

Quality: From Past Perfect to Future Conditional

Paulo Sampaio and Pedro Saraiva

The 21st century will be the century of quality.

—Joseph Juran.

The future of something is quite difficult to define or predict. As Mark Twain stated, “the art of prophecy is very difficult, especially with respect to the future!” However, given the reduced value associated with forecasting the past, and the gains associated with estimating the future, it is worthwhile aiming to do so. And a good way to proceed with such a goal consists in properly indentifying improvement possibilities or new opportunities, and then defines strategies and approaches to address them. When we look into quality through this perspective, it is possible to anticipate that it will have a promising good future, built on top of its past and present achievements, provided that as a field it is able to adapt and move quickly into the future challenges raised by a fast changing world. In this chapter we will try to do so, based upon our national and international experience in the field, very proud of having been both awarded in the past as Feigenbaum Medalists from Portugal.

Quality Specific Roots

As opposed to what happened with the large majority of scientific or knowledge domains, quality “was not born” in the academia, but at first mainly derived from real-world applications, either in specific projects, companies, or other organizations. It was thus mostly from an hands-on experience that later on common grounds and conceptual developments of quality took place, namely those led by

P. Sampaio (✉)
University of Minho, Braga, Portugal
e-mail: paulosampaio@dps.uminho.pt

P. Saraiva
University of Coimbra, Coimbra, Portugal
e-mail: pas@eq.uc.pt

the so-called “quality gurus,” including namely Walter Shewhart, Edwards Deming, Joseph Juran, Kaoru Ishikawa, Philip Crosby, and Armand Feigenbaum, among others. These gurus, in different stages of quality development, contributed strongly to the birth and development of a body of knowledge representing quality in the twentieth century. Although one must not forget that quality is at least as old, in practice, as humankind, as portrayed in the wonderful book edited by Juran (1995). It has thus been the case that only later on, building from experience through mostly an inductive learning process, quality became to be addressed and adopted by universities around the world, where it has become a matter scientifically studied and improved. However, given this unusual roots, being born from the field to academia, even today it is still underestimated as a discipline standing by itself, demanding for its own teaching and research avenues namely at higher education institutions or in the way it is (or not) handled by the usual research financing agencies across the world.

Quality Geography and Scope

From a geographical point of view, the conceptual evolution of quality and its tools in the twentieth century was mostly driven by the USA and Japan, where concepts such as Total Quality Management, Six Sigma or Models of Excellence have emerged. Mostly since the 1980s, Europe has also played a significant role, although mainly focused around ISO standards implementation, as opposed to a more tools and pragmatically oriented approach followed by the USA and Japan. At the same time, quality has enlarged its scope of possible applications, and rather than being limited to industrial companies, has found usage in all kinds of organizations, including services, public administration, people, products, processes, or even territories.

But the world has been changing quite dramatically and quickly, both from a conceptual and geographical point of view, and also in the quality field. This change is here to stay and about to become even more demanding, taking place at rates that even the most prophetic futurists could not have imagined a century or two ago (Sanders 2008). Thus, quality becomes more critical than ever to address such challenges, and should assume a critical role as a strategic driving force for building success in the world of this century. It represents one of the few possible ways available to drive sustainable competitiveness and well-being in different regions and countries in such a global world, based upon the economic and social sustainable development paradigm (Saraiva 2008). A new and better world where things have also changed in the quality field from a geographical point of view, as can be illustrated by realizing namely that China is here to stay as the country with the largest number of ISO 9001 certified organizations, a significant number of researchers and research activities in the field, as well as one of the most ambitious national agendas for quality promotion in the coming decades, assumed by its central government, under a quality development plan for 2011–2020 aimed at having the country achieve a quality reputation leading position in the world before 2030.

However, as quality becomes increasingly global, and asking for increasingly larger international consensus regarding its development, one must also make sure that such an approach does not lead to inertia, lack of ambition, or speed in adopting needed progress and adapting to changing environments.

Quality in Depth

At the same time, and quite sadly, for some companies and people quality has been looked at as being just a “program,” “slogan,” or “fashion,” to which less attention is being paid given the financial crisis lived by many countries since 2008 or its replacement by other “management fashions,” such as innovation, also often seen from a quite shallow perspective. The worldwide evolution of ISO 9001 certified organizations corresponds partially to entities that do so only to seek registration as such and thus obtain a certificate, rather than a set of true organizational improvements derived from quality management implementation. When such standards are not properly understood and adopted, they may even lead to misunderstandings on what quality is all about, as pointed out, among others, by Juran, and it is quite important to notice that quality represents much more than any family of standards is able to cover.

For others, the process and systems based approach has been an awakening and organizations have started to realize that they can have a quality management system that could produce effective measurable competitive advantages (Childs 1997 cited in Shepherd 1998), something that is not really new for the quality field, if one remembers the early works of Feigenbaum, Juran, or Deming, where process and systems based thinking stand as a key pillar of quality management and quality engineering.

Quality Integration and Culture

As is also stated by Conti et al. (2003), quality needs to be seen as an integrated system, through which the best of all available approaches are merged into a single management system that engages the entire organization, rather than being seen as a single function or isolated department, separated apart from the overall organization mission and strategy. An entirely related operating philosophy and organizational culture should be developed by the management team as the core dimension of its way of working. Service quality will be a growing dimension, as the world becomes more and more technologically capable and customers can directly reach out to all competitors in a particular market, as shared economy phenomena become more and more common (e.g., Uber or Airbnb). Each customer therefore needs to be understood and treated as an individual with unique needs that must be identified,

properly addressed, and then reviewed to assure that he is always experiencing the level of service that he demands, or even more than that, by delighting him/her with some of the so-called (under the Kano analysis terminology) attractive product or service features.

In order for quality to be assumed through all the levels of any given organization or territory, it must be assimilated into the entire business or community system (or, even better, ecosystem) and, especially, by the entities top management, their management styles and practices, whereas continuous learning and improvement (both from an incremental and a disruptive point of view) must be increasingly valued by organizations and societies of the twenty-first century.

Quality Leaders

Based upon the work developed by Shepherd, back in 1998, we can also derive that quality managers of the twenty-first century should lead their organizations by using quality concepts to drive improvements and competitive advantages, going well beyond product compliance or meeting specifications. Their role should thus comprise the following inspiring goals (Shepherd 1998):

- Convert organizational improvement into levers to gain market share and volume by becoming a partnered supplier.
- Focus on improvements in the supply chain to address all areas of opportunity for improvement in time, cost and innovation.
- Seek to replace existing measurement systems with ones that truly address what is or should be managed.
- Participate in the concepts of organizational quality, including areas such as environmental management, social responsibility and the organization's role in its community and in the world.

In the past and still today, many organizations manage quality with a technical and/or procedural emphasis, including periodic upward reporting to senior management. However, we need the future to rely mostly in entities that keep maintaining these technical, operational, and procedural useful practices, but that are also able to see and realize that quality is also a fundamental strategy for achieving and maintaining competitiveness at the product, process, people, and organizational and/or societal levels.

Quality Value

We must realize and take into due account that buying patterns integrate increasingly quality with value. They thus demand that we approach quality as a fundamental discipline, measured by total value perception of the product or service as

seen from the customer perspective, which, however, takes also into consideration the end result coming from the overall organization, including delivery and maintenance networks that provide and support products or services (Feigenbaum and Feigenbaum 2004).

Additionally, companies that want to compete successfully must align their quality strategies with successful twenty-first century operations, by making a basic transformation of their management orientation and quality systems. Furthermore, companies committed to quality can no longer focus their quality programs primarily on the reduction of defects, but they must build their quality programs throughout the customer value chain, by integrating and connecting all key quality work processes. The same principles apply when we deal with future needs for addressing quality in the public sector, or as applied to societies seen at the local, regional, national, or even international levels.

Quality Anticipation and Improvement

It is thus not enough any longer for companies to understand what customers want. They must also try to anticipate what customers are likely to want in the future. Today it is also no longer enough to have a good product or service, because this is a mandatory requirement for remaining in the marketplace. However, many corporate leaders are not familiar or experienced with appropriate quality metrics and strategies (e.g., quality function deployment), neither do they realize or fully appreciate the benefits derived from systematically achieving and maintaining defect-free products and services or company improvements, on the one hand, but going beyond those levels of quality, on the other hand (this philosophy is well portrayed by the well-known example of a Japanese company that found it strange to receive an order asking for less than let's say 3 % of defects, and since it was already working under a defect-free environment coupled with a beyond-specifications quality view, supplied each 100 pieces together with a separate box, containing three non-complying units, manufactured on purpose for a customer still in the age of Acceptable Quality Levels for lot acceptance).

Quality Professionals

Even while the fundamentals and foundations of quality remain the same, environment, organizational culture, and tools which needs to be implemented have significantly changed when we look ahead and for quality as it needs to be foreseen in this century. Additional challenges facing the quality professional derive from

this evolution of quality, as well as from the impact of the four following primary trends that affect our worldwide economy (Gutner and Adams 2009):

- Globalization.
- Customer sophistication.
- Talent management and leadership issues.
- Environmental concerns and social responsibility.

Therefore, according to Gutner and Adams (2009), the skills needed to address and adapt to such trends affecting economies and societies, as well as show to companies' top management how quality tools can be used to address their own concerns and challenges, will determine how well quality leaders and professionals will be able to continue to make themselves relevant into the future, as well as the types of professional opportunities available, number of jobs in the field, and, last but not least, their corresponding wages.

Not only must the profession itself adapt, but quality professionals must also change and become increasingly strategic thinkers, skilled in new competencies, critical to address modern challenges. As we have stated elsewhere (Saraiva 2001), in the future good quality professionals should be able, in particular, to the following:

- Combine easily and efficiently both quality management principles together with sound quality engineering tools.
- Understand, at a multiscale and multilevel scope, how quality can be addressed at the product, process, systems, organization, or societal levels and move easily between different scales or scopes of quality application.
- Build adequate bridges between quality and other related fields, without leaving to others, eventually less well prepared, what should be their role in terms, for instance, of data analysis (and big data problems), innovation, or process management, product development, just to name a few.

Quality Feigenbaum Trends

In a book devoted to the future of quality, as seen from former winners of the Feigenbaum Medal, we pay tribute to him and what he represented to the quality field, but very deeply into our own quality souls, as editors from a small country (Portugal) that have been privileged to be recognized with this very prestigious award at a young age of our professional development and always inspired by him in promoting and building quality for the world.

It is thus inspiring, refreshing, and worthwhile going back to the legacy of Armand Feigenbaum, a clear visionary over the future of quality, who shared some key thoughts in his talk during the 52nd Annual Quality Congress, while presenting

his “Six fundamental vital signs of quality development” (Harrington 1999) as follows:

- Remarkable human behavioral change in the way of thinking about how they can improve the quality of the way they work at their jobs and they buy the products they use.
- Quality has become one of the most important management ideas.
- The new disciplines of quality cost economics.
- Quality has become an international business language.
- Widespread managerial recognition of the absolute and universal necessity for fact-based decision-making.
- Measurement of the business results of quality in serious and systematic terms.

Quality Trends

According to Watkins (2006), to be effective under the new contexts, quality management systems must evolve into key components of overall business management systems. As such, one must address and incorporate the whole organization and its management system focus on the use of knowledge to understand and deal with its ever-increasing dynamic complexity.

The role of quality as a function and profession therefore needs to evolve in both scope and orientation. Its scope needs to include the application of continual improvement systems, tools, and disciplines across the entire organization. Central to this goal are the practices involved in knowledge acquisition, management, and expansion (Watkins 2006).

By its own hand, the American Society for Quality (ASQ) has identified, back in 2009, the following four priority areas of focus for the future of quality and organizational excellence (ASQ 2009), which are still valid today:

- Emphasize strategic relevance and contribution to long-term sustainability.
- Connect with innovation.
- Increase public awareness and brand value.
- Use information technology and the movement toward engagement technology and tools.

Additionally, the following three alternative propositions were also identified:

- Quality and performance excellence are dead and passé.
- Quality and performance excellence are alive and well.
- Quality and performance excellence are neither dead nor alive.

The three scenarios underline that there are considerable risks associated with the future of quality, but also possibilities for building its bright evolution. The first scenario corresponds to a particularly tool-centric view of quality, using old tools to address new challenges, and thus not keeping pace with world changes, and in

addition with quality and performance excellence principles not being a part of everyday education, because quality management is not taught as pervasively as other management sciences. Concerning the second scenario, it corresponds to an evolution where quality and organizational excellence are strategically relevant and leading to organizations' long-term success and sustainability, and therefore they build an atmosphere of exploration and adoption of innovative models, so that rather than dealing with quality strictly under mechanistic terms they transfer and share information, knowledge, and experience. Under the third scenario, quality and performance excellence suffer from an image problem, surviving but not being recognized a critical strategic choice for the world well-being, or as important as other related fields, eventually more in fashion, such as innovation, creativity, or entrepreneurship.

We all, as members of the quality community, need to find out and do what needs to be done in order for the second scenario to become the real one across the world, since we have, as individuals, organizations, and societies, a lot to gain if this is indeed the scenario that prevails.

Quality Driven by Communities

Another issue that needs to be overcome, regarding the branding, meaning, and image of quality in the twenty-first century has to do with the ways that will be followed in times where, as ASQ has stated, its "age of the gurus" may have ended with the passing way of the twentieth-century quality leaders, that we all miss, and in the context of this book obviously with a very special tribute to the contributions of Armand Feigenbaum.

We need to overcome this proud sense of orphanage, but realize that the best way of acknowledging all the legacy from these heroes, and certainly they would like quality to move ahead, corresponds to actively renewing it as a field, but now within the context where an age of collective wisdom may have arrived, as is the case with most of the domains of knowledge. There is potential for breeding, recognizing, and promoting the creation of never-ending new generations of quality professionals that keep emerging and contributing with new principles, concepts, approaches, and tools, while recognizing and accepting that quality in the future is unlikely to be any longer "guru driven," but rather become very much "community driven."

And look into this evolution as being a very positive one, and the best recognition one might have for the levels of maturity is that quality has achieved status as a discipline. Such a recognition for young promising individuals, under 35 years of age worldwide, corresponds to the main goal that the Feigenbaum Medal tries to achieve, and motivated us to put together this book, as a collective effort that combines contributions received from such individuals on how they look into the future of quality, from a broad range of insights, perspectives, and experiences.

One can see that such fresh views, coming from a sample out of a total of 15 Feigenbaum Medalists so far, come from people with a variety of backgrounds and geographical origins, related of course with the USA, but also Canada, Portugal, India, and Netherlands.

Quality Technology, Projects, and Costs

Technology and technology-driven innovation, competitiveness, and entrepreneurship are also playing an increasing role in modern societies and organizations, which will in the future evolve over time strongly stimulated by the catalyst of technological change, which makes possible for them to choose new directions, address new realities and business goals.

Thus, the main challenge for quality professionals of the future in this regard will be to become knowledgeable of critical technology developments and make good use of them, thus acting as change managers, as a key component of their duties. As quality becomes also more expressed as a management concept, it will become also imperative for quality professionals to learn and embrace this knowledge (Conti et al. 2003) and the relationships between quality, quality costs, and bottom-line results.

Apparently there seem to be two future promising areas for the development of quality professionals, comprising on the one hand the technologically oriented approach, with more emphasis on statistical thinking, quality engineering and good use of new technologies, and, on the other hand, the project management approach, aimed at building organizational change within the scope of its changing business processes and environments, in a culture that becomes more project oriented than department oriented.

Regarding new technology-based developments, we need to come up with a more ambitious agenda, since in the quality field there seems to be up-to-date only room and collective capability to come up with a new disruptive contribution in every decade or so, rather than every year or so. Then, more incremental “kaizen” inspired refinements take place, but should not replace the birth of new generation of concepts and solutions, which we should strongly promote, namely through much larger and wider mechanisms to support R&D projects in the quality field, supported by companies, higher education institutions, and public agencies.

Additionally, non-quality related technology developments should be surveyed, explored, and made good use of by the communities of quality professionals, rather than leaving such opportunities strictly for other professionals, less well prepared for doing so (e.g., innovation, big data, or new product development are frequently addressed by people and teams that do not include quality experts), thus wasting all the potential, implementation, and added value that quality would otherwise bring to projects in these areas.

In particular, and more from a technology user perspective, the advances made in information and communication technologies have made possible for easy

exchanges and collaborations among quality professionals of different backgrounds and geographies. As was once properly stated, in this sense one can say that as we use more and more e-quality, more and more equality is achieved. New results, trends, access to information, and knowledge are now available, at the same time and under mostly equal conditions, to all interested quality professionals, who may also participate in international collaborations and share their results on a common worldwide basis.

Quality Measurements

As an additional remark, in thinking about the future of quality, one should never forget what was once stated by Lord Kelvin: “if you can not measure it, you can not improve it.” Therefore, quality development must take place at the same time that we make good use of proper metrics, instrumentation, and measurements, including those related with new scopes of application (e.g., nanotechnology, big data, genomics), but not only dealing with measurements of physical realities, but also taking into consideration that today we have available a good set of tools under what we have called the “perceptions metrology,” in a sense that we know how to measure accurately with well-defined levels of uncertainty people’s opinions and feelings, as developments in sensorial panels, customer or employee satisfaction characterizations have shown in the past years (Saraiva and Reis 2009).

Quality Projects

An interesting project, being developed mostly with International Academy for Quality members and conveying an European strong contribution, concerns the definition, testing, and implementation of a single integrated conceptual model for defining and conducting improvement projects (Andersen et al. 2015). We believe that within the context of the concerns and challenges that lie ahead of us, in terms of quality development and its future, this initiative can be quite emblematic (though only time will show if its real impact corresponds to such expectations), given that it simultaneously:

- Moves from the guru-based paradigm to the international community driven paradigm, through a shared scientific contribution that is resulting in a single, universal, and consensual model for structured improvement, aimed at guiding organizations and their teams in proper identification and implementation of improvement projects, built not from scratch but from a detailed comparative analysis and benchmarking supported on previous relevant quality approaches, then refined by a team of quality professionals.

- Derives mostly from European contributions and views, as opposed to major conceptual developments of quality in the twentieth century, that were mostly created with origins either in the USA or Japan, thus showing that the future of quality is likely to be connected with a much wider variety of geographical locations and origins, whereas particularly in Europe we hope that organizations such as EOQ, EFQM, and ENBIS are expected to play an important role.
- Shows the relevance of defining and adopting well-structured and systemic approaches for building quality on a project by project basis, keeping the circles of quality development moving fast, strongly and in a determined way into the future.

Quality ASQ Trends

In order to define the future of quality, one must not forget some of the efforts led by ASQ in this regard across the years. In particular, its research project “The Global State of Quality Research” (2013) highlights that the best quality management organizational structures are the ones that include quality management principles and practices leading to a maximization of organizational results.

Explanatory key factors and trends that have been found and established are as follows: (1) There are significant differences in the use and application of quality management and practices across organizations, depending on their sector of activity. (2) There is a general idea pointing out that larger organizations tend to use more mature quality practices, and although this idea is appropriate for various practices, in general the size of the organization is less important than its activity sector concerning the application of mature quality practices. (3) There is no relevant indication that the use of quality principles and practices differs substantially according to regions or different countries, since some variations do exist, but normally they are related to organization activity and size, or other unidentified factors, more than having to do with its geographical location, thus confirming that quality has become indeed global and universal in the ways it is being defined, built, and implemented.

Quality Management

Quality management has been defined as a “philosophy or an approach to management” made up of a “set of mutually reinforcing principles, each of which is supported by a set of practices and techniques” (Dean and Bowen 1994). Today, quality management is a well-accepted organizational goal in many entities, with proven results. Quality management has thus been considered an important strategic

management tool over the past decades, involving the application of principles and practices of quality at all levels of the organization (Talib et al. 2011).

As time goes by, and we move into the future, quality management must be focused and considered a broader set of issues, ranging from sourcing activities all the way to final product delivery and after-sales service, but not forgetting social responsibility, expectations, and needs from a variety of relevant stakeholders. Furthermore, quality management is characterized by the constant search for continuous improvement, in order to achieve excellence and to attain efficiency, sustainability, and competitiveness (Oakland 1993; Terziovski 2006). Under the quality management concept, companies can improve their organizational performance and business, customer and employees' satisfaction, relationships with suppliers and positive attitudes, by improving organizational quality culture (Talib et al. 2011; Reed et al. 2000). The study conducted by Sousa and Voss (2002), commenting on the validity of quality management, concludes that, "quality management, as espoused by its founders, can be reliably distinguished from other strategies for organizational improvement and there is substantial agreement in the literature as to which practices fall under the quality management umbrella."

Based on some of our previous research (Barros et al. 2014), we were able to identify an exhaustive list of quality principles and practices that are currently used by quality-driven companies worldwide and can be summarized as follows:

Quality Principles

- Leadership.
- Customer focus.
- Employee involvement and commitment, including top management.
- Human resources management.
- Strategic planning management.
- Process management.
- Supply chain management.
- Continuous improvement and innovation.

Quality Practices

- Quality tools.
- Quality standards.
- Business and operational excellence models.

Culture of Quality

However, the successful use of such quality management principles and practices is significantly influenced by the culture of quality that must exist in the organization. It is thus not good enough for an organization to have the best technology or adopt the best available management practices, but it needs furthermore to be engaged and truly committed to a quality culture.

The success of quality programs and initiatives therefore depends mostly on the existence of a culture of quality. Many organizations assume quality slogans but true effectiveness requires an accompanying commitment to various cultural elements such as leadership, a compelling vision, companywide shared values, pervasive behaviors, complementary performance metrics, incentives, and goals. It is only when an organization exhibits these and related components that it can be said to exhibit a true culture of quality (ASQ 2014). There are a lot of organizations worldwide using tools and methodologies of quality without being engaged with a true culture of quality. That is often the case of companies that implemented ISO 9000 standards just because someone above them in the supply chain demanded for it. Those companies are using the quality tools because someone told them they have to. They thus did put some procedures into practice and then, once a year, have compliance audits. But since there is no real sustained commitment to quality, and there is no culture of quality, they do not attain anything close to the full value associated with standards, when they are properly used.

Elements such as vision, values, and leadership help establish and guide such a culture of quality, which can also be applied in our individual lives or at the level of communities, regions, or nations. But there is yet another critical component of a quality-focused culture—the commitment with customers (ASQ 2014). Such a commitment to customers must lie at the heart of any quality program. But this in turn outlines a fundamental ongoing challenge for any organization that is continually and accurately discerning true customer needs. To do the right things, companies need to closely understand their customers.

Quality Bottom-Line Results

World-class companies are investing more heavily than others in both overall and technology-specific quality investments. However, quality people speak a different language from the C-suite. Quality professionals usually speak in technical terms about processes and defects and the CEO (and other senior executives) speak in financial and profitability terms. What needs to happen is that we need to translate defects and process improvements into dollars and euros, and then, when this happens, the C-suite will be more open to the pursuit of quality, and quality costs have been and are likely to become even more so in the future a sound bridge for joining both of these semantic worlds.

Quality of Management

The overall state of an organizational culture may be intangible. But the value of taking steps to shift the company or institution towards a more quality-driven culture can be substantial. Organizations should therefore incorporate the lessons outlined above to accelerate growth, performance, and results (ASQ 2014).

Therefore, in the future one must be fully aware that quality management is going to become more also connected with a management of quality, and within such a paradigm quality represents simultaneously a pragmatic view but also what we have called before as being also in some regard the “Management Poetry.”

Quality ASQ Future Studies

As stated before, when one wants to talk about the future of quality, several studies led by ASQ must be taken into account. On a regular basis, ASQ publishes its Future Studies, with the aim of defining a set of recommendations, evolution perspectives, and directions concerning the future of quality and its implications. According to Watson (2009), the aim of the ASQ Future Studies is to study the future in order to make better decisions about how to prepare it.

The last published study (ASQ 2015) highlights a set of recommendations for the future, based on different perspectives—Leadership, Aerospace and Defense, Manufacturing, Cities, Healthcare, Education, among others. Bill Troy, ASQ CEO, in his “Introduction” section points out that quality will play an integral role in all of the areas and furthermore identifies the following common ideas among the different contributions to the study:

- We need to knock down silos of information in order to get the right information to the right places.
- We need to think differently about things that we assume we already know quite well.
- The implications of limited connectivity will change how we think and how we do almost everything.

Quality Importance

Why is quality an important issue in the present and will become even more important in the future? There are a lot of different reasons that could be mentioned in this regard. However, in our opinion, the following issues are particularly relevant in the twenty-first century:

- Customers are becoming more demanding and better informed than ever before.
- Our life increasingly depends on the proper functioning of quality products and services.
- The world is global and will remain this way.

To cope with such an environment and world, one needs to make proper use of quality principles, methodologies, and tools, at the same time that new concepts are developed and quality R&D projects are nurtured; also sharing the same underlying pillars of the quality discipline, which are as valid today as they were in the beginning of the last century. However, we need also to reinvent approaches, update definitions, and adapt them to the current world, and mainly to the world and organizations of the future.

Quality Performance

Snee and Hoerl (2015) identified the following five specific advances that are needed in order for companies to improve their performance in the future:

- Holistic improvement approaches.
- Identify and solve mission-critical problems.
- Use big data to generate new knowledge.
- Human variation.
- Use innovation to create new jobs.

Quality Scope

Quality should be, in the future, no longer only focused on organizations, but rather cross all the frontiers of the organization supply chain, and addressed also at the societal levels.

Quality management and supply chain management are management philosophies that play an important role in strengthening organizational competitiveness (Talib et al. 2010). The integration of these two concepts is one of the most important organizational paradigms for the twenty-first century organizations—supply chain quality management “is the formal coordination and integration of business processes involving all partners organizations in the supply channel to measure, analyze and continually improve products, services and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace” (Robinson and Malhotra 2005).

Supply chain management assumes a methodical and integrative methodology to manage all the operations and relationships between all the stakeholders of the supply chain. From the perspective of quality management, supply chain management should be recognized as providing quality products and services across

every organization in the supply chain, to address client's expectations. The synergies of quality management and supply chain management can promote the integration of the approaches which will promote a set of significant organizational benefits (Fernandes et al. 2014).

Thus, over the years, the quality concept is becoming increasingly globalized and holistic, and therefore implying more complex challenges for organizations. Rather than just formal issues, the future of quality should mainly be based on specific actions that must be implemented in the organizations—"Quality in Movement" (Saraiva et al. 2010). The future of quality mostly depends on the implementation of quality in the organizations, supported by a true culture of quality. To do so, some critical success factors should be considered (Saraiva 2000; Saraiva et al. 2010), mainly the following:

- Everybody's involvement and commitment, not only in the organization but also through the value chain.
- Credibility of the quality concept.
- The quality concept should be fully assimilated by all.
- Organizations should be truly committed to quality.
- A strong leadership and top managers' role are of crucial importance.
- Credibility of quality training.
- Promote research on quality.
- Relationships between innovation and quality explored.

Regarding in more detail connections and bridges that can be established and explored between quality and innovation (Saraiva and Orey 1999), this particular interface has a lot to gain if we, as quality professionals, take advantage of how quality can drive innovation and innovation can drive quality efforts, something that has been so far clearly underestimated and not fully understood.

Quality at the Country Level

As a pioneering effort in drawing the future of quality for our own country (Portugal), we have conducted a project sponsored by APQ (Portuguese Association for Quality), with both qualitative and quantitative components, and wrote a book about it (Saraiva et al. 2010). Under the Structural Equation Modeling paradigm, we did come up with statistical results that identify the key driving forces for the future development of quality in the nation (Fig. 1), where we can mention in particular the following results (on a 1: lowest performance to 10: highest performance scale of measurement, and positive impact coefficients ranging from 0 to 1):

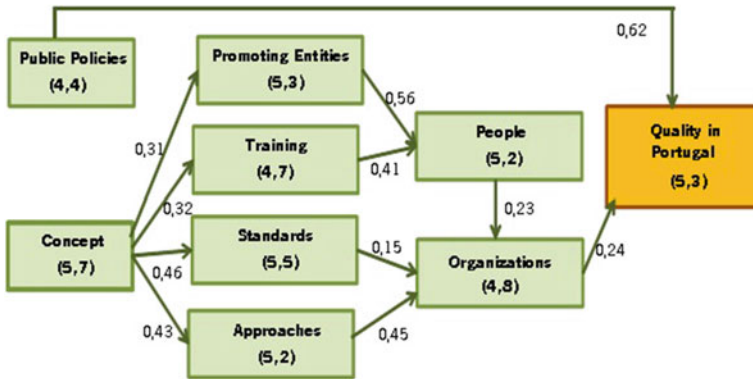


Fig. 1 Structural equation model for the future of quality in Portugal (Saraiva et al. 2010)

- Public policies play a key role and have a direct impact over the global level of quality achieved in Portugal.
- The real approaches adopted and the way tools are used end up being more important than the exact frameworks adopted for quality implementation.
- A proper understanding of quality concepts should drive all quality efforts.
- People training and involvement are critical in order to achieve organizational quality improvements.
- Around 20 practical recommendations for action, based upon such results, were identified as being essential to reinforce national quality levels in the future.

Quality Worldwide

Moving now from national to international perspectives, it is our opinion that a “Worldwide Agenda for Quality” is needed, joining together the most important institutions in the area working together to reach common goals and share best practices. Some attempts have been made in the past under this spirit, but without the deserved successful results. However, we are still having time to do it and to build a smiling future for quality through international joint efforts, rather than having separate and somewhat redundant efforts going on (e.g., do we really need similar but different models of excellence applied in different parts of the world, rather than having just a single unified framework, as is the case with ISO standards?).

Quality Mindset

Using the words of Cecilia Kimberlin 2015, ASQ Chair, in the twenty-first century quality must be an organizational mindset. Quality of the twenty-first century must be imbedded and fully integrated in the organizational and societal cultures, where leaders assume a fundamental role and embrace quality as an enabler for success (ASQ 2015). Quality should be continuously understood, assimilated, and implemented, both in public and private organizations. However, each one of us is responsible to push and pull quality forward, doing always well, better, and differently (Saraiva et al. 2010).

Quality Conclusions and Commandments

There will only be a future of quality. We hope it will be a positive and fruitful one, but all of us must work for that to be the case and become a reality, namely by combining two areas that are not so easily brought together (Quality Engineering and Quality Management) but are essential for building such a bright future.

Let's take advantage of a remarkable past and build a better world with quality for the benefits of present and new generations, with quality professionals playing a key role and being recognized as critical change agents, taking into account, as final summary thoughts, that is, as stated above, the following 25 commandments (by alphabetical order) should inspire us in this forthcoming journey guiding and determining quality's future:

1. Quality development and its contributions to the world require its education and training to become universal and applied to people of all ages and backgrounds.
2. Quality developments need to be built from internationally reached consensus, but be also ambitious and fast enough to cope with changes in the world.
3. Quality for value, with new quality costs and other related approaches, should be a priority and facilitate dialogue with senior executives.
4. Quality has a lot to gain by adopting a multiscale and holistic view, ranging from the product nanoscale to societal challenges defined at world level.
5. Quality in the future should be able to come up with customized problem definitions and tailor-made solutions.
6. Quality is and will be global regarding solutions, concepts, best practices, tools, information, learning, and knowledge sharing.
7. Quality management and quality engineering must intertwist each other and the integration of both of these legs will make it walk into the future.
8. Quality may have a decisive and bright future ahead, to be achieved through hard work and not taking its success for granted.
9. Quality mindset should move from a specification-oriented framework into a continuous improvement mode, including innovative steps aimed at delighting people.

10. Quality must be able to anticipate what is going to happen with customers, stakeholders, and societies as a whole, and contribute to those changes.
11. Quality must explore technological developments as they raise new opportunities, as well as help in making the field more efficient and useful.
12. Quality must not only be kept being built from experience to academia, but also in the reverse direction, from academia to the fields of practice.
13. Quality must move from a “departmental perspective” into integrated, systemic, and well-structured views and also be “project driven”.
14. Quality needs to become, be seen, and recognized as a fully matured field of knowledge.
15. Quality needs to nurture and come up with better and more frequent quantum leap moves and be able to come up often with disruptive evolutions.
16. Quality needs to reinforce its interfaces with other related fields, namely innovation, product development, statistics and big data, social responsibility, and creativity.
17. Quality R&D must be reinforced, namely through projects in this field, accepted as such, just like other scientific areas.
18. Quality should aim not just at satisfying but rather at delighting different sets of stakeholders, namely by anticipating how to go well beyond existing expectations.
19. Quality should be able to measure well, what really needs to be measured in order to improve and drive changes, including good perceptions oriented “metrology” applications.
20. Quality should be addressed, defined, and implemented at different levels, including products, processes, systems, people, organizations, services, supply chains, and societies
21. Quality will lead more and more towards real equality as more and more e-Quality facilitates access to information and knowledge share.
22. Quality will move from being “guru driven” into being “community driven,” namely regarding its development, concepts and tools validations.
23. Quality will relate strongly with organizational culture and societal views of the field and its contributions to the success of regions and countries.
24. Quality’s future is also a matter of public policy choices, branding, training, population, society awareness, and knowledge.
25. Quality’s future needs to get away from slogans or shallow approaches and be consolidated around deep knowledge, foundations, culture, and developments.

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Author Biographies



Author's Short Bio and Perspectives

Name: Paulo Alexandre da Costa Araújo Sampaio

Date of Birth: July 9, 1978.

Residence: Braga–Portugal.

Education: Industrial Engineering Degree (2002, University of Minho, Portugal); PhD in Systems and Production Engineering (2008, University of Minho, Portugal).

Current Job: Assistant Professor of Quality Engineering and Management, University of Minho.

Previous Jobs: (2002–2004) Project Manager, Portuguese Association of Certification; (2004–2008) PhD Student (with a full scholarship from the Portuguese Foundation for Science and Technology).

Introduction to Quality: In the third year of my Industrial Engineering Program, in the Quality Management course, by

Prof. Tavares de Oliveira. In that moment I decided that quality would be my professional field.

Favorite Definition of Quality: Give the customers what they want!

Major Contributions to the Field: When I am working with my students and my researchers with the aim to develop and promote quality as a science and as a strategic area for the organizations.

One Word Defining the Future of Quality: Challenging

One Trend Defining the Future of Quality: Global

Impact of Feigenbaum Medal: It was the most important moment of my professional life. It was the recognition of my work by the most important global institution on quality—the American Society for Quality, and of my role as a Quality Professional. Being recognized gave me more will and inspiration to grow and to learn as a Quality Professional. Personally, it was also a very important moment with a lot of meaning—Pedro Saraiva, my *Sensei*, is the first Feigenbaum Medalist.

Favorite Book on Quality: This one! (I wrote this before check Barbara Santiano bio!)

Three Publications:

“Quality and the ISO 9000 Standards: myths, true and consequences”, Verlag Dashöfer, Lisbon, 237 pp., 2011.

“ISO 9001 Certification Research: Questions, Answers and Approaches”, International Journal of Quality and Reliability Management, Vol. 26, No. 1, pp. 38–58, 2009.

“The path to excellence of the Portuguese organizations recognized by the EFQM Model”, Total Quality Management and Business Excellence, Vol. 25, No. 5, pp. 427–438, 2014.

Plans for the Future: Being better than today.

Quality Quote: “A better world with Quality!” (International Conference on Quality Engineering and Management quote, which I founded).



Author's Short Bio and Perspectives

Name: Pedro Manuel Tavares Lopes de Andrade Saraiva

Date of Birth: October 27th of 1964

Residence: Coimbra, Portugal

Education: Chemical Engineering Degree (University of Coimbra, Portugal)

PhD in Chemical Engineering (MIT, USA)

Current Job: Full Professor (University of Coimbra, Portugal)
Member of Portuguese National Parliament elected by the district of Coimbra

Previous Jobs: Vice-Rector of the University of Coimbra in charge namely of Quality, Innovation, and Entrepreneurship
President of the Development Agency for the Central Region of Portugal

Consultant of the Portuguese President for Higher Education

Founder of several organizations and quality consultant

Introduction to Quality: When I was born, although not realizing the name of it

Favorite Definition of Quality: Doing well and better what really needs to be done

Major Contributions to the Field: Teaching, research, consulting, listening, and writing about quality and contributing at different levels to its promotion and application in different contexts including less usual ones

One Word Defining the Future of Quality: Uncertainty

One Trend Defining the Future of Quality: Evolution

Impact of Feigenbaum Medal: I still remember quite well when Subir Chowdhury told me the good news, as one of my happiest life moments of truth. This helped a lot in establishing international contacts and meeting a number of brilliant people, namely later on as member of the ASQ Feigenbaum Medal committee. But also the opportunity to meet in person and talk with Armand Feigenbaum. My dedication to the quality field, after having been the very first recipient of the award has been always quite strong but was since then inspired and reinforced by this fact that I always keep in mind. Receiving this recognition as a citizen of Portugal has also shown to me that e-quality leads to more equality in the field, since you can have now access to the quality world and contribute to it regardless of geography or the size of your country.

Favorite Book on Quality: Juran's last edited book "A History of Managing for Quality: the evolution, trends, and future directions of managing for quality"

Three Publications: Entrepreneurship: from concept to application, idea to business and technology to value, book published in Portuguese by Coimbra University Press, Third Edition (2015)
Chemical Product Design and Engineering, chapter of the Kirk-Othmer Encyclopedia of Chemical Technology, 6th Edition, published by John Wiley & Sons (2015)

The future of quality in Portugal book published in Portuguese by the Portuguese Association for Quality (2010)

Multivariate and Multiscale Data Analysis, chapter of Statistical Practice in Business and Industry, book published by John Wiley & Sons (2008)

Plans for the Future: One day at a time, with today being better than yesterday but worse than tomorrow

Quality Quote: Just do it!