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Current Societal Challenges to Quality and Quality Management in Higher Education

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The purpose of this white paper is to discuss some of the major challenges that Higher Education is facing across the world, by taking into account the “Current Societal Challenges to Quality and Quality Management in Higher Education”. It is the fifth paper in a series of thoughts collected, organized, and promoted by the Quality in Education Think Tank (QiETT) of the International Academy for Quality (IAQ).

The first paper addressed a broader scope of topics and put into perspective the overall field of “Quality in Education”, which set a common ground for further reflection and guidance of QiETT activities. The forthcoming papers, such as this one, focus around more specific subjects and delve deeper into particular topics based upon the collection of international inputs from quality and education experts.

The five first white papers comprises the following titles:

“Quality in Education: Perspectives from the QiETT of IAQ”

“Large Scale Training of Quality Professionals”

“Inclusive Quality of Education”

“Continuing Education in Quality Improvement for Healthcare Professionals and its effects on organizational improvement”

“Current Societal Challenges to Quality and Quality Management in Higher Education”

1. Introduction

The purpose of this white paper to deal with the current situation of quality in Higher Education (HE) and HE institutions, provide a theoretical foundation for quality management in HE and HE institutions, its professional consideration and practical approaches for the institution-wide quality management that are faced with a variety of strong and current societal challenges.

Our focus of analysis here will correspond to universities seen as a comprehensive institution with a broad area of activities including teaching, researching, R&D, and societal contributing, although some of the present thoughts can also be useful for teaching-oriented HE institutions, colleges, or polytechnic institutes.

Especially, the challenges of the modern societies will be considered here, in particular, those related to the so-called “the 4th industrial revolution” and also incorporated social revolution that include the smart society development, and with significant impacts over what one expects from universities and what quality and quality management do mean under such renewed contexts. Professional quality activities are new in HE institutions in these circumstances, but also new in general means of quality management.

Quality and quality management have often been seen in a quite fragmented way when they are applied to HE, and thus not leading to satisfactory solutions for many HE institutions. Quality in HE should be implemented in a professional way and aligned with the general development of the quality discipline and major trends in society and its various organizations. Universities should be *primus inter pares*, although until now very little of the current professional quality-related practices have been invented or developed in universities. There are no restrictions to using well-known quality methodologies in universities, as has been demonstrated by many universities that have been doing so under appropriate settings.

In this white paper, we also justify why and show how universally standardized quality concepts can also be used for quality in the HE and that this may also be quite useful. Furthermore, we will present a solution for implementing university quality management, which is a comprehensive and systemic approach, and takes into account the structure of a complex university organization, and also allows the application of professional quality concepts, principles, and methods. However, new emerging forms of operation and their quality needs should be also considered.

This white paper is mainly based on several articles and thoughts from Juhani Anttila (Finland) (Anttila and Jussila, 2018b), Maria João Rosa and Pedro Saraiva (Portugal) (Saraiva and Rosa, 2017), complemented by comments and references of the IAQ QiETT members Bo Bergman (Sweden), John Dew (USA) and David Hutchins (UK).

2. Universities for the Development of the Quality of Society

Universities are key actors in society, and higher education (HE) has been seen as playing a key role in the development of societies in general, that has also been the reason for them to have been created for the first time, many centuries ago. Universities and HE institutions can be considered as synonyms under the context of this paper, although some countries have a dual system, comprising colleges or polytechnic institutions as well as universities, which form the academic community, to which our thoughts can be also applied to a large extent. Top

business schools also play an important role in many universities and benefit from the contents of this white paper.

Often, universities have had a major impact on major societal changes and transformation. This has already been the case since the very beginnings of HE institutions, as early as in the 6th century, at the time mostly driven by religious entities. Later on, HE institutions were created and promoted by public authorities of the states, regional and local administrations, for the very same reason: only with good HE institutions would it be possible to overcome some of the essential challenges of communities and societies. As long ago as in the Middle Ages, the HE institutions gained much autonomy.

The importance of high quality of the HE is emphasized and justified (EURASHE, 2015) as a prerequisite for the universities' successful contributions to the development of society. Many different academic university rankings are directed to emphasize academic achievements, but they do not fully follow the traditional recognized quality concepts or principles. However, many quality-related elements are inherently present in the recognized universities, without naming them so, namely because many universities are not so much familiar with present-day professional quality concept and practices, or they may even have a somewhat old-fashioned quality understanding. Quality management in HE has also sometimes been misunderstood as being elusive, and often quality management is seen as not being easily applicable in the HE environments. Because quality can also be a relative concept (ISO, 2015), all organizations, including HE institutions, will always have a certain degree of quality. Hence, one might say that 'Maybe I do not know how to define quality or quality management in HE, but I sure know when I see it happening in front of my eyes'. However, this kind of thinking cannot be advisable or justified with regards to quality in organizations that strive for working to achieve high quality in a professional way. The general professional perception is that high quality cannot arise by chance, but in organizations it needs a broad and clear uniform understanding of quality and, consequently, coherent measures.

A challenge to the universities is that they consciously should be aligned with general professional quality development or even be pioneers in it. Universities are intertwined with all the functions of society. Hence, the universities have much to learn, research, and develop with regards to professional quality practices. Particularly this should happen in collaboration with the other organizations, which they also are serving in the society. Additionally, an important issue is that HE institutions operate in competitive environments. All societal actors should strive for their own success and the common target of the quality of society. The quality of society is based on the quality of the organizations in the society, including the HE institutions, and the results from their achievements and collaborative learning. Hence, the quality of society evolves by diffusing. One always needs to keep in mind that only with HE of high quality is it possible to build the human capital needed to address different kinds of societal challenges, including the creation of well-informed leaders. HE institutions also compete with each other on quality.

From the HE quality point of view, an essential issue is related to what the university's position and relationships are in the society (the university's external context), and how the university internally operates and contributes to the development of the society (the university's internal context) (Ibid.).

Universities are essentially urban institutions. Almost one thousand ranked universities exist in different cities all over the world (Times Higher Education, 2017). The bigger cities typically

have several or even many different universities. Modern universities were born and developed from the year 859 onwards (Arbaoui, 2012) in cities. In turn, they have influenced the development of the cities and whole societies.

Universities also play a significant role in supporting regional social cohesion, economic growth, and future competitiveness (EURASHE, 2015). As a significant example, the Humboldt University in Berlin (Germany) provided the model of the University of Civilization, based upon the idea that science provides the basis for civilization ('Bildung durch Wissenschaft') (Hautamäki, 2016). This means that the University's societal responsibility arises when its research and teaching address challenges of the society, which have an important impact on people's lives and well-being, and whose solution requires interdisciplinary and broad interaction with the various interested parties or stakeholders (e.g. in Astana, Kazakhstan, the University of Civilization especially aims at promoting the inter-ethnic harmony) (ArchiPanic, 2017).

Significant and rapid changes are taking place today in societies. Technological and social revolutions are combined with many other megatrends underway in society and affect universities and place requirements on them (Ossiannilsson, 2019). The development of smart societies/cities is a particular challenge for universities. "Smart City" does not yet correspond to a very clear concept (Mohanty et al., 2016; ISO/IEC JTC 1, 2015), and it has no consistent definition among practitioners and academia. A proposed definition (Ibid.) is that *smart city is a term denoting the effective integration of physical, digital, and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens*. Hence, the smart city also is a manifestation of the fourth industrial revolution (Schwab, 2016) and the so-called "industry 4.0" (European Parliament, 2016), which are currently the subject of discussions in the international fora.

Particular challenges of the universities are those dealing with the various elements of the smart cities, including smart citizen, smart governance, smart education, smart security, smart healthcare, smart building, smart infrastructure, smart transportation, smart mobility, smart energy, and smart technology (Frost & Sullivan, 2013). Digitalization, together with information and communication technology (ICT), are the main enablers to transform traditional cities into smart cities. The related emerging ICT technology trends include namely the following: 5G networks, Cloud Computing, Internet of Things (IoT), Industrial Internet of Things, Big Data, Quantum computing, Biohacking, Artificial Intelligence (AI), Machine Learning, Intellectual Robotics, 3D Printing, Additive Manufacturing, Augmented Reality, and Blockchain, among others. They provide many unlimited opportunities but also very new and wide-ranging problems in the development of smart cities and societies, with strong implications or impacts also for HE and HEI. In addition, these are involved and often interconnected with other emergent technologies, such as nanotechnology, biotechnology, optical technology or energy technology, among others.

Universities are particularly suited to handle these trends and challenges, namely as they can adopt a multidisciplinary approach to handle these whole new entities and contexts. Given the desire of societies to become increasingly knowledge-based, as is the situation with regards to the smart society development, HE becomes now even much more essential to the socio-economic and cultural development. Indeed, many university units or their researchers have been involved and collaborated with other organizations in smart city development projects, which have been carried out in various countries since 2011, and that will happen intensively

in the future. There is a need for a multidisciplinary approach, with particular regard to SSH (Socio-economic Sciences and Humanities) (European Commission, 2017) perspectives.

Smart cities aim at innovatively fulfilling the operating and living needs and expectations of people and organizations with the smart urban infrastructure and services. Smart cities are intentionally greener, safer, faster, and friendlier than traditional ones. For this reason, smart urban development projects are ultimately also aimed at sustainable development (United Nations, General Assembly, 2015) and societal quality improvement as a whole in the broad sense.

Involvement in smart city development is an important education and research challenge to universities and HE. This requires the key skills needed for the digital economy in universities and within the other actors of the society, that includes (Lee, 2016):

- Innovative and adaptive thinking
- Virtual collaboration and social intelligence
- Ability to work across disciplines
- Literacy in different types of media
- Computational thinking and analytics

Because smart cities are much based on information, information security is also a core topic in the context of smart city development. This includes the knowledge area of privacy management (a human focus), information security management (an organizational focus) and cybersecurity management (a society focus) (Anttila and Jussila, 2017a), which are competencies required by all partners involved in the development and operation of smart cities. This also presents a serious challenge to HE. Needs for theoretical expertise and practical know-how in these areas are essentially important in many different organizations, including SMEs and startups, involved with smart society projects. Threads of the digital economy that should be taken into account relate namely to:

- Human behavior and mind development
- Privacy and information security
- Information overload, disinformation, fake news or alternative facts

Traditionally, universities have three merged missions: (a) the highest level of education, (b) academic research and dissemination of the research results, and (c) partnership and collaboration with the surrounding society, including education, training, research, and development projects with public and private organizations. Societal collaboration has also been characterized by the Triple or even Quadruple Helix models (Etzkowitz and Leydesdorff, 2000) of collaboration among government, university, and industry players, which can cover teaching, manufacturing, governmental, health care, or any other kind of services.

Companies and quality institutions have encouraged HEI to embrace quality principles because of the positive impact that they have had on their own performance, and sometimes cooperation with companies also means meeting certain quality management requirements. Naturally, many universities have also taken different quality measures on their own (Dew and Nearing, 2008), either covering the whole institution or specific operational units. Quite often quality management is carried out in a rather fragmented way, based upon different frameworks and

agencies that work pretty much by themselves (e.g. accreditation agencies cover teaching quality but research funding agencies are in charge of assessing research quality).

Innovations play a significant role in university activities (KPMG, 2017). Innovations for smart society development presents serious challenges to universities, and in this context, all the activity dimensions of the university should be considered together because they all are organically involved in smart city development. Fundamentally, universities are intelligent, as strong and intensive cognitive thinking centers. The intelligent lifestyle stands for making research-based decisions in order to improve society in general and the well-being of its citizens (Land, 2016). This is also a unique strength of the universities in contributing to the development of smart cities (Deakin and Al Waer, 2011). Quality and innovation are separate disciplines but very closely related (Anttila and Jussila, 2016).

Urban societies are 'scale-free networks' (Barabási, 2003), and hence smart city development is a diffusion process from the activities and achievements of many different independent, but interacting private companies, public service organizations, institutions, and influential individuals. Universities are among those actors. Smart city development is seen as a big financial effort. The estimated smart city market was estimated to be worth a cumulative \$1.5 trillion by 2020 (Frost & Sullivan, 2013).

A lot of smart city researches have already been done, and the related reports are available. Standardization activities are going on, hundreds of practical implementations are in progress all over the world, smart city conferences and Expos have taken place, and even globally smart city award competitions have been arranged annually. Right now, the global smart city development is still in its beginning, and cities have started their projects within restricted parts of the cities or with some particular smart objects and targets. In many projects, these cities have mutual cooperation and collaboration with local and foreign universities. Hundreds of universities all over the world have reported their involvements and contributions in different ways to various smart city projects. Furthermore, some universities have implemented smart campuses within themselves (The University of Glasgow, 2017).

HE institutions have shown extraordinary characteristics of continuity and resilience compared with the other organizations of society. As pointed out by Kerr (Saraiva and Rosa, 2017), out of about eighty-five institutions in the western world that were already established by 1520 and still exist in recognizable forms, with similar functions and unbroken histories, seventy are universities. Hence, universities have demonstrated capabilities to use approaches that enable them to survive and adapt to a changing world across centuries. An interesting question one may raise is what may be the root cause of this longevity and why this may have happened. When looking at universities from a quality point of view, however, the university's persistence in societal changes is not often sufficient for high quality to be achieved, but how the university fulfills the needs and expectations of its stakeholders and hence positively influences the development of society's quality is important.

The general HE evolution shows that HE is no longer a small elite-driven reality. It is indeed quite the opposite, in some sense a 'commodity' and thus a widely influential factor in society. As the World Bank statistics illustrate (Figure 1) (Ibid.), we moved from a reduced number of a little more than 30 million students concentrated in a relatively small number of countries and HE institutions, back in 1970, to around 20 thousand HE institutions dispersed across 200 countries, with a total of almost 200 million students in 2012, and this represents 6 times the size of HE found in 1970.

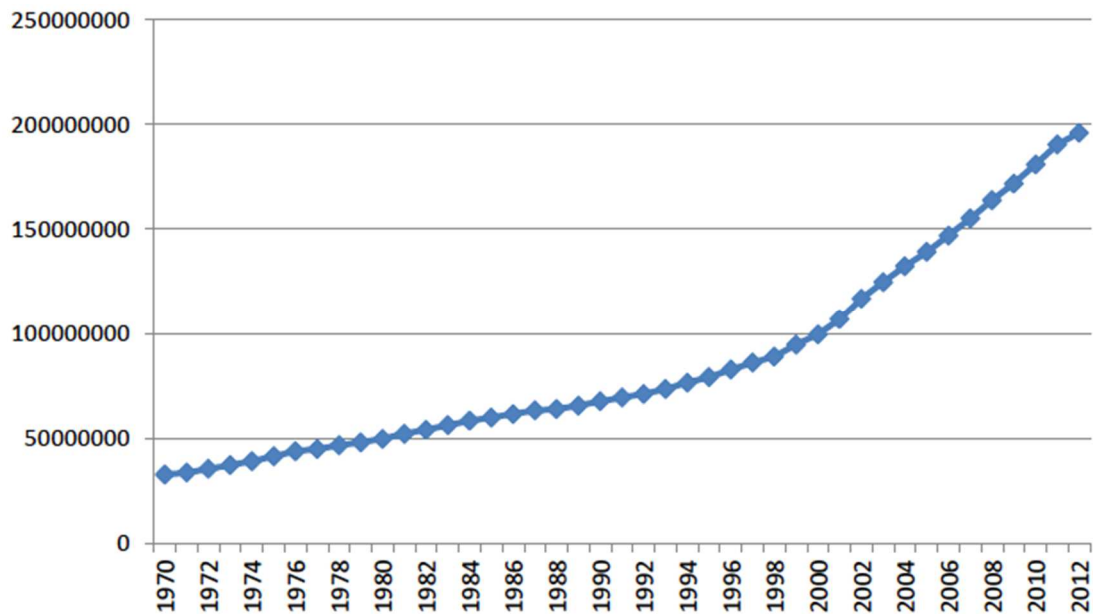


Figure 1. Evolution of the number of HE students in the world from 1970 to 2012 (World Bank Data) (Saraiva and Rosa, 2017).

The massive growth of higher education, by now with at least 6 countries having more than 5 million students (Figure 2), also means that strong competition among HE institutions has emerged. Students and their families try to make well-informed choices regarding which HE institution to attend, and increasing national and international flows of students and faculty have become quite common. Quality is HE institutions' competitive factor.

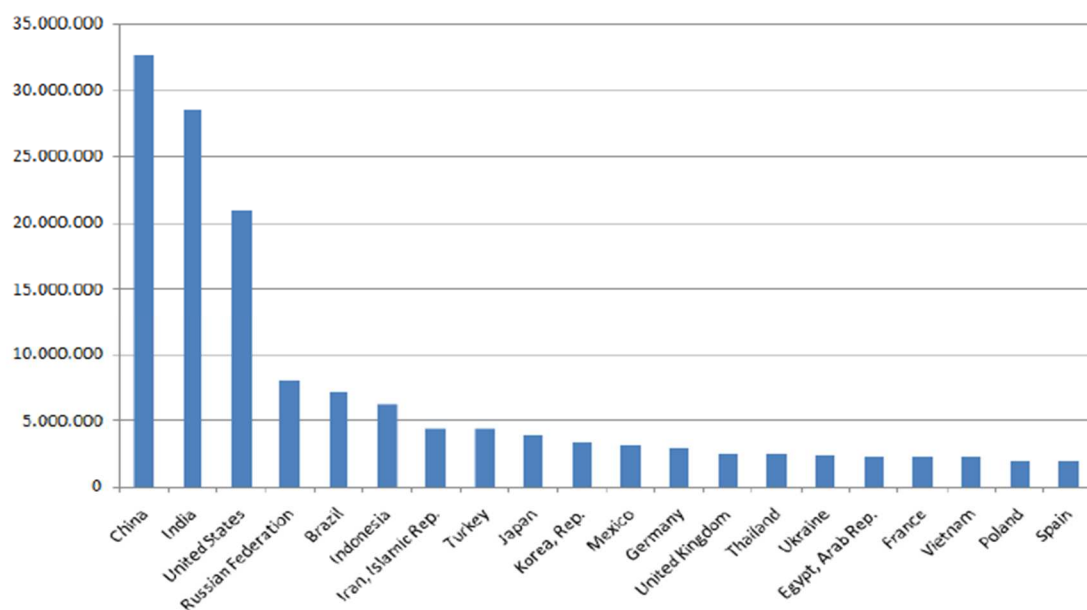


Figure 2. Top 20 countries with the largest number of HE students in 2012 (World Bank Data) (Saraiva and Rosa, 2017).

In summary, universities have both a duty and a wide range of opportunities to influence the positive development of society's quality, also in the context of new technological and societal challenges. However, this can only be successfully achieved by professional and constantly evolving quality activities within the HE.

3. Conceptual challenges for the quality in the HE institutions

The educational sector is in a paradoxical situation with regard to quality. The absolute importance of quality is highlighted in the speeches and writings, but its professional conceptualization and implementation remain largely indeterminate or ambiguous. For instance, according to UNESCO (UNESCO, 2005), quality is imperative in all educational institutions, and Quality Education is one of the 17 Goals of the 2030 United Nations Sustainable Development Agenda. However, notwithstanding the growing consensus about the need for 'good quality', there is much less agreement about what the term actually means in practice, and they refer to quite an old text of Adams (Adams, 1993) who identifies about fifty different definitions of the term. As a result, quality can mean virtually any good thing, and hence, for the necessary assessments and measures, the whole concept becomes obscured. One reason for the conceptual fragmentation of the quality issues in the field of education is the general conceptual ambiguity present in professional quality approaches.

In the sector of education, the prevailing quality practices are fragmented and inconsistent. Even top universities do not necessarily have the explicit professional understanding or implementation of quality, or they may follow somewhat obsolete approaches. Difficulties of the universities' quality management arise from many different reasons, including the following (Anttila and Jussila, 2018b; Saraiva and Rosa, 2017; Bergman, 1995):

- Basic professional concepts of quality, quality management, quality improvement, and quality assurance (ISO, 2015a) are not well-known, although they are widely used in other business sectors globally and even are internationally standardized and widely used in other areas of society.
- Quality approaches in the universities – for instance, according to the Bologna process (EURASHE, 2015) – are mainly based on old-fashioned formal quality assurance systems and external control for conformity, which easily causes confusion and leads to stagnation. Then quality is perceived to be no more than a sophisticated form of inspection and hence largely ignored. The need for methodological improvement has been recognized, but the consequential development has not yielded well-established results (PHEExcel Consortium, 2014).
- The universities' quality considerations normally focus only on education and do not cover the areas of research and social collaboration. However, all these three areas are very closely related to each other and they should be considered as a whole.
- Many universities have no specific quality-related research activity or education programs, not even to cover the fundamentals and the traditional quality principles and practices.
- Many universities do not have well-established general managerial practices and cultures that support the effective integration of quality into the management processes. HEI consist of fragmented and loosely coupled organizational units, which are motivated by the existence of dispersed stimuli or incompatible expectations.

- It is unusual for HE products to be designed using quality-centered means such as conjoint analysis, QFD, or Design Thinking (Gustafsson et al., 1999).
- The goals and purposes for business and quality are not necessarily defined clearly, unambiguously or with enough consensus. Academic staff tends to quite often define their own mission, as opposed to promoting alignment with an institutional mission, shared by all and working for the accomplishment of the HE institution's overall goals.
- Self-sufficiency is a typical feature of universities, which is also supported by strong individuality, internal competition, and low incentives to teamwork around the achievement of broader common and clearly assumed organizational goals.
- Conservatism and inertia do exist, most probably due to the fact that the HE institutions are a collection of individuals as opposed to an organization where individuals strongly share the same explicit goals.
- Leadership is difficult to assume in HE institutions, where decision-making power is most of the time dispersed across different collegial bodies, and this ends up limiting change and the adoption of new approaches. Much of the operational power belongs to the professors who, however, relax with this power and do not show organizational leadership but focus on their field of specialization, in which they are talented and recognized.
- HE institutions are in difficulty in clearly identifying the relevant interested parties and their needs and expectations, and balancing them in order to define measures that lead to their satisfaction.
- How to behave in competitive situations is not familiar to HE institutions.
- HE institutions are societal institutions, and their operation and development depend on the decisions of those in power in the society. Often public funds are not aligned with quality and excellence goals.
- Ontological and epistemological bases of teaching/learning/collaborating and quality are not linked with the quality realization and evaluation.
- Prevailing academic evaluation culture of student and university scoring and qualifications are not aligned with the quality-related evaluations.
- HE institutions compare their activities mainly with organizations in the same sector. More could be learned through benchmarking with organizations in quite other fields.
- Innovations have an important role in universities but they are not addressed consistently within the scope of HE quality management (Anttila and Jussila, 2016; Anttila and Jussila, 2019b).

It is obvious that quality professionalism and professions, in general, have not been able to fulfill their promises in the field of HE, and this seems to be a consequence of the crisis of the quality profession itself. The quality professionals are fragmented in this respect and cannot sing from a common hymn sheet. Hence it is unlikely for them to be able to encourage others to do better.

It is also generally believed that persistent high quality cannot be achieved by itself or by chance, but requires coherent measures, and a professional approach. Also, quality evaluation is not unambiguously possible without a clear conceptual basis. For example, Juran (Juran, 1988) suggested that quality management and financial management are analogous functions. If different interested parties have different basic concepts, co-operation cannot be effectively achieved. The persons and organizations receiving the service do not necessarily need quality conceptualization because they know the needs and perceive experiences of quality comprehensively and subjectively. However, professional service providers need to design and

implement the service consistently and in detail. The strong universities can and may also deliberately strive to stand out from the others through their unique resources and solutions. For instance, Harvard, MIT, Cambridge, and Oxford are generally considered as strong and top-level universities. They are able to cross brilliant students with bright faculty members, under a common organizational environment where creativity and academic freedom are strongly stimulated, and it is apparently pretty much as simple as that for leading quality in HE. Academic freedom includes the fact that there may be very different views on doctrines, teaching and research within the university.

The basic concepts of *quality*, *quality management*, *quality improvement*, and *quality assurance* (ISO, 2015a) are essential prerequisites for professionally realizing, implementing, or evaluating quality practices in all organizations, including the HE institutions. They are also needed if the parties are operating with each other, and high quality is appreciated. Hence, these internationally standardized and defined concepts are suitable and beneficial also in HE, but they should be understood properly in their context. With these general concepts and definitions, HE institutions can be aligned with the other society members, with which they also collaborate. Benchmarking with organizations outside the educational sector requires a mutually understandable and rewarding dialogue in order to provide new ideas for the development of universities, but this potential has not been sufficiently exploited.

According to its general definition (Ibid.), the essence of the concept of *quality* refers to the perception of the fulfillment of the needs and expectations and satisfaction of all interested parties (stakeholders) of the HE institutions. Especially both teachers and students should perceive the educational processes and their results as valuable. Hence the key challenge for quality in the HE institutions is to recognize the relevant interested parties involved with the HE services, and their needs and expectations. The needs and expectations of the interested parties cannot be standardized, nor even easily identified, and the degree of their fulfillment always is a subjective and relative matter. Hence, the general quality definition is valid also for the HE environments, but the challenge is to understand and describe its meaning in the composite situation of education, research, and societal collaboration.

It is very important that there is a clear understanding of what is the object of quality consideration. There is no quality without an object, nor any object without quality. In the HE context, the object may be a university as a whole, one of its particular units, a certain HE service, a faculty member, a teacher, a student, teaching, researching, or collaborating process, an educational program, a course, a teaching environment or equipment, and so on.

Quality management implies coordinated activities to direct and control the HE institutions and their processes with regard to quality (Ibid.). Hence realization of quality originates in the institution's management processes. There are plenty of approaches and practices to realize quality management in practice. Some references still use total quality management (TQM) in the context of universities (Bergman, 1995). However, the overall interest of organizations in the TQM concept has diminished (Dahlgaard-Park, 2011), and in fact, the quality management principles (QM) covered by the ISO 9000 standards nowadays fully reflect the concept of TQM as it was once understood. The most natural approach to quality management is quality integration within the normal HE managing and operational processes (Anttila and Jussila, 2013).

Quality improvement is to increase the ability to fulfill the needs and expectations of the stakeholders (ISO, 2015a), and hence it is a key element of professional quality management. Also, quality improvement should be based on scientific foundations (Bergman et al., 2015).

There are many well-established approaches to quality improvement, namely by using continual small step improvements or big breakthroughs (Juran, 1964; Dew and Nearing, 2008). Actually, improvement means individual and organizational learning and innovation for performance improvement. Hence, it is natural to consider the HE institutions as learning organizations (Anttila and Jussila, 2018a).

The purpose of *quality assurance* is to provide the interested parties with factual information when the HE institution needs to demonstrate its ability to provide outputs that fulfill the needs and expectations and aims at enhancing the satisfaction of the interested parties. Quality assurance is a part of quality management (ISO, 2015a), but the concept of a quality assurance system, that is often used in the context of higher education, is at least confusing since many times it also corresponds to what is indeed quality management and improvement.

Especially universities' collaboration with and services to the companies and other organizations of the society set severe quality requirements. In fact, universities should be pioneers or at least 'primus inter pares' in their quality approach. Universities should not be isolated institutions. It is not enough that they follow the quality references of the education sector, but they also should rather take into account the best general professional business references applied in other organizations of the society. Quality is a global issue and it applies to all business sectors. Harmonized quality concepts, principles, and practices are foundations of professionalism and support collaboration. Special challenges arise for the challenges of the 4th industrial revolution and the incorporated social revolution (Ossiannilsson, 2019), because universities are multi-faculty entities, and the quality of the university results from multidisciplinary factors.

The importance of quality in universities is emphasized in the composite activities of education, research, and societal collaboration. The university should strive for excellent performance (NIST, 2015b) in a creative way for sustained success by using the general professional quality management approaches, including recognized quality management principles and practices (ISO, 2018b), which are intended for all kinds of organizations of the society.

The overall performance of the HE institutions is connected to a broad concept, including four main categories of performance (NIST, 2014):

- Stakeholder-focused performance: Institution's performance seen by its interested parties (ISO, 2015a).
- Operational performance: Institution's internal performance including hard process performance (for example cost efficiency, throughput, or lead time) and soft performance (for instance workforce skills).
- Product performance: Characteristics of the products including goods and services (Ibid.), and the products of HE institutions are mainly services.
- Financial and market performance: Operational costs, productivity, competitiveness, and market position and share, among others, not forgetting that HE institutions these days compete with each other globally.

Only performance excellence can ensure sustained success. The term *performance excellence* in the context of HE institution refers to the integrated quality approach within the management and operations of the institution and its units, which results in: (a) the delivery of ever-improving value to the interested parties and contributing to organizational sustainability; (b) the improvement of overall organizational effectiveness and capabilities; and (c) the

organizational and personal learning (NIST, 2015b). Competitive advantages of the HE institutions can be very versatile. HE institutions are competing at least for good students, good teachers, funding, research projects, and top researchers. Successful excellent operation requires surpassing challenging references and continual organizational learning. This includes:

- Exceeding the institution's own performance goals and targets.
- Succeeding in organizational performance within its own academic branch on average and being among the best reference HE institutions.
- Evidencing world-class performance, including benchmarks and best practices among other organizations of the society outside the HE sector.

When dealing with quality management in the universities, one should consider both the university (the university corporation) as a whole and all its different operational units. Faculties, institutes, or other specialized units of the universities may be very different, and they also may be at different development stages. Hence, those units also should have different quality management approaches.

Startups (Anttila and Jussila, 2019a) may also be important for the success of the universities in particular for the development of the 4th industrial revolution. And some of the traditional quality management models do not work so well in startups. Quality management of the startups could therefore also be an acute education and research topic in universities. The main challenge here is to get the university interested in the methods of professional quality and implement them in their novel organizational solutions, as well as experience and recognize them as being useful.

In addition to the basic concepts and definitions, professional quality management is based on coherent quality management principles, which are generally and widely recognized and used everywhere in the world. However, it is very typical that education-people are not familiar with these aspects. The quality management principles consist of fundamental beliefs, norms, rules, and values that are accepted as true and form a sound basis for professional quality management. The seven general quality management principles of the ISO 9000 standards (ISO, 2015a) are valid and relevant in the HE but very challenging, too:

1. Customer focus: The primary focus of quality management is to meet the needs and expectations of the interested parties. The most important interested party may be called a customer. It is very often the case in HE that students are customers of education. However, they also may be understood as co-workers, because their contribution is very essential for successful learning.
2. Leadership: Business-focused leadership is a big challenge in HE institutions.
3. Engagement of people: Competent, engaged, and collaborating people are essential to enhance the universities' capability to create and deliver value.
4. Process approach: HE institutions are very strongly process-oriented, although the professional process management practices (Anttila and Jussila, 2013) are not widely applied.
5. Improvement: Quality improvement is the most important activity of quality management, and it is based on individual and organizational learning.
6. Evidence-based decision making: Empirical evaluation is a key issue in quality management.

7. Relationship management: For achieving success, universities should manage well their relationships with relevant interested parties.

These principles set foundations for the professional way, in which quality management can be realized for HE institutions. ISO 9000 quality management principles are also aligned with the core concepts and principles of the American, European, Iberoamerican, Asian, or Middle East performance excellence models.

The new future concepts of the ISO 9000 standardization (ISO, 2021), which are being prepared, should also be taken up as a challenge in HE institutions.

Because of the many ambiguities, doubts, and contradictions in the quality questions in HE, and because universities are challenging operational environments, a sound theoretical and scientific basis for the subject is needed to improve the current situation, which on the other hand seems to be quite natural in the HE environment.

4. Ontological foundation for HE quality

In order to ensure the effective applicability of quality in the present complex world and in particular with regards to HE quality implementations, taking into account the current smart societal contexts, it is necessary to be aware of the theoretical foundations of quality thinking and practice. This means that an ontological approach, which examines the nature of the quality phenomena in terms of existence and realization in the HE reality, the involved elements, and their relations, can be quite useful. In the educational context, quality is related to the teaching and learning processes, and how the professional quality concepts are linked with these phenomena. The scientific basis for this approach demands us to ensure that appropriate semantic relationship between thinking, language, and reality are used (Anttila and Jussila, 2017b; Niiniluoto, 1999; Chomsky, 2016; Tarski, 1944; Popper, 1978). Also in this context, the historical evolution of the definition of the quality concept should be well understood, because it has an influence on the quality conception and application also in the field of education.

Quality is an ancient and at the same time a very casual and philosophical topic. Both researchers and ordinary people have considered quality-related questions for a long time. The concept of quality dates as far back as Aristotle (Aristotle, 350 BC). Quality was seamlessly merged with work skills and results at the times of handicraft manufacturing. This also looks like a similar situation in the academic world and more generally in the entire education sector. The roots of the modern quality profession date back to the time of the beginning of the industrial revolution, around 1750. Quality implied the production of products according to requirements and specifications, with process improvement, environments of living and working, and patents becoming also part of it (Juran, 1995). Due to the professionalization in the early decades of the 1900s, quality experts started to draw up formal definitions of the concept of quality (Dahlgaard and Dahlgaard-Park, 2015). This led to many different views and fragmentation, which was enhanced by the richness and variety of the word quality in everyday language. Over time, the definition of quality - unfortunately - was conceptually differentiated in the industrial and service sectors. The most obvious reason for that to happen was the absence of a general theoretical conceptual basis.

In general everyday language (Oxford Dictionaries, 2015) the meaning of quality is well aligned with Aristotle's explanation and depicts what the characteristics of an object are, or

how the object is perceived in relation to other things (Anttila and Jussila, 2017b). Following Garvin's (Garvin, 1988) ideas, the various meanings of the concept of quality, which have been developed in the course of time, can be categorized according to the following five groups of definitions (Anttila and Jussila, 2017b):

- 1) Product-oriented quality definitions
- 2) Production-oriented quality definitions
- 3) Quality definitions based on the monetary value
- 4) Value-based quality definitions of the real economy
- 5) Heuristic and mythical definitions of quality

These viewpoints can be recognized also in the field of education. In addition to the above-mentioned categories of definitions, there is also the international standard definition (ISO, 2015a) of the quality concept that has evolved from 1986 and is particularly aimed at all kinds and all fields of professional purposes, in business, production, servicing and marketing. This definition is also well aligned with the original Aristotle's thinking and the general everyday language (Anttila and Jussila, 2017b).

Quality belongs to the basic concepts used in many contexts for characterizing the performance of human individuals, organizations, and societies. These three intertwined entities are very different in nature, and in modern smart societies, the forms of their interactive relationships are quite complex. The interacting processes of these entities co-create a wide range of effects, tangible and intangible outcomes (products) that are very rich in information content. Especially in all forms of education and learning, this has a very central meaning. A compatible quality approach is needed in all these cases at least for consistent professional purposes. Conflict-free professional quality activities require that the definitions of basic quality concepts become unambiguously expressed. This also is the prerequisite for undisputed quality evaluations. The professional quality language should also correspond to the eclectic character of the concept of quality in everyday language that, however, has a solid historical heritage.

The ontological quality archetype of all quality phenomena comprises the *intentional interactive transaction between two persons with the co-creation and exchange of tangible or intangible entities or things through which these parties perceive mutual value* (Figure 3). This also corresponds very well to the basic teaching-learning situation. The quality archetype presents the most original pattern of which all the quality objects, their relationships, and related concepts and principles are derived, modeled, or emulated, and which explicates all the involved phenomena and events with regards to quality. Hence, the quality archetype also is the basis for defining quality and related concepts including quality management, quality improvement, and quality assurance, and it can also provide a proper framework for considering measurements and evaluations of quality.

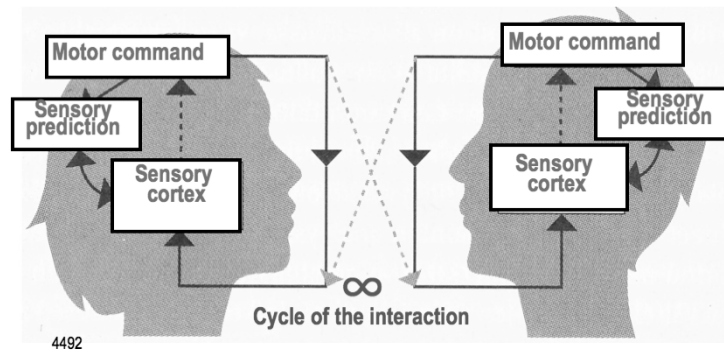


Figure 3. The archetype of the quality phenomena: an intentional interaction of two self-conscious independent persons. A schematic presentation of the action-perception loops of two persons (the cycle of the interaction, the ontological realism), in which both of the loops close via the environment (Hari and Kujala, 2009). In HE, this directly corresponds to the teacher-student situation, and in the universities' research and social missions relationship between the representatives of the university and external parties.

The quality archetype (Figure 3) implies the following essential features that relate to the general understanding of the quality concept according to its everyday and ancient meaning, as well as the standardized definition:

- Interactivity, intentionality, and awareness are intrinsic human properties. Interaction is related to the needs and expectations of the parties.
- The parties have their own purposes for interaction, and they independently affect and respond to each other and co-create tangible or intangible results (the object) and outcomes of the interaction to both parties. In business terms, the object is called a product, which can however mainly consist of services.
- The interacting parties perceive the features of the object and realize the degree of satisfaction with regard to their own particular needs and expectations. The purpose of the interaction becomes full reality when its results satisfy both parties.
- The parties or the expert observers can characterize the perception object by means of the traditional quality expressions and linguistic descriptions. According to Chomsky (Chomsky, 2016), each human language is essentially an internal and individual intentional instrument of thought and biological property of humans.
- The interaction can take place through technology as extensions of the body and senses (McLuhan, 1964).
- The person-to-person archetype can be extended to the interactions of organizations as manageable systems and processes and societal networks of many independent actors.

This archetypical model leads us to understand that the ISO 9000 standard definition of quality is suitable and useful also for being considered by quality professionally in the HE and HE institutions. The ISO 9000 family of standards is the leading international set of standards for quality management, including also the basic concepts, terms, and definitions of this field. These standards are the most important and most widely spread references for professional quality activities and currently are being used in over one million of different organizations around the world. The basic definitions of the ISO 9000 standard have been developed for more than three decades through the collaborative work of international quality experts coming from different fields of industry. At present, this defines quality as being the '*degree to which a set of inherent characteristics of an object fulfills requirements*' (ISO, 2015a). This definition emphasizes the relative nature of quality ('degree'), but also highlights the subjective perception of quality. The object of quality is here defined more generally than for the goods or service products only, and hence it also covers the three mission areas of universities. The

object has its inherent characteristics that consist of all features or attributes. 'Requirement' means needs and expectations, which may be related to all interested parties (Ibid.) of the object and the interaction. In fact, this definition of quality is also compatible with Aristotle's original explanations, and with the prevailing understanding in everyday language. The standard concepts, terms, and definitions, including the relationships between the terms, have been created according to the established principles of terminology work (ISO, 2000).

Interaction between the parties (for instance the teacher and the learner) takes place through three channels of the educating process (Figure 4):

- Human interaction (MW)
- Hardware interaction (HW)
- Interactive software (SW)

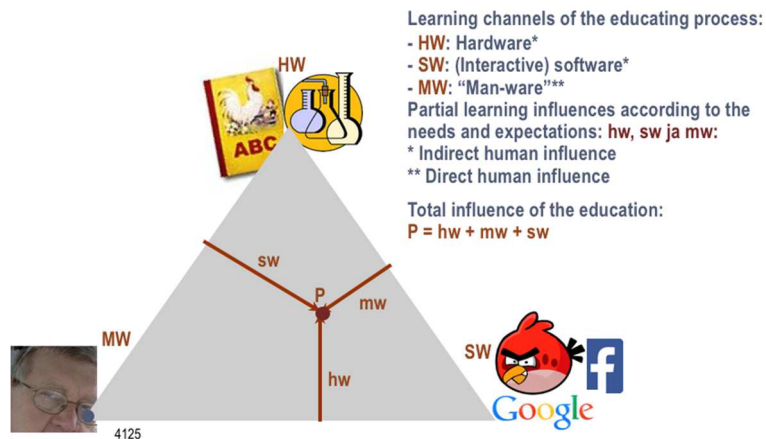


Figure 4. Learning channels of the educating processes: providing learning in the education processes through different learning channels. Symbols of Rovio (Angry Birds), Facebook, and Google are used to characterize the area of the interactive SW.

Quality management, quality assurance, and quality improvement should directly be based on the clear situational understanding of the quality concept and practice about how the HEI and its processes are being managed.

A recent literature review of articles published on quality management in HE (Saraiva and Rosa, 2017) shows that the most significant trend seems to be the development of quality management frameworks and their specific dimensions, either conceptually or based on empirical work. Several authors have been developing models of institutional quality for HE, covering different quality dimensions and encompassing the main processes taking place in these institutions, namely teaching, learning, and research. Furthermore, the authors clearly refer to the need for integration of these models into the strategic plans and overall management of the HE institutions. And also suggest the need of developing a quality culture within each institution, under which the models can be used as a frame of reference for the development of a consistent quality management approach.

Although quality management is conceptually quite clear, its implementations in organizations, including HE institutions, are very fragmented. The vast majority of such implementations are based on the instrumental means suggested by different methodological schools, which is confusing and can also be even detrimental to a unified understanding of the concept by itself. In order to obtain an overall understanding of the positioning of different quality management practices, a paradigm mapping (Figure 5) (Anttila and Jussila, 2017b) may be quite useful, which aims at the scientific characterization of the different approaches. In all the different cases the same formal definitions of quality and quality management do apply.

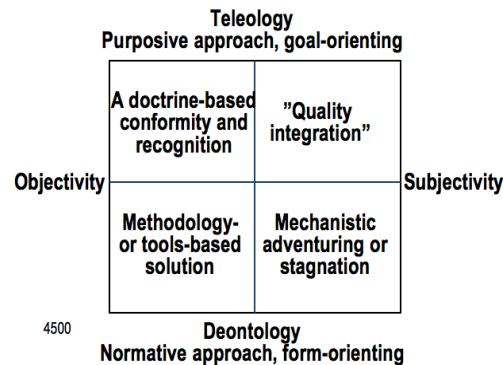


Figure 5. Paradigmatic positioning of the different quality management approaches. The preferred and the most natural practical solutions to realize quality management are the teleological solutions that strive for the organization-specific quality targets, which can be called quality integration.

Objective approaches to quality generally use recognized and well-known models or practices, such as ISO 9000 standards, performance excellence models, maturity models, Six Sigma methodologies, or lean approaches. ‘Deontological’ solutions aim at applying a given method in the right way to achieve conformity, for instance establishing and maintaining a formal quality management system according to the requirements of the ISO 9001 standard or specific requirements for universities. ‘Teleological’ solutions for instance include ISO 9001 certifications or quality award recognitions. Quality integration is the most natural approach also to follow in HE institutions. It means that the implementation of the general and specific quality concepts, principles, and methodologies need to be embedded within the normal management activities of the HE institutions.

Universities’ research and social collaboration are very closely related to the situation of any service organization in the society, and hence, also more traditional and generally well-known quality practices can be applied here. However, these university missions can also be understood as educational activities in a broad sense, which are directed towards the needs of the organizations and the whole society.

Innovation management (ISO, 2019) is an important part of quality management in universities. The European technical specification CEN/TS 16555-1 (CEN, 2013) defines innovation as the ‘implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations’ (Ibid.). A particular challenge to quality

management is that a lot of different parties and collaborations are needed for innovation to happen (Figure 5).

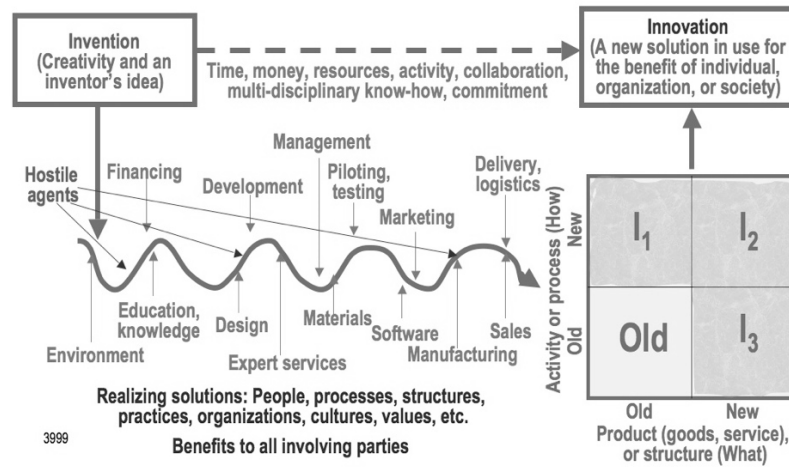


Figure 5. From invention to innovation in practice (Anttila and Jussila, 2016). Quality aspects should be taken into account in all phases. This diagram also allows us to visualize that practically innovation cannot be carried out only by one person, but a great variety of different expertise is needed in the process for realizing the innovation result. Inventors are key persons to initiate the process, but nobody alone can be an ‘innovator’ in practice.

Startups are important innovative activities drivers, and some of them are also commonly related to universities, in particular for smart society development or science-based entrepreneurship nurtured by HE institution spinoffs. Professional quality concepts and general quality management principles are valid and important also for a startup (Anttila and Jussila, 2019a; Cox, 2016). However, the old general management models do not work as well, without proper adaptations, in the startup world (Ries, 2011), and a new kind of management may be needed for this type of new company.

5. HE institutions as manageable systems for quality and excellence

High quality does not take place accidentally but rather needs a professional approach and coherent quality integration within the management and operational processes of the HE institution and its units. A starting point for the systematic quality development is to identify the HE institution and its units as organizational systems and recognize their organizational context, including external and internal issues that are relevant for its purpose and strategic direction and that affect the ability to achieve the intended results of quality (ISO, 2018b).

We will present here a solution for implementing university quality management, based upon a comprehensive and systemic approach, and takes into account the structure of a complex university organization and also allows for the application of professional quality concepts, principles, and methods.

This framework model (Seghezzi, 1993; Rummeler and Brace, 1990), presented in Figure 6, can be useful for characterizing the comprehensive quality management approach in universities, covering all of their organizational functions and units.

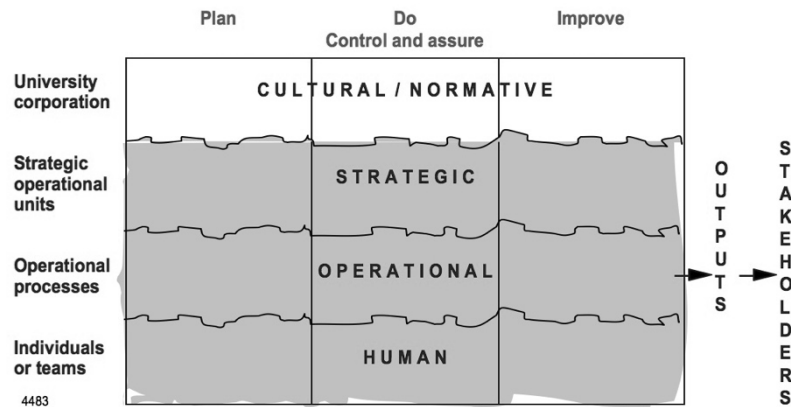


Figure 6. General management framework for the university corporation, ‘universitas’, consisting of different kinds of competence, responsibility, and practices and learning needed at the four organizational levels of the university. Quality-related planning, doing, and improving are needed at all levels.

This model covers the following four organizational levels:

- The normative and cultural level (university corporation), where general principles, university-wide common insights, goals, shared tools, policies, and practices concerning quality are created, including how these are to be applied in practice on the basis of the whole university’s needs. The responsibility belongs to the top management, and it cannot be delegated.
- The strategic level (strategic units of the university), where decisions are made by the management of the unit, and measures undertaken concerning the entire unit’s activities and especially the competitiveness of the unit in the future. The unit’s operational system is composed of interrelated operational processes. Different units may have different needs, but all units operate within one organizational framework of the university.
- The operational level (operational processes), where decisions and measures concerning daily management are made and undertaken, and products (goods and services) are realized taking into account stakeholders’ needs, ‘now and here’. Responsible persons are the process owners.
- The human level (people and teams), where the personal contribution of each member of the organization’s personnel (including managers) is provided in daily working environments. Responsibility relies on the person him/herself.

The main challenge of strategic management is to change the organization and drive its performance towards the HE institution’s vision, and that of the operational management of the business processes is to ensure and assure the fulfillment of the current business requirements (Figure 7).



Figure 7. Emphases of strategic management (Process and structure change: Top→Down) versus operational management (Operational target promise and report: Bottom→Up).

Quality is a specialized competence that should be taken into account at all levels of the university corporation, including normative, strategic, operational, and human viewpoints. Quality management measures at all these levels should be well aligned. Professional and exemplary quality approaches are needed to ensure effective collaboration with other organizations and sustained success of the university in its activities (ISO, 2018b).

Quality management practices and activities do take place at all of these managerial levels of the model. This model can provide the foundation for applying management system standards, for instance, according to the ISO 9000 (quality management), ISO 14000 (Environmental management), ISO 21001 (Education management), and ISO/IEC 27000 (information security management) standards, or performance excellence models.

Process management and improvement can be based on the PDCA (Plan–Do–Check–Act) model, which is also used in many management-related standards. In fact, the PDCA model covers the following three different application areas, which is why we call it the ‘triple PDCA’ model (Anttila and Jussila, 2013):

1. Rational control (operational)
2. Continual rational small step improvement (operational), also known as the ‘Kaizen’ approach
3. Innovative breakthrough changes (strategic)

The management framework and the triple-PDCA approach also drive performance improvement through organizational learning loops. Single-loop learning is about correcting errors without questioning underlying assumptions, and double-loop learning detects errors, questions underlying assumptions behind the actions and behavior, as well as learning from these mistakes. Triple-loop learning is operating at a higher level: it develops the organization’s ability to learn about learning, looking for answers to the question ‘How do we decide what is right?’ (Tosey et al., 2012).

A HE institution is a composite of different strategic units that can be considered as learning organizational systems. Systematic development of quality in those units means organizational learning that leads to quality activities embedded into the units’ managerial and operational

processes (Figure 6). Organizational learning at the HE institutions and collaboration with the other organizations in the society also leads to societal learning, which is essential for the universities' contributions to smart society development.

A comprehensive model (Senge et al., 1995) of organizational learning (Figure 7) can be used for developing organizational quality integration towards excellence of performance. The HE institution's overall existing performance depends on how well the institution's people understand the governing principles (or guiding ideas) relevant to that particular HE institution, what kind of managerial tools and methodologies they have for responding to the needs and expectations of the stakeholders, and what kind of infrastructure they have for getting the whole institution and all of its people to strive for the objectives towards excellence goals.

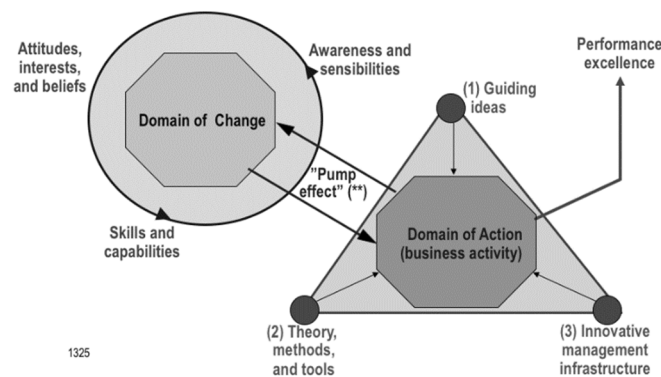


Figure 7. The overall business excellence development model for HE institutions' quality integration. This model follows the approach of organizational learning developed by Senge (Senge et al., 1995; Anttila and Jussila, 2018a).

In order to achieve better performance, the HE institution should establish a process to change and improve the existing guiding ideas, tools and methodologies, and the business management infrastructure. That particularly means finding new awareness, changing attitudes and beliefs, and creating new skills and competencies within the institution.

Awareness, attitudes, skills, and competencies do develop in HE institutions through organizational learning. Incremental learning is related to certain particular skills, representing different disciplines that are needed for improved operations. Radical discontinuous change in the development is a strategic transformation process, and genuine transformation often requires a crisis (Anttila, 2009). In a strategic crisis, there is the need for a large-scale breakthrough change in the organization's structure and processes.

Transformation means a change of form, shape or appearance, and basically, it is a mental conversion (Deming, 1993). Transformations are initiated and managed from the strategic management level of the HE institution. Organizational transformations do not happen spontaneously or at random, but rather by decisive actions and include consistent learning and innovations, too. Diffusion of awareness, knowledge, and skills of specialized disciplines within the institution requires personal mastery, mental models, shared vision, team learning and systems thinking (Ibid.), which are all important in creating new integrations in a given HE institution.

6. Quality assurance rising confidence

Quality assurance means to assure quality, i.e., to create and strengthen confidence among the relevant interested parties of the organization. Quality assurance is in HE overly emphasized at the expense of quality management, although sometimes quality assurance in HE is employed when indeed people are referring to what quality professionals would associate with quality management activities.

In the last decades of the 20th century, HE institutions have faced significant political changes in different aspects of their functioning, including the relationship between state and institutions, institutions' governance and management structures, financing, access, and quality assurance systems. Qualification can be seen as being essentially a quality assurance procedure. Qualification means a pass of an examination or the official completion of a course, especially one conferring status as a recognized practitioner of a profession or activity. HE qualifications are based on a variety of specific requirements, namely those defined by HE accreditation agencies and standards.

Particularly, in terms of quality assurance, changes in Europe have been quite significant since the mid-80s, with different approaches emerging from quality assessment and accreditation of degree programs to the HE institutions' quality evaluation and quality audits of internal quality assurance mechanisms. The emergence of the 'Evaluative State' in the late 1980s, the Bologna Declaration, and the emphasis it gave to the need for developing comparable criteria to assure higher education quality created a number of new challenges as well. The establishment of the European Association for Quality Assurance in Higher Education (ENQA), and the adoption of the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) (EURASHE, 2015) by the European Ministers in charge of higher education and the establishment of the European Quality Assurance Register for Higher Education (EQAR) are all milestones in the development of quality assurance in the European HE (Saraiva and Rosa, 2017). More recently new developments are taking place, such as the U-Map and U-Multirank tools, the risk management approach to quality assessments and evaluations, and the so-called quality enhancement approach, that intends to devolve to institutions the responsibility for their own quality assurance and improvement. Similar developments have also taken place in other regions and globally (Ibid.).

From all of these developments, it is important to highlight the role of the ESG, namely its Part 1, referring to standards and guidelines for internal quality assurance within HE institutions, as well as the role that the quality enhancement approach is having in promoting the design and implementation of internal quality management systems in HE institutions. Both the logic behind the quality enhancement movement and underlining the ESG are based on the idea that it is the institutions' responsibility to set up such systems, based on the models and frameworks they feel more appropriate for assuring and improving their own quality. Therefore, both are not prescriptive and leave significant space for institutions to decide if, for example, it would be a good option to consider if quality management models developed for other organizational contexts can indeed prove to be useful methodologies and tools also in the HE context, or rather to use more specific models and frameworks, created specifically for the quality management of HE institutions.

A comparative analysis (Ibid.) of the ESG Part 1 and two of the most well-known quality management methodologies to measure and guide quality assessment and improvement in organizations (the ISO 9001 standard and the EFQM Performance Excellence model) has

shown that when an institution opts for the implementation of one of the two mentioned quality management frameworks, it is indeed also implementing to some extent the ESG standards. Furthermore, when doing so, HE institutions are also being able to establish interrelationships among standards, allowing them to really take into consideration the need for feedback processes that will lead HE institutions, and their processes, to continuous improvement. It seems to be the case, from the analysis undertaken, that quality management models not only have full potential to cover the standards and guidelines established in ESG Part1 but additionally they may allow HE institutions to go a step further, opening the possibility for them to really move towards quality enhancement.

At another level, OECD, building on its large experience with the PISA results, that do compare regions and countries according to the performances achieved over the same tests by children with 15 years of age, has also conducted the AHELO (Assessment of Higher Education Learning Outcomes) feasibility study (Saraiva and Rosa, 2017), involving 150 HE institutions in 17 different countries, in order to see how a similar worldwide approach might eventually be adopted for measuring HE students learning performances over the same tests applied to similar courses across all the participating countries. However, after this pilot experience, it was concluded that conducting a larger-scale approach for assessing learning outcomes at HE across countries would not be feasible, and therefore this effort was discontinued.

Nowadays, there are many different approaches and models available to assure quality in HE. Most external quality assurance is based on self-assessment guidelines that can be used to guide quality efforts, both at the level of processes – teaching and learning, research, and third mission – and at the institutional level. The ESG Part 1, as already mentioned, also does provide a framework to establish an internal quality assurance system. And the models from the quality management field are obviously also an option. The best approach for each particular HE institution will depend on its characteristics, ambitions or goals and should always be a decision of the institution, shared as much as possible by its community. Anyways, what is really most important is that regardless of the choices made, integrated, meaningful, and continuously developing quality management and quality assurance activities are carried out and implemented in the field.

7. Innovative organizational solutions for universities

Successful universities have introduced new disruptive operational practices that are not typical in the traditional university culture. Here we take as an example the Aalto University (Aalto University, 2017), located in Espoo, the neighboring city of Helsinki. Aalto University has also contributed to the smart city projects in both Espoo and Helsinki (Hertell, 2016).

In addition to the traditional educational means adopted in the different Aalto University's schools, the university also has created the 'Design Factory', which corresponds to a quite flexible new university unit, serving as a joint platform that combines expertise from the several university schools. This factory is designed to facilitate new forms of collaboration in an environment where academic teams, researchers, and students work together with companies and communities. The themes of teaching and learning are important parts of the factory activities – the new knowledge produced by research is here smoothly transferred to teaching in rather creative ways. For instance, the Design Factory (Aalto Design Factory, 2017) has made a lot of cooperation with companies, and hence they have practical multidisciplinary projects, research, and education in product development, marketing, international business,

innovations, and IPR (intellectual property rights). The results have been very successful, and the Design Factory concept has been expanded to many other universities all over the world.

The City of Espoo has co-initiated with the Aalto University the privately run Urban Mill (Urban Mill, 2016), a public-private co-working and co-creation platform for urban innovations also located at the Aalto University campus. The Urban Mill's success can be demonstrated by its 50000 users and 100 prototypes developed since 2013. It is yet another powerful example of an open innovation platform that uses a thematic approach, agile orchestration, and co-creation methods to advance urban change.

The Aalto University also supports students' activities for creating entrepreneurship skills. An important example of such efforts is Aaltoes (Aaltoes, 2017) (Aalto Entrepreneurship Society), which is the largest and most active student-run entrepreneurship community in Europe. A particularly interesting area, at which Aaltoes is quite active, is the Startup activity, including the concepts of Startup Sauna (Startup Sauna, 2017) and Startup Life. The success of the Startup Sauna's activities can also be seen by the annual Slush event, taking place in Helsinki (Slush, 2021), that in 2016 gathered together 17500 attendees, 2300 startups, 1100 investors, and 600 journalists from all over the world.

These new operational modes of the Aalto University are not particularly directed to smart society projects, but many of its research and development topics are also relevant for different features of the "smart societies".

8. HE quality evaluations

Performance evaluation is traditionally a central issue in the established quality management literature and methodologies. Many different evaluating practices have been developed for the formal educational systems and learning results, which have been used at different educational institutions nationally and internationally (Anttila and Jussila, 2015). These approaches typically focus on distinct performance aspects and are not consistently compatible and may even be confusing in terms of the overall quality achieved. Hence, it is essential that the evaluations made have a strong theoretical and professional basis, rather than being merely bureaucratic.

Quality-related evaluations can apply to quality, quality management, quality improvement, and quality assurance, which differ from each other in terms of their purpose and methodologies. The evaluations may cover all activity areas of the HE institutions, including education, research and social collaboration, focus on enablers (processes), results (outcomes), or both. Evaluation of the effectiveness and efficiency of the organizational systems and processes in place at the HE institutions is fundamentally different from just the evaluation of students', teachers', and other stakeholders' perceptions, and academic ranking reviews of universities are not usually well aligned with professional quality evaluations. For quality management purposes, evaluations should primarily be made by the organization itself, under a self-assessment and self-improvement mindset.

According to the formal ISO 9000 definition of quality, it can be related to any kind of object. Hence one may consider quality evaluations of HE from the viewpoints of HE stakeholders, involved people, activities, processes, process outcomes (products), operational systems, the HE institution as a whole, their specific organizational units, or even local, regional, national

or even international assessments of HE within or across countries. Examples of HE related objects, whose quality may be assessed, include the following actors:

- Students
- Faculty members
- Teaching activities and materials
- University scientific activities
- Third mission activities, in terms of their contributions to innovation and entrepreneurship
- Contributions to local and regional development

Quality in HE can be perceived in different ways, depending on the particular interested party of the HEI and the perspective over which they are considered. Quality is not the same for a student, an academic researcher, an employee or employer in organizations, or the government authorities.

The growing concern with quality in HE has also led to the emergence of a number of mechanisms to assure and improve it, such as performance indicators, accreditation mechanisms, programs, and institutional assessment, and quality audits. Many practices for quality evaluations in HE have been presented by different researchers and institutions (Rosa et al., 2001). As a mere example, the European University Association (EUA) has developed a model, which was applied in several hundreds of HE institutions and includes an internal evaluation complemented with an external evaluation conducted by panels of international experts.

Addressing a specific perspective, focused around innovation and how entrepreneurial HEI are, an interesting model has also been developed jointly by the European Commission and OECD, with thousands of HE institutions that have already made their self-assessments according to the corresponding HEInnovate model and platform, the same happening at a broader level with a number of countries (OECD, 2020).

All evaluations should be based on sound epistemological and metrological foundations (Anttila and Jussila, 2011). Epistemology implies questions about what knowledge is and how it can be acquired (Allison and Pomeroy, 2000). Knowledge is built on theory and theory is a window into the world. Interpretation of data from observations, evaluations, or measurements will largely depend on the pre-knowledge of the subject matter (Deming, 1993). Knowledge and experience of somebody always depend on the paradigms which one follows intuitively or consciously. Metrology is the science of measurement and its application (OIML, 2010), and the vocabulary of metrology covers the generally accepted terms and definitions for the whole topic and for all areas of activity. Measurement means experimentally obtaining values attributed to the quantities characterizing the object, and Measurement System Analysis has proven to be very effective to support appropriate decision making and quality management. One should make clear in a practical way the meanings and roles of concepts like facts, data, information, or knowledge, and how they are related to measurements.

There are many different purposes for the HE institution quality evaluations, including:

- Research for getting new knowledge of organizational performance.

- Acquisition of information for planning and university operations.
- Controlling operations and processes.
- Measurements for problem-solving and performance improvement.
- Measurements for quality assurance.

The most important purposes of the evaluations relate to performance control, improvement, and quality assurance.

Recognized evaluations related to practices for educational institutions from a quality point of view include (ISO, 2018a):

- Monitoring, measurement, diagnostic analysis, and evaluations
- Internal audits
- Management reviews
- Self-assessments

These practices are not, however, well-established in practice in the educational sector, although it is widely recognized that self-assessments can play an important role in quality management and improvement in the HE institutions.

The main issue here is to integrate self-assessments into the management of the HE institution effectively and in a natural way. Some of the assessment items relate to the results and the others to enablers, i.e. the processes through which the results have been achieved. In order to achieve excellent performance, the institution cannot optimize a single area of activities and neglect its entirety, and one should recognize connections between the performance of processes (enablers) and results (outcomes). Scoring is based on the assessment criteria (Table 1) (NIST, 2014). Processes and results can be assessed separately but criteria emphasize causal relations between them.

Table 1. Self-assessment scoring dimensions, with processes and results being assessed separately and scored from 0 to 100%, according to the scoring criteria (Ibid.).

Processes	Results
1. Approach: The planned actions, including process plans, measures, and deployment of requirements	1. Level: Levels of the achieved results
2. Deployment: Executing the planned approach in practice	2. Trends: Sustainability and the rate of improvement of performance results over time
3. Learning: Capturing new knowledge, including innovations	3. Comparisons: Performance relative to appropriate comparisons or benchmarks
4. Integration: Embedding the approach in the organization's strategies and the management of the processes and activities	4. Integration: Achieving the results in a balanced and comprehensive manner according to the organization's strategic objectives and anticipating future development

Scoring according to Table 1 highlights the key issues of learning and integration for the development of the strategic university units towards high quality and performance excellence.

9. National, regional and global challenges

Many countries and regions understand what a critical issue the wide coverage of high-quality HE is for their success. Therefore, quality efforts are considered not only at the level of each HE institution but also from local, regional, national, and international viewpoints. Hence, the quality of HE can also be compared amongst countries and regions of the world. Therefore, although different pathways have been followed in different parts of the world, quality in HE has become a critical worldwide topic. The availability of public information regarding performance and rankings of HE institutions has also put additional pressure in regards to the need to adopt sound quality management definitions and tools in HE institutions. This also brought into the discussion important issues regarding how to measure quality in HE in general and at HE institutions.

Since data is available for the analysis of HE quality also at the level of a country, it is possible to cross quality-related indicators together with the allocation of financial resources to HE under comparable conditions. Starting with a set of 36 countries, for which the OECD Education at a Glance 2014 publication (Saraiva and Rosa, 2017) provides values of expenditure per student on equivalent USD, one can see that this indicator varies considerably, ranging all the way from a little over 1000 USD per student (Indonesia) up to 26000 USD per student (USA). We crossed this data (Ibid.) from each country with how many universities each country has in the top 100 best HE institutions according to the Shanghai Academic Ranking of World Universities for 2014. We observed that only 16 countries have at least one HEI in this top 100 of quality. The average expenditure of such 16 countries in HE stands above 17600 USD per student, and only two of them have an expenditure level below 15000 USD per student (Israel and the Russian Federation). On the other hand, the remaining 20 countries from the OECD financial database, with quality levels of HE that do not place any of their HE institutions in the world best 100 universities, do have an average level of expenditure of just 9600 USD per student, i.e., just 55% of the average amount of expenditure for the countries present in the top 100 of the HE institutions. Only in Ireland do we find an expenditure level above 15 thousand USD per student without a presence in the top 100 ranking. Many other more detailed statistical results can be derived from these data but these simple overviews are enough for us to raise some critical points regarding relationships between investment and quality achieved in HE. It seems to be the case, from the strong empirical evidence that we have been collecting over the years, that if a given country wants to promote the quality of its HE, and see it recognized by having at least one HE institution in the first league of top 100 quality HE institution, then, against what has been stated without scientific support by many people, the following considerations should be taken into account:

- Rather than focusing on the critical mass of just a few HE institutions of elite, countries with HE institutions in the top 100 invest significantly in the overall quality of their HE systems, and it is thus very unlikely to achieve good results with a reduced global budget concentrated on a relatively small number of HE institutions.
- There are obvious limits to the quality levels that HE can achieve with the resources provided to it in any particular country. No miracles can be found, in the sense of having countries with top world HE institutions but yet a reduced level expenditure.

A very simple rule seems to emerge from our studies, in terms of a recommendation for countries that want to improve and be present in the top 100 HE institutions. It is not enough to talk about it, and indeed the best advice we can have to help in practice the promotion of

quality in HE, in this regard, corresponds to investment levels allocated to HE in a sustained way that should be competitive at the international level. At the present time, and with the data available that we used, this means, on quantitative terms, that a country wanting to be present in the top 100 HE institutions in terms of quality should spend at least 15 thousand equivalent USD per student in its HE system. If you do so, the likelihood of that to happen, and become after some years a member of the top 100 club of countries, is at least of around 0.93 according to the studies that we have conducted, since only in one country that does not happen. On the other hand, if you believe that this can be achieved by investing less than 15 thousand equivalent USD per student in your national HE system, the chances for the nation to reach the group of countries having top 100 best HE institutions is about just 0.1, since only two countries do so, and possibly that will not keep happening for a very long period of time.

If a country does not invest in competitive terms in its HE system, as a whole, it is thus very unlikely that it will be able to achieve top world quality levels in any of its HE institutions.

In addition to the pure educational area, countries also should promote the R&D and social activities of universities. This, for instance, includes applying scientific knowledge in nationwide initiatives for the quality of society.

10. Professional references for HE quality

One can find significant general ideas for quality integration in HE from the rich professional quality literature, teachings of the recognized gurus of the quality profession, and through benchmarking for practices of world-class organizations. In addition, international standards are important references for quality management, too. However, these information sources are not well known among educational organizations, including HE institutions. In addition, these references, unfortunately, give a fragmented understanding of quality practices, and hence their consistent application can be difficult without reasonable theoretical and holistic knowledge and know-how of the quality profession.

International ISO 9000 standards are the most well-known and widely used general business independent quality management standards. They have been major references for the development of quality management approaches in all kinds of organizations globally for more than three decades. ISO 9000 standards also define the universal quality management principles that are the fundamental truths or propositions that serve as the foundation for a system of belief or behavior, or for a chain of reasoning for the standardized approach of quality management. The ISO 9000 basic standards series consists of three standards, ISO 9000 (ISO, 2015a), ISO 9001 (ISO, 2015b), and ISO 9004 (ISO, 2018b), considering terminology, requirements, and guidance for quality management. These standards are well applicable, sometimes in a creative way, also to universities, when integrated within the processes and with good professional knowledge of quality (Anttila and Jussila, 2017b).

The education-specific standard ISO 21001 (ISO, 2018a) will challenge all educational organizations because it requires the adoption of general basic quality concepts, quality management structures and practices. This standard will also enable HE institutions to demonstrate their ability to provide consistent education and hence to increase the credibility of the organization and enhance the satisfaction of the stakeholders of educational organizations. This standard does focus only on the area of education, and therefore does not cover the two other main areas of HE activities (research and innovation).

The Baldrige Excellence Framework (Education) (NIST, 2015a) is an education-specific performance excellence model aimed to present leadership and performance management approaches for the education sector and to empower educational organizations to accomplish their missions, improve results, and become more competitive. This framework model is particularly useful for self-assessments of the overall performance in HE institutions. It includes:

- The core values and concepts (beliefs and behaviors found in high-performing organizations)
- The education criteria for performance excellence covering critical aspects of achieving excellence throughout the organization
- Guidelines for responding to the education criteria and evaluating and scoring processes and results

In addition to this education-specific reference model, general performance excellence models can be used also in HE institutions. The Malcolm Baldrige, EFQM, or UAE Government Excellence Models are some of the most important references in this area.

11. Conclusions

Quality is a generally recognized professional discipline with over 100 years of modern successful evolution. Quality is imperative in all educational institutions for their benefit, and HE institutions should follow the quality principles and practices that are applied globally in all kinds of organizations of our societies. This applies to all activity sectors of the universities, including education, research, and societal collaborations. Universities also should act as advanced quality role models and scientifically and educationally contribute to the development and dissemination of the quality philosophy and methodologies widely in society. This however requires that striving for excellence in the universities' own development of quality integration becomes a priority.

The 4th industrial revolution and the incorporated social revolution, and the smart society development aim at the effective integration of physical, digital, and human systems in the built environment in order to deliver a sustainable, prosperous, and inclusive future for its citizens. Smart society projects take place through the collaboration of many public and private organizations everywhere in the world. Participation in these projects provides a big challenge for the HE institutions, where their strengths are multidisciplinary activities in education, research, and societal cooperation, and the success can be ensured with the high quality and professional quality management of universities.

In this white paper, we have reviewed many concepts, principles, and methodologies from the quality world that can help and inspire HE institutions in the definition and implementation of quality under the present societal environments and challenges. Furthermore, we have also discussed how HE institutions and what they do can also contribute in many ways to the development of quality concepts, tools, and methodologies, taking into account their duties and scope of activities.

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