on knowledge repositories. Another important ingredient to assure information quality is users. The users of a KM system should be involved in determining what goes into the KM system, what output is expected from it and what will be a context based format for presenting the (input) information and the (output) knowledge.

Cultural issues are quite significant in KM and they directly impact KM success or failure. In fact they are the first barrier to success (Barth, 2000; Knowledge Management Review, 2001; KPMG, 2000). As in TQM, in KM initiatives people tend to avoid or fight change and they prefer “the old way of doing things” in the company. With KM, there will be a new way of decision making in the organization and people have to share knowledge and “know-how”. Knowledge being often associated with “power”, promoting knowledge sharing is not an easy task particularly if employees don’t see how they can directly benefit from it. Knowledge transfer can also take place among various organizations (Lam, Chen, & Ubroeck, 2002). Leadership then becomes critical and managing through a knowledge lens should become a priority (Ribière & Sitar, 2003).

Organizational and managerial issues in KM include devising managerial processes for capturing and distributing knowledge. In addition, these processes need to be improved continuously to become more effective and efficient. KM systems must be included in an organization’s structure. However, such a structure (as in TQM) must be flexible and adaptive. “It is important that organizational structures are designed for flexibility (as opposed to rigidity) so that they encourage sharing and collaboration across boundaries within the organization and across the supply chain” (Gold, Malhotra, & Segars, 2001).

KM Implementation and Practices: Lessons Learned from TQM

Launching a KM initiative is an evolutionary and on-going effort. This paper suggests that there are many similarities between implementing KM and implementing total quality management (TQM). In addition, there are also similarities in KM and TQM practices. Therefore, we recommend that best practices, the lessons learned, and common pitfalls in TQM implementation and TQM practices should be utilized for KM implementation and practices. TQM and KM commonalities are listed below:

a) TQM and KM both involve cultural change. TQM introduces a new management style into the organization and KM introduces a new way of information sharing and decision making.
b) Success of both TQM and KM is heavily dependent on the top management support.
c) TQM and KM both may require organizational changes/restructuring.
d) TQM and KM are customer-centric (both internal and external customers). In TQM customer is king and KM provides the foundation for customer relationship management (CRM). Proven methodologies such as Quality Function Deployment (QFD) that has been successfully used in TQM can successfully be applied in KM projects.
e) The ROI on both TQM and KM is difficult to measure. The benefits of both are realized in a distant future; thus, in both cases the top management may be reluctant to support the project (a short-term return may be preferred by some managers). The methods used in TQM for top management support (e.g., creating success stories by starting with a small scale TQM project) can also be used in KM (e.g., start with a small application area).
f) TQM and KM both need a champion to ensure success.
g) Both TQM and KM require a sound training program. That’s particularly relevant when a company wants to
become a learning organization.

h) TQM and KM should both support the organizational mission and its long term strategies and objectives.

i) Both have broad implementation guidelines (abstract and general) that may end up into failure

j) They are now considered as everyone’s job even if it was not the case when they started (e.g., Quality control Dept)

k) Some organizations were doing it (QM & KM) before it became a discipline and got so much attention

l) Both had some Japanese Gurus (Quality: Kaoru Ishikawa, Genichi Taguchi, …

KM: Ikujiro Nonaka, Hirotaka Takeuchi)

m) In order to develop, implement and maintain both you need: Leadership, Processes, Culture, technology as a key enabler and Measurement systems

n) Deming’s 14 points (presented in Table 1) which have been successfully applied to TQM can be applied, to a large extent, to KM systems.

### Quality Standards and Initiatives

During the first part of this paper we used the term TQM in a broad sense. If we want to obtain a better understanding on how KM relates and integrates with Quality we need to define and analyze the different types of quality initiatives that are currently implemented in organizations. We decided to focus our analysis on four well known and well accepted quality practices/tools.


- Total Quality Management Initiatives
- Six Sigma
- National Quality Awards (MBNQA & EQA Excellence Models)

These quality practices/tools explained below address the main “generic” concepts shared by the majority of worldwide quality initiatives that organizations may implement.

### ISO 9000

The ISO 9000 family of standards represents an international consensus on good management practices with the aim of ensuring that the organization can time and time again deliver the product or services that meet the client’s quality requirements (International Organization for Standardization, 2003). These best practices have been distilled into a set of standardized requirements for a quality management system, regardless of what your organization does, its size, or whether it’s in the private, or public sector (International Organization for Standardization, 2003). The ISO 9000 family of standards have been revised in 2000 and resulted in a closer alignment of quality management systems with the needs of organizations and better reflect the way organizations run their business activities (American Society for Quality, 2003). ISO 9000:2000 is composed of standards, guidelines and technical reports. We present a brief explanation of ISO 9000:2000, ISO 9001:2000 and ISO 9004:2000 that are defined by ISO as follow:

**ISO 9000:2000, Quality management systems - Fundamentals and vocabulary**

*Establishes a starting point for understanding the standards and defines the fundamental terms and definitions used in the ISO 9000 family which you need to avoid misunderstandings in their use.*

**ISO 9001:2000, Quality management systems - Requirements**

*This is the requirement standard used to assess the ability to meet customer and applicable regulatory requirements and thereby address customer satisfaction. It is now the only standard in the ISO 9000 family against which third-party certification can be carried.*
The familiar three standards ISO 9001, ISO 9002 and ISO 9003 have been integrated into the “new” ISO 9001:2000. The goal of this standard remains the same: consistency of action. It captures the who, what, where and when of operational processes in procedures and the how of operational processes in work instructions (Clarke, 2000). The ISO 9001:2000 standard is less rigid than its predecessor. The standard tells you what to do and not how to do it. On one side this flexibility allows organizations to implement their quality management system in their own and creative way but on the other side the lack of detailed guidance makes it more difficult for some organizations to get started or to understand what is expected. Overall the new standard is more customer oriented than the previous version.

ISO 9004:2000, Quality management systems - Guidelines for performance improvements

This guideline standard provides guidance for continual improvement of the quality management system to benefit all parties through sustained customer satisfaction.


Total quality management is defined as a management approach that tries to achieve and sustain long-term organizational success by encouraging employee feedback and participation, satisfying customer needs and expectations, respecting societal values and beliefs, and obeying governmental statutes and regulations.

Six Sigma (6σ) (Six Sigma, 2003)

Six Sigma is a rigorous and disciplined methodology that uses data and statistical analysis to measure and improve a company’s operational performance by identifying and eliminating “defects” in manufacturing and service-related processes. Commonly defined as 3.4 defects per million opportunities, Six Sigma can be defined and understood at three distinct levels: metric, methodology and philosophy...

Six sigma was developed by Motorola during the 1980s. It was subsequently adopted by leading corporations such as GE, Sun Microsystems, AlliedSignal and Bank of America.

National Quality Awards (NQAs)

National Quality Awards played an important role in promoting quality worldwide. The most notorious prizes are The Deming Prize (Japan), The European Quality Award (EQA) and the Malcolm Baldrige Quality Award (MBNQA) in the United States. Many other countries modeled their own NQA based on these three awards (Tan, 2002). The companies which apply for these awards are judged against Excellence models.

Knowledge Management

"Knowledge management is a conscious strategy of getting the right knowledge to the right people at the right time and helping people share and put information into action in ways that strive to improve organizational performance. Knowledge management is a complex process that must be supported by a strong foundation of enablers. The enablers for KM are strategy and leadership, culture, measurement, and technology. Each of these must be designed and managed in alignment with the other and in support of the process. The process usually involves several of the following stages or sub-processes in the use of knowledge: create, identify, collect, organize, share, adapt, and use” (APQC, 2000).

Table 2 compares and summarizes the objective and focus of the previous six disciplines. As seen from table 2, the ultimate objective of all Quality and KM practices is to increase customer satisfaction. In KM, however, there are additional objectives, namely, Innovation and Customer Relationship Management (CRM). This latter objective is of utmost importance and has direct impact on profitability.

Now the question is to understand the relations between theses disciplines. We will then propose a framework on how
these disciplines could interact and build on each other’s competences in order to achieve worldwide performance excellence (Figure 1).

We can look at the relations between these six disciplines through different lenses. If we first focus on the five quality disciplines previously described we could organize them into layers where a lower layer is considered as foundation for the upper layers.

The foundation layer is based on the ISO 9001:2000 standard or its counterpart QS 9000. This layer represents the Quality Control and Quality Assurance dimension of a Quality initiative. It is necessary to maintain a low variation in the quality of the product or services provided by the company. In the past being ISO 9000 certified didn’t imply that the product/service provided met the customer needs but just that the product/service was produced with a minimum variance on the initial requirements. The new version (ISO 9001:2000) is much more customer oriented and may reduce this problem. However, based on the proposed framework, a company can initially get ISO 9000 certified only as a marketing tool and may not strive to reach the upper layers of the quality pyramid (Figure 1).

At the next level we find ISO 9004:2000. This is not standard but recommendations that are based on eight quality management principles:

- Customer focus
- Leadership
- Involvement of people
- Process approach
- System approach to management
- Continual improvement
- Factual approach to decision making
- Mutually beneficial supplier relationships

These principles bring a new management and leadership dimension to ISO 9001:2000. When followed, these principles can help improve organizational performance and achieve success. The subtlety is that in order for a company to get its quality management system certified it must meet ISO’s requirements but not ISO’s guidelines. There are a lot of advantages and opportunities to follow ISO 9004:2000. ISO 9004:2000 was devised for top management use and they can utilize it to improve organizational performance, reduce costs, satisfy customers and improve competitiveness (Russell, 2003). Russell even suggests that ISO 9004:2000 could be used by organizations to assess the maturity of their Quality management System compared to world class performance (Russell, 2003). Unfortunately these guidelines are often ignored or misunderstood and the value it can bring to an organization might not be optimum.

On the next layer we can find two disciplines: TQM and Six Sigma which are sometimes referred as “philosophies”. The concepts of TQM (Cf. Tables 1 & 2) have been accepted and recognized as critical criteria for organizations to remain competitive but their application has always been problematic. Only strong and visionary leaders were able to fully implement them in order to fully take advantages of TQM. The TQM ideas are still present in management techniques that emerged afterward (e.g., BPR, CRM, Lean Thinking/Manufacturing). If properly implemented, the application of ISO 9004:2000 should facilitate the transition to a full TQM program which requires a deeper organizational change. Some organizations like Motorola took their own approach to TQM and created a new discipline directly inspired from TQM. One such an approach is Six Sigma which is currently the most popular and the most successful one. The main difference between TQM and Six Sigma resides in the word management. Six Sigma is a methodology which is well defined compared to TQM philosophical guidelines. Six Sigma is more short term results oriented and it is not the territory of the quality department (Pyzdek, 2001). Nevertheless, Six Sigma does share common themes with TQM, as seen by the overlap in our framework. We believe that a Six Sigma initiative is more likely to succeed if it is implemented in an open and quality friendly culture. ISO 9004:2000, if properly implemented should create such a culture where a strong, committed and supportive leadership is present and where employees are motivated.
Finally, on the top layer of the framework we placed the Malcom Baldridge National Quality Award (MBNQA) as well as the European Quality Award (EQA). Both are National Awards and are well recognized Quality Awards that are built on Excellence frameworks (Cf. Figures 2 and 5). To reach this level of quality excellence organizations needs to have a robust quality system that covers all the aspects of the organization as well as a supportive organizational culture. That is the reason why we believe that the foundations required for attaining such level of excellence resides on successfully implementing the lower layers. Organizations will have to implement only one of the two disciplines presented in the layer three (TQM or Six Sigma).

Knowledge Management not being a quality discipline on its own will not fit as a layer in the previous pyramid but it can be added as a transversal layer nourishing all the quality layers. The purpose of KM being to collect and disseminate tacit and explicit knowledge (best practices, lessons learned, know how, …) each quality discipline in our framework will strongly benefit from it.

If we take a look at these disciplines through another lens in trying to understand commonalities we could then represent them using a vein diagram (Figure 4). What is interesting to note in this diagram is the intersection between disciplines. We believe that the intersection between ISO 9000 family of standards and TQM resides in the proper application of ISO 9004:2000. As mentioned earlier both of these standards add a quality management perspective to control quality and quality assurance. The other intersection between ISO 9000 family of standards and Knowledge Management could be based on the management of information which is critical in both disciplines.

Regarding the intersection between TQM and Six Sigma we mentioned Business Process Reengineering (BPR). TQM can not be implemented without a serious reconsideration of the business processes of an organization. One of the goals of Six Sigma is to create new processes that will satisfy customer needs or to modify existing ones. So in both cases BPR is critical.

The intersection of ISO 9000, TQM and BPR is Kaizen (a philosophy oriented toward continuous improvement).

The intersection between Six Sigma and Knowledge Management directly relates to Communities of Practice (CoP). CoP can be defined as a group of individuals with a common working practice who do not, however, constitute a formal work team. Communities of practice generally cut across traditional organizational boundaries and enable individuals to acquire new knowledge otherwise unavailable or at a faster rate. Six Sigma teams can be considered as CoP due to the fact that they regroup employees from different divisions and very often from different locations around similar activities and interests. Already some Six Sigma teams are starting to use knowledge portals and online Communities of Practice to collaborate and share knowledge across divisions. An example of successful initiative in this area is the case of Caterpillars with their current use of more than eighteen hundred CoP.

We made all the disciplines intersect into National Quality Awards (MBNQA or EQA). NQA reflect all these disciplines. This might seem obvious concerning all the quality disciplines but it may not be obvious regarding KM. In fact it is only in the 2003 version of the MBNQA that KM timidly appeared as one of the criteria (#4) of the framework (Figure 5) (NIST, 2003). We believe that the enterprise wide integration of all these disciplines will drive to “Business Excellence”.

Finally we think that the most important perspective of looking at the relations between these disciplines is the following one. We strongly believe that organizations can not achieve worldwide performance excellence focusing only on quality disciplines. The missing piece of the quality puzzle is in our opinion Knowledge Management (Figure 6). During the past decades the success or Quality initiatives were mixed. Quality initiatives were mainly relying on data and information management but in order to meet the higher requirements of today’s customers this is no longer enough. Juran once stated “in the United States, close to a third of the work done consisted of redoing what had been done before. Depending on the nature of the industry the cost of poor quality consumed between 20 and 40% of the total effort”. Not wasting time and money reinventing the wheel is one of the main goals of Knowledge Management. This can be done through different manners but KM practices as Lessons learned repositories, Best practices and Communities of practice contribute actively at reducing such problem. Enabling and facilitating knowledge sharing is key to Quality. An example that reflects this concept is the role of Master Black

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Belts in Six Sigma initiatives. Their primary responsibility is training and mentoring new Black Belts in the organization (Lucas, 2002). Through this mentoring and training phases the Master Black Belts will share their valuable tacit knowledge with Black Belts that will later on become themselves Master Black Belts. This is a good example of the need and power of establishing KM in an organization.

The successful implementation of KM in an organization will also serve as a change agent that could facilitate the success and expansion of quality practices. But how can we make sure to succeed in launching a KM initiative? The first thing to do, as we preached in the first section of this paper, is to learn from the successful and unsuccessful implementation of TQM. The second thing to be aware of is that 80% of the efforts of a KM initiative must be made on the people aspect of it and only 20% of efforts needs to be dedicated to technology. Technology is an enabler for successful KM as well as a catalyst for its emergence (Wilson & Asay, 1999).

We strongly believe that Knowledge Management is the keystone of the door to Business Excellence (Figure 7). Without it, organizations will not fully benefit from their Quality initiative, whichever it is, and may not obtain the competitive advantage expected. The enabler to successfully “pass this door” being Strong Leadership, Organizational Culture, Measurements and Information Technology (the pillars of our door).

### Conclusion

This paper provided a brief discussion of TQM and KM and identified the commonalities between them and how they integrate. Since TQM is mature and has established a reliable set of best practices and common pitfalls, it was suggested that KM can benefit greatly from TQM experiences due to their significant commonalities. In addition a layered framework was presented to depict the relationships between various quality standards. KM was subsequently added to this framework to emphasize the significance of KM and the role it plays in enabling an organization to achieve “Business Excellence” both in its quality endeavor and in its KM practices. Finally, the conclusion was that KM-TQM is a two-way path and both disciplines can benefit from each other.

### References


2 Tables

Table 1. Deming’s 14 Points

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.

2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.

3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move towards a single supplier for any one item, on a long-term relationship of loyalty and trust.

5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.

6. Institute training on the job.

7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of an overhaul, as well as supervision of production workers.

8. Drive out fear, so that everyone may work effectively for the company.

9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.

10. Eliminate slogans, exhortations, and targets for the workforce asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.

11. a. Eliminate work standards (quotas) on the factory floor. Substitute leadership.
   b. Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

12. a. Remove barriers that rob the hourly paid worker of his right to pride in workmanship. The responsibility of supervisors must be changed from sheer numbers to quality.
   b. Remove barriers that rob people in management and engineering of their right to pride in workmanship. This means, inter alia, abolition of the annual or merit rating and management by objective.

13. Institute a vigorous program of education and self-improvement.

14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody’s job.
Table 2: Contrasting ISO 9000 standards family, TQM, Six Sigma, National Quality Awards and Knowledge Management
adapted from (NIST, 2002; Summers, 1997; Wernack, 2003; Zhao & Bryar, 2001)

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<td>Focus</td>
<td>Focus</td>
<td>Assess the maturity of Quality Management System that will lead to preventive action and continual improvement</td>
<td>It focuses primarily on total satisfaction for both the internal and external customers within a management environment that seeks continuous improvement of all systems and processes.</td>
<td>Understanding customers' needs and acting on them. Concentrates on measuring product quality and improving process engineering. Drives process improvement and cost savings.</td>
<td>Focus on performance excellence of the entire organization in an overall management framework. Identify and track all-important organizational results: customer, product/service, financial, human resource, and organizational effectiveness</td>
<td>Focus on processes needed to collect, store, retrieve, share, and leverage knowledge assets</td>
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<td>Personnel development</td>
<td>Competence, awareness and training</td>
<td>Competence, awareness and training</td>
<td>Empowerment, training, development</td>
<td>Building future leaders</td>
<td>Placing value on employees and partners</td>
<td>Empowerment, competence development, learning.</td>
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<tr>
<td>Leadership</td>
<td>Requires management responsibility for quality system</td>
<td>Upper Management</td>
<td>Top level and upper management</td>
<td>Master Black Belt, Black belt and Green Belts</td>
<td>Visionary leadership</td>
<td>Chief Knowledge officer, Knowledge Champions, Communities of Practices</td>
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Figure 1: Quality Practices Framework

Figure 2: The EFMQ Excellence Model
Integrating Total Quality Management and Knowledge Management

Figure 3: Quality Initiatives Structure & Knowledge Management

Figure 4: Relationships between the Quality disciplines and KM

Figure 5: Malcolm Baldrige Quality Award, 2003 Criteria for Excellence

Figure 6: KM the missing piece of the Quality puzzle
Figure 7: Knowledge Management as the keystone of the door to Business Excellence
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