



EOQ Congress 2019

Rediscovering Quality

BOOK OF ABSTRACTS

The European Congress of Quality is an annual event that started in 1957.

Professionals from Europe and around the world come to meet, learn and benchmark.

High-level speakers present over two days on important and/or timely topics on Quality in its broad sense.

25 years after the last time it took place in Portugal, it will take place for the third time in the country in 2019, under the title:

Rediscovering Quality!

Organized by:



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Day 1

OPENING SESSION

[António Saraiva](#), CIP President

[Francisco Frazão Guerreiro](#), APQ President

[Torolf Paulshus](#), EOQ President

MOMENT OF PORTUGUESE GUITAR

PLENARY SESSION – REDISCOVERING QUALITY CONCEPTS

CHAIR: [Ana Ramalho](#)

For the Next Generation

– [António Marquez Filipe](#), Symington Family Estates

Abstract:

Pioneering wine-making that meets the challenges of our time.

Sustainable Quality

– [Carlos Ribas](#) and [Pedro Cardoso](#), Bosch

PARALLEL SESSIONS 1 – QUALITY CONCEPTS AND APPROACHES:

P1A – Quality New Ideas and Concepts I

CHAIR: [An Kint](#)

Old Quality versus New Quality: who wins?

– [Patrick Mongillon](#) and [Jade Plantin](#) [FRANCE]

Abstract:

*Usually, people are considering quality as a restrictive, motionless, technical and boring function. Within a company, people often avoid to work with quality specialists !
But Quality is evolving : a real transformation is showing up since a couple of years. Nowadays, the quality issues stand for aligning resources on strategy, empowering teams. In a word, Quality is simply looking forward to fostering innovation and performance for the companies.
Based on their various and rich experiences in quality and management, Patrick & Jade bring up a quite new insight on the quality function evolution through a very lively sketch. You might be surprised by the new Quality ways...*

The future of Quality: New and Old challenges

– [Anni Koubek](#), Quality Austria [AUSTRIA]

Abstract:

As the world of organisations is changing, so is the world of quality. Trends such as a changing digital consumers, circularity, digitalisation and agility, just to name a view, have a direct impact on quality, where “customer needs and expectations” and the “processes needed and their interactions” are the prime focus. The presentation will take a look on the challenges and discuss where quality management should change but also which values and focal points need to remain in order to achieve its scope.

Open Foresight “Quality 2030” – Collaborative anticipation of future developments and trends

– [Melanie Wiener](#), Johannes Kepler University [AUSTRIA]

Abstract:

Quality is changing – the future of quality will be defined by global changes. Various megatrends determine what issues are encompassed by quality and these have an effect on excellent products and on specialist quality personnel. In many industries – whether high-tech, healthcare or the service sector – highly successful companies exist that by far exceed the current requirements of common quality standards. They distance themselves from their competitors by differentiating their product or service on the basis of an extended concept of quality. Such best practice organizations were invited to join the collaborative open foresight project “Quality 2030” initiated by Quality Austria and the Institute for Integrated Quality Design (IQD) from the Johannes Kepler University Linz. In open foresights projects organizations share their expectations and knowledge on future developments. By this, synergies can be used, white spots can get identified and companies can create added value for themselves to enhance competitive advantages. The aim of the “Quality 2030” project is to shed new light on the discourse surrounding the issue of quality in commerce, politics and society and to detect the requirements that will in future allow companies to effectively compete in the domestic, European and global markets.

Integrating management of quality and digitalization

– [Lars Sörqvist](#) and [Marita Bergendahl](#), International Academy for Quality [SWEDEN]

Abstract:

Today there is a strong focus on digitalization within most organizations. Companies all around the world are investing a lot of money and time in IT. It is often claimed that a high level of digitalization is very important to stay successful in the future. New technology and IT-applications is believed to create innovations and new ways to work smarter. Automatization, robotization and artificial intelligence (AI) is according to many researchers going to do more and more of the work human beings are doing today. Digitalization is a new way to develop a business towards higher value creation and efficiency. Quality management is about developing an organizations ability to meet customers’ needs and expectations. Within the knowledge area of quality tools and methodology for systematic improvement work have been developed for many years. An important question is how to link digitalization and quality management together. Successful digitalization must start with understanding of the customer. When the needs and expectations of the customers are known it is possible to develop IT-solutions that creates customer value and support the organization in meeting those needs. Understanding customer needs and expectation is about deliver quality. Quality management is an subject area there a lot of knowledge, methodology and tools exist that could be used to develop customer focused and successful

digitalization. Digitalization, IT-development and use of new technology have the purpose to improve the business. To successfully development an organization and its processes there is a need for a systematic and fact-based working methodology. Six Sigma and Lean are two well-known concepts often used. Problem solving and root cause analysis is needed to find solutions and achieve good results. If not integrating and using this knowledge in digitalization there is a big risk for less successful IT-projects and bad investments. Digitalization and use of new technology will in itself affect quality. New opportunities will appear to develop work, processes and products in a better way. Internet of things and AI creates new future opportunities to learn, control and build in quality in products. Digitalization and IT has through this more and more becoming a knowledge area that must be a central part in the development of quality. Increased vulnerability, sensitivity and new risks could be effects of new technology. IT solutions have to be upgradeable, maintainable and possible to continuously improve and develop. Agility is of big importance and will probably be more and more difficult to keep up as customer demands, technology and global competition change faster and faster. The need for a culture based on continual improvements are then important. This paper will focus on how quality and digitalization could work together and improve customer satisfaction and business results. Since 1999 quality and IT-management have been integrated in one common department and research area at the Royal Institute of Technology in Stockholm. Numerous research programs have during those 20 years given many important experiences about how quality and IT development better could be linked. Those experiences will be summarized in this paper.

Actual aspects of the “Quality Kazakhstan” Concept

– [Azat Abdrakhmanov](#), Kazakh Organisation for Quality and Innovation management

[KAZAKHSTAN]

Abstract:

From the first years of independence of Kazakhstan, the Government sought to solve quality problems in different fields. Therefore several legislative acts and programs have been developed, which were devoted to the issues of standardization, accreditation, metrology, as well as certification of management systems, products and services. Were adopted documents aimed at improving the quality of education, healthcare, occupational safety, public services, as well as, protection of the environment, etc. These documents dealt with specific aspects of quality management (products, services, personnel, etc.). The Quality Award was established by the Presdident of Kazakhstan in 2006 and annually held the “Altyn Sapa” National Quality Contest, which aims to motivate the winning organization to increase their competitiveness and productivity based on the improvement of quality management system. The main goal of the competition was to achieve an understanding of the importance of high quality products and services, as well as to increase the awareness of the business community about the need for a systematic approach to improving and sharing strategies for leadership and international recognition. However, was not adopted a single fundamental document containing a comprehensive concept of quality on a national scale. In this regard, a long-term National Quality Strategy has not yet been approved, the implementation of which should lead to an improvement of the quality of life of population based on the country's comprehensive economic and social development. The project of the "Quality Kazakhstan" Concept has been proposed for implementation to unite all the efforts of the Government, non-governmental organizations and business community using new approaches to the Quality, Innovation and Creativity.

P1B – Quality Models and Standards

CHAIR: [Francisco Barroca](#)

Can we sustain trust through conformity assessment? We'd better!

– [Pedro Alves](#), IQNET

Impact of implementing a Sector Specific Quality Assurance System in organizations providing Social Services

– [Guus van Beek](#), All About Quality Consultancy [NETHERLANDS]

Abstract:

EQUASS (European Quality in Social Services) is an initiative of the European Platform for Rehabilitation (EPR). It aims to contribute to a European Social Service Sector where high-quality services ensure and promote inclusion and a high quality of life for the service users. The EQUASS system for quality is customised for the social sector and offers a comprehensive approach based on specific quality criteria, performance indicators and clear external assessment and audit procedures. The EQUASS system is compliant with the European Quality Framework for Social Services (EQF) established by the Social Protection Committee in 2010. More than 500 Social Service Providers in Norway, Sweden, Estonia, Latvia, Lithuania, Germany, Ireland, the Netherlands, Portugal, Slovenia, Italy and Greece have implemented the EQUASS system in their organisations. The vast majority of the Social Service Providers are serving individuals with a disability in vocational rehabilitation sector aiming for employment in open labour market by using supported employment measures. The impact of Quality Management Systems on the provision of social and healthcare services have been investigated in many evaluation studies. Many Service Providers apply instruments which are focussed on limited aspects of the quality. What they attempt to 'measure' often leads to exactly the opposite of what we pursue. Organisations providing services to individuals with a disability, will act according to the criteria and indicators and develop strategic behaviour making them achieve goals on paper, but in reality, the criteria and indicators do not have impact on the quality of the service. Various National and International studies have evaluated the impact of the EQUASS system on the organization and the services of the Social Service Provider. The studies also reported on the challenges of implementation of the EQUASS system in the organization of the Social Service Provider. The presentation will show into what extent the EQUASS system has impact on:

- 1. The improved quality of the service?*
- 2. The interaction between employees and service users?*
- 3. The implementation of the UN Convention for Persons with a Disability in the organisation of the Social Service Provider?*
- 4. The professional development of employees?*

Additional to impact of the EQUASS system on service of the Social Service provider, the presentation will show who the challenges have been addressed in the new EQUASS system.

A Discussion of Best Practices in Leading Quality Improvement

– [Elizabeth Keim](#), Integrated Quality Resources, LLC [USA]

Abstract:

The session will present the findings of research on best practices regarding worldwide leadership's role in quality improvement. The results of several surveys will be presented. Topics discussed will

include effective quality management systems, top executive commitment and engagement, supportive employee empowerment, and successful continual improvement projects.

Madeira Islands: Recognition System of the Quality and Excellence of Service

– [João d'Orey](#), *Mínimos Quadrados [PORTUGAL]*

Abstract:

The Government of the Autonomous Region of Madeira, Portugal, defined in 2005 its first Regional Strategy for Quality, whose primary objective was positioning the Madeira Islands in a prominent position in quality at national and international level, turning it into a Region of Excellence. In 2013 the Regional Strategy for Quality was reviewed and reformulated for the period from 2014 to 2020. Integrated in the set of strategic initiatives implemented in this period, the Recognition System of the Quality and Excellence of Service (QESM) was developed by the Platform for Quality and Excellence of service in the Autonomous Region of Madeira and aims to contribute to the promotion, awareness and development of the service quality in Madeira Islands, positioning the Region, in accordance with the strategic Vision, as "national leader and an international reference in quality of service and hospitality". This recognition system, formally established by the Regional Government order no. 133/2018, of April.12.2018, aims to stimulate the continuous improvement of the service quality and to recognize the involvement and good practices in this field. It is available for all regional organizations, regardless of their nature (private or public) or size, whose objective is to continuously improve the quality of their services. The system includes the components of Sensibilization and Recognition. The Sensibilization component aims to foster the involvement of regional organizations in the quality of service, through the use of management tools and methodologies that promote the development of structured approaches and results in this field. The QESAM self-assessment framework is a central element of this component, and it is a questionnaire tool to help regional organizations in their service quality and hospitality efforts. An electronic version of the QESAM questionnaire was developed and can be open accessed and used on web page: www.qesa.pt. The Recognition component aims to reward the good practices of Regional organizations in the service quality field, and integrates three distinct levels of recognition, directed to different evolutionary phases of the practices and service quality management systems implemented. The attribution of the "QESM Recognized Entity" mark constitutes a formal recognition of the organization's efforts and good practices in the field of service quality and is an important stimulus for the continuous improvement of its approaches and results. On the other hand, it contributes to a greater awareness of the organization among its customers, employees, suppliers, partners and society in general. The awards granted are valid for a period of three years and may be renewed for equal periods. However, if they gather conditions for that, the entities recognized at levels 1 and 2 may, at any time, request a transition to a higher level. The process of submitting applications to the various levels of recognition is totally dematerialized and electronic. Candidate organizations can access and complete their application forms at: <https://qesa.pt/sistema-reconhecimento>, which also contains all information regarding the requirements and recognition process, as well as the support manual for the presentation of applications.

Hygiene And Sanitation Management System: A New Approach To Quality

– [Handan Hilal Köse](#), *Turkish Standards Institution [TURKEY]*

Abstract:

Hygiene is a set of practices performed to preserve health. According to the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases." Sanitation is the process of keeping places clean and healthy.

Hygiene starts at individual level and arises as a significant aspect affecting community health by spreading all areas of life. The public places such as hotels, restaurants, airports, dormitories, schools, malls and institutions providing health services where we spend time together carry risks regarding to community health. Extensive disease burden is associated with deficient hygiene and sanitation and hygiene-sanitation builds the basis for preventive and protective medicine. Several diseases could be prevented through access to adequate sanitation services and better hygiene practices. According to WHO; unsafe water supply, sanitation and hygiene lead to infectious diseases which result in million of deaths. Furthermore, hygiene is an important indicator for the development level of the countries. Hygiene is irreplaceable in all areas of human life and plays vital role in the success of businesses as well as it is accepted as a quality indicator. Producing and presenting services by following the hygiene rules with clean, attentive, aesthetic, comfort providing features is expected from a business. The efficiency of hygiene and sanitation practices in business circles could be executed in a management system which is integrated with the organization. Therefore, 'The Hygiene and Sanitation Management System Standard' will provide the organization to plan its processes and interactions related with hygiene and sanitation through establishing Plan-Do-Check-Act (PDCA) cycle and risk-based thinking. This standard has been prepared by the Turkish Standards Institution (TSE) and published on 15 January 2018.

The aim of the 'The Hygiene and Sanitation Management System' is to create the ability to consistently provide products and services that meet customer and applicable statutory, to facilitate the opportunities to increase customer satisfaction, to address risks related with its context and objectives, to create awareness to demonstrate conformity to specified hygiene and sanitation management system requirements, to receive product/service for human health, to contribute the psychology of workers positively and to establish trust among interested parties for hygiene and sanitation. This new standard enables the organization to install an administrative framework with a view to protecting community health through defining conditions to achieve goals and objectives and helping the organization to meet minimum hygiene and sanitation standards. The complementary feature of the standard increases the quality understanding in it as well. With the guidance of this standard, the organization could expand its opportunities as well as its quality perception. As a result of the utilization of the standard by the organization, continual improvement in the management system will increase the value or service of the organization. Innovation and research will be carried out with this standard and it will involve new approachments for the organizations to meet the hygiene and sanitation needs of the community.

P1C – Quality Tools and Applications I

CHAIR: [Rui Ramos](#)

Meaningful Metrics: Measuring Isn't Enough

– [Christianna Hayes](#), Impact Performance Solutions [USA]

Abstract:

Presentation Summary: In this session participants will be introduced to OKR (Objectives and Key Results) the powerful practice behind the success of global companies such as Intel, Google, Amazon, and LinkedIn. OKR is a simple 3-part system that was first introduced at Intel in the 1970's to skyrocket the organization from \$1.9 to \$26 billion in revenue. This goal-management framework ensures that only metrics that are meaningful to the organization and its mission have focus.

Creating metrics to measure organizational performance is an activity that most organizations are familiar with but developing metrics that are meaningful and not in conflict with the purpose of

the organization can be a challenge for even the most data rich companies. OKR helps an organization avoid the pitfalls of measuring and managing data that doesn't align with the strategies of the organization or worse, drives bad behaviors within the organization. Participants will learn the difference between measurements and meaningful metrics, the kind of metrics that add value to an organization. We will introduce the three principles of meaningful metrics: 1) understanding the characteristics of meaningful metrics, 2) prerequisites for using metrics to promote successful results and 3) the effective application of metrics.

In order for metrics to have meaning within an organization, they must exhibit specific characteristics such as the ability to promote the analysis of defined strategies. OKRs are intended to help support the strategies of the organization and demand action when data determines the need for it. Good metrics encourage new measurement techniques and not just "good scores" which can drive poor behaviors. As an example, think of a metric commonly used in many organizations that measures the number of products built in a day or the number of patients served in an hour. This type of metric promotes volume but can easily discourage quality of product or service which can ultimately conflict with an organization's customer-centric focus. By measuring only primary metrics (metrics that measure the result we are trying to achieve) we miss secondary metrics which are put in place to measure the consequences of achieving targets.

Because meaningful metrics are intended to support the strategies of the organization, it is critical that the development of the OKRs are based on good strategic planning and must help the organization determine their status toward accomplishing those goals. Measuring only the results of the strategies however leaves behind the opportunity to measure the planned activities that will support the strategic goals. The most effective metrics will determine whether efforts and the resources match the planned activities.

Finally, the challenges of applying metrics are abundant. Often seen only as an exercise in reporting or compliance to an ISO Standard, the effective application of metrics relies heavily on data driving further analysis and decision making to improve processes. Metrics that are not meaningful are difficult to implement and sustain as they often do not add enough value to apply the extensive resources necessary including those needed to carry out reviews.

Hoshin Kanri

– [Manon Duclos](#), MQQ [CANADA]

Abstract:

Don't let luck determine the future of your organization...take control of its destiny with an effective strategic planning process ! Hoshin Kanri is a planning and implementation method that provides organizations with direction that is aligned with its vision for the future. We will first, quickly review the steps of a standard strategic planning process - as an input to the Hoshin Kanri matrix - and second, provide an explanation of the tool. Finally, as an example, we will go through the strategic planning and deployment cycle that Quebec Society for Quality completed for 2018-2021.

Harmonized Management System as a tool for Change Management at EPS

– [Tatjana Klačić](#), Electric Power Industry of Serbia [SERBIA]

Abstract:

Public Enterprise Electric Power Industry of Serbia is the largest company in Serbia, the backbone of its energy system. The core activities of the company are generation and distribution of electricity. EPS power plants (renewable and traditional energy sources) of 7.33GW capacity generate about 35.3 billion kWh annually. As market oriented company, EPS ensures regular, safe and reliable electricity supply to approximately 3.5 million customers. Until status change in 2015

Electric Power Industry of Serbia consisted of 14 legal entities. EPS had 42 certificates of different quality management systems at that time. Having in mind the fact that the management systems were certified independently, they represented the managing tool of the top management of former legal entities. EPS reorganization program aimed at increase of operational efficiency by creating a unified corporate management system at the level of the entire company. Additionally, numerous projects aiming at increase of efficiency in production of coal and electricity and decrease of overall (technical and non-technical) cost were initiated. Under such circumstances, management systems had the task to respond to all occurring changes and at the same time go through the period of adjustment and harmonization. Such harmonized management systems were recognized by EPS top management as one of the key tools for change management that ultimately aim at corporate management. Implementation, maintenance and improvement of management systems were followed by continuous learning process. Our company has huge intellectual property that represents the significant driver of the company. Nevertheless, the process of reorganization and compliance of the management system requires adoption of additional knowledge and exchange of experiences with companies of similar activities, before all from the surrounding states. That is why EPS plans significant funds for courses and vocational training of employees. The aim of the paper is to present the manner in which EPS has conducted process of compliance of management system and adoption of best practice, application of the harmonized management system as the tool for the management of the changes, with accompanying influence to EPS' business operation as socially responsible company.

Critical Root Cause Analysis Tools and Concepts

– [Matthew Barsalou](#), QPLUS [GERMANY]

Abstract:

This talk described performing a root cause analysis to determine the cause of a failure with a method than can be applied regardless of which problem solving process, such as 8D or A3 reports, is used. The talk will explain understanding the problem with the help of a problem statement, identifying potential causes and listing them in an Ishikawa diagram. Ishikawa diagrams often contain hypothesis with little indication as to how the hypothesis is related to the failure under investigation; this problem will be explained and a solution will be offered. Hypothesis must be investigated once they are available in the Ishikawa; a method will be provided to convert an Ishikawa diagram into an easy to use action item tracking sheet that can be used to prioritize actions, assigning reasonability and deadlines, and consolidate investigation results in one document. The virtues of a good hypothesis will also be explained and using the scientific method for root cause analysis will also be described. To simplify this approach, the scientific method will be shown in the form of Plan-Do-Check-Act. Finally, the proper use of five whys will be explained; not as a theoretical tool for brainstorming as it is often described in the literature, but as a method for finding the true underlying cause of a failure so that the correct preventative actions can be identified to prevent a reoccurrence of the failure. Concepts will be illustrated through the use of a realistic hypothetical example.

From Six Sigma to problem solving – Back to basics

– [Piero Valle](#), SFK [FRANCE]

Abstract:

SKF has a great deal of Quality knowledge readily available in the company. To revitalise and consolidate this basic knowledge of DMAIC and Design for Six Sigma SKF is taking a new approach, that leverages problem solving, which represents why we need these methods and tools. Problem solving is meant here to cover from Prevention (solve the problem before it happens) and then

Correction, Improvement and cross company sharing, so it is encompassing the widest possible improvement opportunity cycle. The company's ambition is to share experiences and learnings through core documents. Risk management is the basis for the new approach. The Design FMEA is revisited and converging the customer viewpoint. The new curricula of the Black Belt and Green Belt training provided by the Improvement Academy have more emphasis on problem solving, to solve before it happens and to prevent reoccurrence. The three phases along the full value chain are; 1. Prevention: to prevent and mitigate risks in our operations. In other words, to solve the problem before it occurs; 2. Correction: a problem and a complaint are always an opportunity. Tackle the issue to eradicate it forever and then record and share lessons learned; 3. Improvement: continuously improve our processes, products and services, by systemically capturing our improvement opportunities. The Six Sigma Belts curricula have been updated to achieve the problem solving model, covering the three phases. The Belts are needed to understand FMEA and to dissipate the learning across the company.

P1D – Reliable Quality (metrology, reliability, risk management, prognostics and diagnostics)

CHAIR: [Odete Fernandes](#)

Reliability Centered Quality: Judo vs Karate approach

– [Zigmund Bluvland](#), ALD Group

Abstract:

Quality and Sport have a lot of essential and vital common dimensions: Success-driven - Conformity to the rules - Understand and satisfying the expectations - Noisy environment - Uncertainties and Risks - Uniformity and Repeatability - Consistency and Reliability. In this article, author considers the applicability and relevancy of various tactics and strategies of sports, especially Judo and Karate, in order to achieve and maintain Reliable Quality of Products and Processes. Examples and recommendation for Reliability Centered Quality policy and advanced process organization, management and control are provided.

Quality Management Aspects of Complex Risk Management

– [Jan Emblemsvaag](#), Midsund Bruk [NORWAY]

Abstract:

After several major disasters over the last decades that were not supposed to take place from a risk management perspective, it begets the question of whether or not we have suitable approaches for managing risk. In particular, this seems to be the case for complex risks. The presentation will discuss these issues and more.

Quality as a Service – How Digitization Enables for Predictive Quality

– [Max Ellerich](#), RWTH Aachen University [GERMANY]

Abstract:

The concept "Everything as a Service" (or XaaS) is currently one of the main influences in developing new business models and products. It is possible to apply this approach to Quality Management, e.g., when working with data driven process analytics. However, as quality and especially Quality Management is one of companies' most crucial processes and USPs, how can external partners provide assistance in this field of business? What hurdles have to be crossed in order to establish a

QaaS network? Our use-case shows how process data analytics are able to support Quality Management and how they may replace or extend existing methods. We demonstrate what insights and process enhancements are achievable within a well-established manufacturing company when listening to quality relevant data. Furthermore, we provide insights into various challenges and their respective solutions to achieve data driven Predictive Quality.

Approaches, tools and automatization for the efficient risk management in the supply chain

– [Nataša Gladovič](#) [SLOVENIA]

Abstract:

Nataša Gladovič manages the Food safety and quality system in the international FMCG company Atlantic Grupa. After integrating in their quality management system all the plan, do, check, act demands of global food safety standards, such as: supplier approval procedures, managing contracts, risk assessment in the supply chain, inspecting goods, evaluation of suppliers, nonconformity management, etc., in all business' operations and on all markets, they recognized the need for integration of all these tools, the need for risk based optimization and also automatization. She will present their improvements and explain how they started to make a shift from not only verifying a material/service, but to verifying data in the supply chain.

Application of lean methodologies and tools: the case study of the ceramic industry

– [Marta Ferreira](#), CTCV [PORTUGAL]

Abstract:

The CTCV - Technological Centre of Ceramic and Glass and APICER - Portuguese Association of the Industries of Ceramics and Glasswork developed a study with the intention of understanding the state of the art and the level of implementation of Lean tools in the ceramic sector, through the accomplishment of a sectorial benchmarking. Lean methodologies have been adopted by various organizations as an effective working philosophy to achieve their strategic objectives. The current context of an increasingly competitive global economy, requires companies to adopt management models that enable them to increase the efficiency of their processes, improve the quality of their products and services, and reduce production costs. It can be said that the future of any organization depends essentially on an effective internal control of costs, the continuous improvement of safety and quality and a strategy guided to the satisfaction of the clients' expectations. Lean methodologies have become powerful process improvement tools and have enabled many organizations to achieve high levels of performance with excellent financial results. Lean thinking, applied to the management of organizations, focuses on reducing waste to create flow and increase the speed of processes from ordering to delivering the product or service (lead time). This philosophy is based on a principle of continuous improvement of the efficiency of the operational and business processes, with consequent increase of productivity and reduction of costs. It is the goal of a Lean organization to provide what the customer wants, when the customer wants and where the customer wants. The implementation of Lean tools to support strategies to improve productivity and competitiveness has demonstrated its added value in most of the successfully organizations in business today. In this study, companies were challenged to answer a questionnaire about their management practices related to the Lean philosophy. About 50% of the inquiries were answered, covering a range of companies from all subsectors of the ceramic industry. The results enabled to compare the differences between the different subsectors and the structural and strategic investment needs to meet the needs of the increasingly demanding market. It was concluded that, in most companies in the ceramic sector, the use of Lean

methodologies in the management of companies still has a large margin of progression and areas of improvement and investment have been identified in the short and medium term.

Some of the results are presented bellow:

- 14% of companies had their production layout defined without considering the continuous flow of materials;
- 51% of companies do not monitor nor analyse set-up times in order to identify opportunities for improvement;
- 54% of companies do not classify their products according to the ABC classification and do not manage production or stocks supported on kanban, milkrun, or other Lean tools;
- 17% do not implement the 5S methodology and 49% do not regularly carry out 5S audits.

The study also allowed to formulate some recommendations regarding Training, Top management, Performance and Comprehensiveness of the Lean tools framework to be implemented.

P1E – Quality Tools and Applications II

CHAIR: [István Lepsényi](#)

Quality [Professional] Tools 4.0

– [Lance Coleman](#), IDEX H&S [USA]

Abstract:

The awareness and use of data is a direct reflection of the maturity of a company's management system. Quality Tools are the lens, collectors and sifters through which we interact with our data. With that being the case, alignment of metrics tracked with organizational goals is extremely important. Key to understanding metrics are the tools used to present them to management. So how do you categorize tools to align with key metrics? Once categorized, how do you know which one(s) to use? How do you use tools in concert for optimal results? What are potentially costly mistakes to avoid when using quality tools? How can technology help? For the answer to these questions and more, read on... Quality tools can be categorized in many different ways. With hundreds of tools to choose from there is no one "right" way. However it is important to be able to categorize them in a manner that makes sense to you, so that you know which tools to use when. For the sake of this presentation we will categorize quality tools as Investigative, improvement, graphical, risk, standardization, predictive and analytical. DMAIC is just one process to follow in order to drive improvement, whether that improvement is to minimize/eliminate an undesirable condition or to move towards a desired future state. The individual phases are described below. Define – Identify the potential issue or desired improvement, verify condition, craft problem statement and develop plan. Measure – Collect additional data according to plan, take measurements, perform measurement system analysis(MSA) if necessary. Analyze – Begin to identify potential root causes, form hypotheses and postulate potential corrective, preventive or improvement actions. Improve – Implement selected corrective, preventive or improvement action and confirm desired results through effectiveness verification. Control – Standardize new methods, tools, equipment that were deployed and train employees on new methods/equipment. Establish response plan and ensure controls to monitor for recurrence. Once you have properly categorized your tools, then you will know which to use as you move through the DMAIC process to implement your improvement, as shown in the table below.

DMAIC Phase Tool Category Examples

Define Graphical, analytical, investigative, risk Control charts, pareto, process map

Measure Analytical, investigative MSA, run charts

Analyze Analytical, investigative Fishbone, 5-why, DOE, scatter diagrams
Improve Improvement, risk Layout, kaizen, SMED, risk matrix, RPN, FMEA
Control Standardization 5-S, standard work

A case study will be reviewed to show how a logical sequence was determined for tool deployment and multiple tools used in concert then implemented to resolve a seemingly intractable problem. We will also discuss how taking a risk based approach when using these tools can lead to a more profound understanding of organizational processes and more informed fact based decision making.

A Second Life For SPC: From Control to Management

– [Willy Vandenbrande](#), QS Consult [BELGIUM]

Abstract:

Statistical Process Control (SPC) is a fundamental technique in quality management and one of the first successful applications of statistics in the control of industrial processes. Until today it is a mandatory tool in the automotive industry and a vital element in many quality courses. A large number of people are going through SPC courses, from quality and process engineers to machine operators. But the industrial environment has changed drastically compared to the time when SPC was developed. Today we see customer requirements expressed in single digit ppm values, ever reducing lot sizes, extremely accurate machines, Poka-Yoke control systems and production lines containing 100 % automated inspection on all product characteristics. The general view within quality is that quality control will be replaced by technology. Within that technology there may still be some SPC used, but it will be hidden. At best, statistical rules will be built into machines but it is more likely that new developments like machine learning and artificial intelligence will take over. However, the conceptual knowledge of SPC can still have a great future at another, more important level: process management. In this presentation we will show how SPC can have a major impact on our businesses if we start using it as a managerial tool. But this means that we must train other people and that the use of SPC has a different objective: changing a bi-polar and fundamentally uncontrolled system to a properly managed organization. The first thing any manager should know is that there is always variation in a system. For some reason this seems to be very difficult to understand so we still judge processes by comparing their results to single value Key Process Indicator (KPI) targets. As a result we can only be either happy or depressed. This leads to a very nervous and unnatural way of running a business. The essence of SPC is the distinction that is made between common cause and special cause variation. Replacing single line targets on KPI's by intelligent control chart lines will lead to a better running of the business with a clear constancy of purpose: controlling and improving the system. We will show how an Individual / Moving Range chart can create a different, more exact way of looking at a process and help management to take better decisions, to react when reaction is needed. We will give examples of quality and productivity indicators but also show how this can help you manage some of your personal KPI's in a better way. Changes don't happen overnight. So SPC will not all of a sudden totally disappear from the factory floor as a quality control method. But our biggest fear is that its use will gradually decline while it's vital knowledge will not be introduced and applied at the managerial level. To prevent that from happening we must start today with showing the value of the tool. This is an opportunity for improvement not to be wasted.

Using the Digital management method to improve organizational efficiency and influence in the design field

– [Xuewei Sun](#), Shanghai Nuclear Engineering Research & Design Institute [CHINA]

Abstract:

According to difficulties in using quality management information in design process and lack of mutual understanding among designers, a digital design quality management method using informationized technology was developed, combining with design quality management practices in the author's institute recent years, to improve the transparency and availability of management process information and the influence of organizational system, as well as the awareness of self-improvement for designers.

Designing quality inspection in short-run assembly processes of wrapping machines

– [Elisa Verga](#), Politecnico di Torino [ITALY]

Abstract:

Manufacturing companies are increasingly focused on producing high-quality, fault-free products that meet customer needs. From this perspective, designing inspection procedures that are effective in detecting defects occurring in different stages of production has always been a great challenge and a pivotal factor in being competitive in the market. Studies in the electromechanical field have shown that defects caused by operators during assembly operations can be predicted through specific conditioning factors relying on process and design complexity, and human behaviour. Recently, these defect prediction models have been used to obtain reliable a priori estimates of defect occurrence probabilities in short-run assembly manufacturing processes, for which traditional statistical process control (SPC) techniques are not appropriate. The research here presented investigates, for the first time, the development of a specific probabilistic model of defect generation for assembly processes of wrapping machines, and its subsequent use for designing effective and affordable inspection strategies. The production of wrapping machines can be classified as a short-run assembly process due to the high degree of customization, to such an extent that each machine may be considered almost unique. Accordingly, the planning of product quality inspections represents a remarkable problem in this industrial sector. In this view, this study aims at (i) identifying a relationship between process or design complexities and the generation of defects in the assembly processes of wrapping machines, and (ii) determining how the knowledge of the defects possibly occurring in the process can influence the design of inspection strategies. The study focuses on the assembly of a specific part of a wrapping machine: the pre-stretching device. In a first phase of the research, basing on experimental data, a prediction model relating the observed defects number in each workstation and complexity factors was investigated. The obtained results showed that the exponential behaviour of the model is confirmed also for wrapping machines, in agreement with what is reported in the scientific literature for other manufacturing sectors. Consequently, the prediction model can be used to obtain reliable estimates of the probability of occurrence of defective-workstation-output in each workstation. Basing on these probabilities, a second step of the research led to the definition of a probabilistic model aimed at the assessment of the effectiveness and cost of quality inspection. The proposed methodology plays a key role not only in the early design stage of new quality inspections for the assembly of new devices or new wrapping machines, but also in improving existing inspection strategies. In fact, through the use of the two indicators of effectiveness and affordability, the most critical workstations can be easily detected. As a result, inspection engineers are driven to identify alternative control procedures in order to make the inspection strategy more effective and cost-efficient.

Kaizen System implementation

– [Balázs Németh](#), Kvalikon [HUNGARY]

Abstract:

Kaizen (Change for better) is a companywide activity involving everyone in continuous improvement. There are several preconditions of successful Kaizen implementation at the companies. Kaizen needs first of all stability in the current operations, standard work is the foundation of Kaizen. Without standards, we cannot identify problems and cannot maintain performance. The second most important thing is feedback about the current performance. The third thing is problem awareness of people. If expectations, standards are set, and the people receive feedback about current performance, problems can be identified. If problems, or improvement opportunities are identified, then people should be empowered to change the current method to improve performance. There are different levels of Kaizen activities at the organization, individual Kaizens (suggestion system), Small group activities (Quality Circles), and Management level Kaizen. Kaizen is a cost effective way to improve organizational activities. Kaizen is said to be cost free, bottom up activity, but I believe that without Top Management support and clear definition of expectations and allocation of resources, Kaizen will not happen automatically. There are several preconditions of successful Kaizen implementation this presentation will discuss the most important preconditions (including proper processes, evaluation & feedback, review, knowledge dissemination..) of successful Kaizen implementation, based upon the author's several years consulting and research experience. The author will also propose a proven implementation program for successful Kaizen System implementation.

PARALLEL SESSIONS 2 – QUALITY APPLICATION SCOPES:

P2A – Companies

CHAIR: [Martin Luptak](#)

How the System Works

– [Sidsel Winther Storaas](#), Storaas Quality Consulting [NORWAY]

Abstract:

The presentation takes you on a journey to describe what is needed to create an integrated system for quality in any type of organisation. This includes cultural aspects such leadership, empowerment and output of teams and your people, and structural aspects as the actual components of your system, how to handle exemptions and control quality costs and the defence-lines you need to protect the integrity of your system. This thought provoking lecture will guarantee valuable output and key takeaways for reflection and implementation.

The safety of bakery products from cradle to full age or what we have been able to implement from quality systems for 18 years of practice

– [Alice Váchová](#), PENAM [CZECH REPUBLIC]

Abstract:

The presentation deals with the initial introduction and subsequent development of the quality management system in the biggest Czech bakery and mill company PENAM, a.s. during eighteen years. The safety and medical harmlessness of our products is a priority mission of the company. I would like to show in my presentation the development of bakery company in real life. Our company has been trying to gradually implement the requirements of the new standards and quality systems

from its origin to the present days. I would like to show what are the benefits that individual systems have brought to the company and how it has shifted from the point of view of product health safety. In conclusion, I would highlight the benefits of introducing new system requirements for food company and application of their requirements in the practical life of the production of bakery and mill products.

Quality is more Stracciatella than Dame Blanche

– [Bart Ceulemans](#), Continental Automotive Benelux Mechelen [BELGIUM]

Abstract:

To get into the IATF top 5 through a strategy map and an a quality culture initiative, you need Stracciatella ice cream. Based on this strong metaphor Continental plant Mechelen rolled out a successful program with a remarkable positive effect on all stakeholders. ‘Learning and Growing’, ‘Living Our Values Everyday (LOVE)’, ‘We don’t offer a job, we offer a culture’ are not just slogans. They pave the way to a bright future.

The impact of Quality Management on the Business of the company Metalac

– [Aleksandar Marković](#), METALAC [SERBIA]

Abstract:

The scope of this presentation is to show, in a historical survey of the development made in quality management and environmental management system, standardization in general as well, the positive impacts of these changes on the company’s business. Such positive impacts reflect improved business processes, higher effectiveness and efficiency, stronger competitiveness, better relationship with customers and stable long term partnerships that we have created. We obtained the first ISO 9001 certificate in 1994, among the first ones in former Yugoslavia, and how the standards amended and our company progressed we obtained certificate renewal and improved ever since. In 2015 we acquired the company FAD, factory of car parts, and we added the certificate ISO/TS 16949 to the list. Since Metalac has a strategic planning practice in its corporate culture according to the methodology of balanced scorecard, the implemented IMS (Integrated Management System) is very helpful in quality formulation of parameters and their monitoring. Also very helpful are formalized procedures and it reflects the quality of corporate governance. Further progress in standardization enabled us to pass audits of world-renowned auditing firms performed on Workplace Conditions Assessment principles, as well as to become members of the BSCI (Business Social Compliance Initiative) platform. These standards which primarily relate to international labor principles are great support in our relations with clients making us a stronger competitor, and above all they rely on our integrated quality management and environmental management system. Last but not least prospective of our balanced scorecard is learning and development, we invest a lot in it because well chosen, trained and motivated employees are the fundament of our future. Investing constantly in training courses and rewarding those who show to be outstanding, we stimulate continuous processes of improvement so maintaining our competitive advantages. Moreover, we take good care of the wider community and for a long time we have been recognized as a socially responsible company, this also has positive impact to our clients and partners.

Improving Quality Audits with Unconventional Tools

– [Susana Vicente](#), Xpand IT [PORTUGAL]

Abstract:

At Xpand IT, a CMMI appraised company, our Quality team had been using the traditional methods of performing quality audits which are all based on documentation and manual checklists. After

using them for 4 years, they had proven to be tedious since they are manual, time consuming and inefficient. Adding to that, they cannot be easily supported by evidence, resulting in misunderstandings and often, mistakes. We needed to try something new, so we adopted what is traditionally a software test management tool called Xray to manage our audits, and Xporter, to automatically generate the audit reports. The simplicity of these tools is that they are seamlessly integrated into our company's project management platform - Jira - and our document and knowledge base platform - Confluence - where the audit reports are stored. As the result of this approach, we confirm that these tools have significantly improved our quality management system by optimizing teamwork management by 250%, spending 3x less time on each audit and delivering better quality audit results. To start an audit, the only thing we need to do is perform an execution of our pre-made checklist. Adding to this, a huge benefit to using Xray is that it allows us to add comments, evidence and screenshots of what was observed, directly on the task. In case a non-conformity is identified, it is possible to record it right in Jira and assign it to the person responsible for resolving it. This way we can set deadlines and monitor its resolution, without ever losing track. Using Xray has also allowed us to perform an audit where all the information is related: the audit requirements, the audit plan, the checklist and a set of steps to follow, in order to improve the quality of the audit and maintain an expected result. In the end, following our defined workflow, we close the audit execution, generating an automatic report through a predefined custom template, in order to inform the interested parties of the final findings and the non-conformities detected. This report is also automatically stored in Confluence - our documentation and knowledge base platform. With the use of Xporter it is also possible to export the traceability from audit requirements to non-conformities or compliance rates, among others. Furthermore, we have seen significant improvement of the audit results - making them more detailed, reducing mistakes and failures, and generating reliable information, by avoiding information that is lost in exchange. We have standardized our process because all auditors can use the same checklists and criteria. Finally, because the process and information are available in real time, we have better team collaboration. Overall, we have seen that by adopting these unconventional tools, we have found a solution that has significantly improved our quality audits. Because this process is replicable, takes only 1 day to onboard, and is scalable within a large organization, we'd like to share our insights to the 63rd European Congress of Quality and help organizations achieve the same impact.

P2B – Data Driven Quality I

CHAIR: Paula Guimarães

Making Golden Decisions with Big Data and Advanced Analytics

– [Jim Duarte](#), LJDUARTE & Associates [USA]

Abstract:

Quality and Six Sigma have significantly more analytical possibilities for making consistently good decisions with Big Data and Advanced Analytics. Innovative advances in technology bring significant information and analytical capabilities to quality professionals in the realm of recent developments in Smart Manufacturing, Industry 4.0 and especially, Quality 4.0. With all the advances in data availability and advanced analytical tools, a collaborative effort is necessary among quality professionals, engineers, information technology (IT), operational technology (OT) and key decision makers in the organization. Too often the responsibility for data and analysis is “thrown over the wall” to IT with the expectation that “magic” will come back for making good decisions. In conjunction with “low volume”, “low velocity” data; “high volume”, “high velocity”

data needs significant collaboration. There needs to be agreement on how to best take advantage of “data at rest” from stored data as well as “streaming data” from sensors and connected devices; e.g., Internet of Things (IoT). Today, data bases, data clusters, data warehouses, historian systems and streaming data capabilities make it possible to see nearly a whole population quite rapidly, rather than sampling, to perform analytics. Smart manufacturing and Industry 4.0 can create data in tremendous amounts at unbelievable speeds. Quality professionals are key to making intelligence of this data through techniques proposed in the realm of Quality 4.0. Quality professionals in many organizations have the greatest knowledge of products, processes and customers. Bringing this knowledge together with engineers and computer professionals can build a Big Data infrastructure for making golden decisions. Not to be forgotten is the selection of appropriate analytical software, again, using a collaborative effort to make the most of the available data. In this presentation there will be: 1) examples of management leadership roles for organizing disciplines to gain benefit from Big Data and Advanced Analytics, 2) a description of the various roles of “data scientists”, 3) information related to methods for ensuring good data are collected and stored, 4) methods for formatting good data as well as providing access, to best meet the needs of data analysts, and 5) advanced analytical methods that in some cases are disruptive to current analytical techniques. Beyond just theory, case studies will be shown including text analytics for streaming social media data, Discrete Event Simulation, Analytical Network Diagrams, and machine learning predictive analytics from Big Data. A model for evaluating analytical software is included to assist in making the best choices to obtain maximum information from Big Data for making golden decisions. A matrix of roles for management and “data scientists” including types of software, hardware and introductory training will be provided as a take away to consider as a first step in creating a Big Data, Advanced Analytics, and data science infrastructure for integrating Quality 4.0 with Smart Manufacturing and Industry 4.0.

Agile Quality at Bosch Termotecnologia

– [Claudia Paiva](#) and [Catarina Santos](#), Bosch Termotecnologia [PORTUGAL]

Abstract:

The increasing digitalization of the working world and globalization of the markets are making product development and problem solutions more complex and less predictable. The term “VUCA” appears frequently in this context. VUCA stands for:

☑ V = Volatility: The nature and dynamics of change

☑ U = Uncertainty: The lack of predictability

☑ C = Complexity: The diversity of influencing factors

☑ A = Ambiguity: The blurring and/or ambivalence of the environment

Agile working is an answer to the challenges of this VUCA world! Put more simply: whenever the customer's requirements for a new product (or service) are unstable OR whenever the necessary knowledge to fulfil the requirements and/or to produce the product is not (yet) available, agile working is the medium of choice.

Towards the definition of a novel quality paradigm for Product-Service Systems

– [Federico Barravecchia](#), Politecnico di Torino [ITALY]

Abstract:

Product-Service Systems (PSS) are increasingly emerging as an important source of competitive advantage, allowing manufacturing companies to differentiate themselves from their competitors. PSS are integrated bundles of products, services and supporting infrastructures, which are jointly capable of fulfilling specific client demands over the whole product life cycle.

Despite the recognized importance of PSS issues and the extent of published research in this area, few studies have investigated the way PSS quality is perceived. Two basic research questions are analysed in this investigation: (i) What are the latent quality dimensions of PSS? (ii) Are the quality dimensions the same for different PSS? This investigation proposes an innovative approach to recognise PSS quality dimensions. The identification of PSS quality dimensions could be based on the extensive analysis of UGC leveraging tools and methodologies for big data mining. Big data analysis based on UGC may offer an effective way of investigating a large variety of PSS settings without incurring in expensive and time-consuming endeavours typical of the traditional empirical approach. The combination of evidence derived from the analysis of different typologies of PSS and the comparison of the results with currently dominant theoretical frameworks from the literature (e.g. product quality and service quality) may provide a new means to develop and empirically validate a generalizable and comprehensive set of quality dimensions for PSS.

Towards quality travelling: Development of an instrument for measuring perceived service quality in the public transport sector

– [Daniela Monteiro](#), Domp SA [PORTUGAL]

Abstract:

Given the relevance of customer satisfaction surveys to understand how customer perceptions and evaluations influence long-term business performance, measuring users satisfaction with an appropriate and empirically validated instrument that allows reliable conclusions to be drawn arises as mandatory. In the public transport sector, the improvement of a company's performance aligns with customer orientation and willingness to contribute to environmental preservation. Metro do Porto, as one of the largest light rail networks in Europe, values customer satisfaction and service quality, measuring them regularly in order to improve their service. Consequently, DOMP worked with Metro do Porto to develop a survey with the dual function of measuring the perceived quality of the provided service and evaluate customer satisfaction, as well as other theoretically related dimensions such as value-for-money, social image and loyalty, thus becoming a management tool. The perceived service quality scale, present in our survey, is based on the Portuguese Quality Standard NP EN13816: 2003 (adapted from EN13816: 2002) and NP 4475: 2008 (adaptation for light rail networks) and designed specifically for the client population, by conducting a pretest study which identified the most relevant items for measuring each dimension. After the validation of the scale, we investigated the relationship between global satisfaction, perceived service quality, social image and loyalty. We aimed to: (1) recognize which dimensions of perceived service quality emerged from the data, creating a measurement model of it, (2) identify predictors of global satisfaction and loyalty, and (3) test a mediation model to explain the relationship between perceived service quality and loyalty and between social image and the loyalty, with global satisfaction as the predicted mediator. The validation of the Perceived Service Quality Scale was performed through the random split of the global sample (n= 1639) into two smaller samples (calibration sample, n1 = 1000; validation sample, n2 = 639). Regarding the calibration sample, we conducted an exploratory factor analyses, using the Principal Axis Factoring method, and obtained a final solution of 21 items, aggregated in four dimensions. This structure was then submitted to a confirmatory factor analysis, using the Maximum Likelihood method. The results reveal the existence of four dimensions of service quality: Commodity, Frequency and punctuality, Perceived value and Ticketing, the aggregation of which resulted in the measure of Perceived Quality of Service. The fit indices that were obtained reveal a satisfactory model fit. Regarding objectives 2 and 3, we found that social image and perceived service quality are predictors of global satisfaction and loyalty. Furthermore, global satisfaction is a mediator (in a partial mediation) of the relationship between perceived service quality and loyalty and between

social image and loyalty. Additionally, this survey, and the data gathered with it, make it possible to deepen the analyses even further, such as creating clusters of clients according to their satisfaction levels and identifying the priority areas to work on. Therefore, this survey proves to be an extremely useful tool not only for customer acquisition, but also for the maintenance of client loyalty.

Measuring Tests

– [Thomas Fehlmann](#), Euro Project Office AG [SWITZERLAND]

Abstract:

Today's practices in software and system testing are quite strange. People count entries in bug inventories and mistake this for the number of defects. Test cases refer sometimes to code and sometimes to general behavior of software. It remains unclear to what piece of software a bug report refers to. Even worse, testers look at lines of code and define one defect if developers must fix this line – notwithstanding that code can contain many more defects than just one per line. And that one defect can spread over many lines of code. If the defect originates from design of a piece of software, the number of lines of code affected by the defect remains undefinable. Moreover, functionality sometimes can be implemented by hundreds of lines of code, containing dozens of defects, or simply by one concise statement providing the same functionality – whereas a maximum of one defect is countable. Thus, one key metrics for the quality of software, Defect Density, remains unmeasured. But you cannot control what you cannot measure. Luckily, functionality of software can easily be assessed and modeled, based on Functional User Requirements (FUR). Functional requirements exist not only for code written on purpose – in agile software development called user stories – for AI, for SVM, for cloud services, and for any standard software, they exist as well. Any software can be modeled by its functional requirements. The ISO/IEC 14143 [1] standard defines what FUR exactly are and how to model them. The key statement is that model elements cover everything that is needed to implement some FUR; thus, ISO/IEC 14143 defines granularity. The level of granularity depends from the user viewpoint; sometimes, general service considerations on the level of microservices are enough; sometimes, code-level granularity is required. The model is well-defined due to the granularity required by the FUR. The Proposed Talk: In this talk, we first present the concepts behind measuring functionality and how to apply them to software testing. Next, we explain the challenges of today's software engineering and what makes agile development different to traditional development cycles. Today, software is created with disciplined methods and deployed according the DevOps paradigm. Testing happens at a different stage today than it used to be and is partially detached from coding. Software quality is more important than ever; software defects are unacceptable in many domains. Airplanes and autonomous cars, as well as the Internet of Things, depend on correct and flawless functionality of software. Thus, if you cannot measure tests, you can no longer fly airplanes or drive cars. We outline how to organize and manage such measurements for highly complex and safety-critical technical systems. Finally, we show how this relates to the old quality discipline of Six Sigma and Quality Function Deployment, and how testing can be automated and become autonomous, thanks to this relation.

P2C – Health

CHAIR: [Maria José Freire](#)

The Use of Dynamic Interactive Data Visualization in Reducing Global Maternal and Child Mortality

– [Blanton Godfrey](#), North Carolina State University [USA]

Abstract:

In the past few years there has been an explosion in the data sciences especially in the tools available for dynamic interactive data visualization. Some of these tools help us explore the data and start to see important relationships. Other tools are better in creating a deeper understanding of what is in the data – what are the actual causes and effects. Other tools are better for presenting the results, explaining to wide-ranging audiences what we have learned. In this presentation we demonstrate some of the most advanced tools we are using to create a dynamic interactive data visualization and utilization laboratory – a “War Room” - supporting initiatives in 193 countries to reduce maternal and child mortality. What we are learning is that the value of this visualization lab may be more in learning from countries and regions around the world what works, why it works, how it works, and where it works rather than in us teaching others what we know about quality improvement. Discovering and sharing best practices throughout the world may be, by far, the best way to accelerate the reduction of maternal and child mortality.

Success factors for healthcare facilities for the 21st century

– [Gerd Hartinger](#), Geriatric Health Care Centres of the City of Graz [AUSTRIA]

Abstract:

In a retrospective analysis, the Geriatric Health Care Centres of the City of Graz (GGZ) have identified 10 success factors for the future of healthcare facilities, which should enable encouragement for the 21st century.

Quality as the foundation for excellence – taking a systemic perspective

– [Christian Mänder](#), B.Braun Aesculap AG [SWITZERLAND]

Abstract:

The presentation reflects the impact of quality indicators on the performance of companies, especially on production site level. The presented insights result from an extensive collaboration of Swiss based research and close contact with representatives from industry with a special focus on the pharmaceutical industry.

Statistical tools applied to domestic medical devices data to evaluate their quality

– [Manuel Matos](#), Instituto Superior de Engenharia de Lisboa [PORTUGAL]

Abstract:

Medical devices are nowadays available and used in large quantity by the population to evaluate their health. Nowadays, medical devices are sold in supermarkets at very reasonable prices. This availability has the advantage to promote the capacity of the population to monitor their health in a diary basis or even several times a day. Among the best-selling devices are digital media such as clinical thermometers, blood pressure meters and oximeters. Most of these devices are manufactured in Far East countries and typically have reduced usage instructions. Very often, the data from medical devices are used for making health-related decisions. Based on the readings made by the users, they make decisions that may involve to going, or not, to medical appointment, take, or not, permanent medication or even a visit to the hospital. The measures taken from domestic medical devices are today a critical decision factor in public health [1]. To evaluate the

data produced by domestic medical devices we have performed several repeated measures using the same medical device in the same volunteer. The measures are repeated using other medical devices from different brands, in the same volunteer and in the same environmental conditions. The measures are realized as quickly as possible to maintain the vital signals in the volunteer. The results were statistically analyzed using several statistical tools to evaluate the quality of the measurements. Among others, Dean-Dixon test for outliers, aberrant t test, F test, hypothesis testing, have being used to select and evaluate the domestic medical devices data. Of the clinical axial thermometers tested for body temperature measurements, 55 % present the same accuracy. In the case of infrared thermometers this value drops to 38% of identical accuracy. On weighing instruments, 34% present identical levels of accuracy. For sphygmomanometers, it was found that only 25 % of the results were statistically identical to the precision of both systolic pressure and diastolic pressure. In oximeters it was found that blood oxygen saturation and beats per minute presented 53 % of statistically identical results. In the majority of measurements the sequential data obtained have low standard deviations that leads to a high precision in measurements. Because the presented high precision and also because the difficulty of the majority of population to clearly identify the difference between precision and accuracy, the results are considered very good by the users This leads to an exaggerated confidence in these domestic measures and also to a uncritical decision-making by the users. Because of the potential effects of these measures in public health, legislative measures should be taken to mandatory evaluate the quality of the measurements made using domestic medical devices. Also the increase of metrological requirements for these equipment must be considered to consequently better protect the users in Europe. [1] Ferreira, M. do Céu. The role of metrology in the field of medical devices. Int. J. Metrol. Qual. Eng., 2, 135–140, 2011.

Personnel Certification in Quality Management in Healthcare – a Success Story in Romania

– [Liliana Nitu](#), Romanian Association for Quality [ROMANIA]

Abstract:

Quality management in healthcare became, in the last period, one of the most important topic in Romania. The interest for quality in healthcare services started to grow continuously after 2010, due to governmental involvement, including the establishment of the National Authority for Quality Management in Healthcare as an accreditation authority in healthcare. In 2010-2011 tools for assessing the quality of health services were developed at the national level, and in 2011 started the first accreditation cycle of healthcare services providers, which ended in 2016. Based on the results of the first cycle of accreditation, the accreditation standards were improved and up-dated and now is on-going the second accreditation cycle, with higher quality requirements. In this context, one of the most important topic was to ensure qualified personnel in quality management in healthcare. In the framework of an EU Project, Romanian Association for Quality, as the leading organization in quality personnel certification in Romania, and as Romanian Representative of EOQ, was involved, in partnership with others players, in developing a new EOQ Certification Scheme for Quality Manager in Healthcare, which was approved at EOQ level in 2014. The paper will present the advantages of applying for certification following the EOQ Certification Schemes in healthcare, how the scheme is working in Romania and the results of this Certification Scheme in improving the organizational culture in organizations which are providing healthcare services.

P2D – Education

CHAIR: [Luís Fonseca](#)

A New Instrument to Improve Quality in Education

– [José Sarsfield Cabral](#), University of Porto [PORTUGAL]

Abstract:

This presentation provides a brief overview of the recent development of education around the world, with particular reference to the widespread expansion of higher education. Some of the consequences and problems for quality assurance in higher education arising from this growth are mentioned, as well as the path that was followed towards the widespread accreditation of educational programmes and institutions (external quality assurance). Taking into account the "old" principle of Quality Management - Fact-Based Management - and given the huge amount of data and variables of different types and origins currently available to educational managers, Learning Analysis is briefly presented, and signalled as a tool with great potential to help institutions to improve their internal quality and, consequently, their educational performance.

Digital Learning – Key Success Factors and Examples

– [Ansgar Carbow](#), DGQ [GERMANY]

Abstract:

Focussing on three aspects concerning digital learning:

- *Key success factors in designing, developing and providing digital training and educational courses*
- *Combining online and standard on site/ classroom training*
- *Some examples of digital learning tools (chatbot, AI, learning app).*

Holistic Approach of Quality Standards and Excellence for an Entrepreneurial Ecosystem University

– [Edmond Hajrizim](#), UBT – University for Business and Tehnology / QK – Quality Kosova [KOSOVO]

Teaching Quality Management to Industrial Engineering and Management Students: How to improve their learning experience?

– [Helena Alvelos](#), CIDMA/DEGEIT, University of Aveiro [PORTUGAL]

Abstract:

According to the Institute of Industrial Engineers (IIE, 2019) "Industrial and systems engineering is concerned with the design, improvement and installation of integrated systems of people, materials, information, equipment and energy." Industrial Engineering and Management (IEM) is about choices and one of its most distinctive characteristic is flexibility. As such, industrial engineers are most probably the ones that are specifically trained to be specialists in productivity and quality improvement, in a large range of organisational settings (like automobile manufacturing, healthcare, leisure, education, among others). Is then understandable that most university programs in this area include courses on Quality Management (QM). The Integrated Master in IEM offered at the University of Aveiro (UA) offers two of them. But what should these courses be about and how to teach them in a way that students learning experience is indeed relevant for their training as industrial engineers? The IEM/UA Quality Management courses have been designed based on the assumption that Quality implementation is paramount for an organisation's sustained and continuous success. An option has been made to select, from a set of programmatic contents, those that seem to be the most relevant for students to be able to perform adequately in the quality area in different types of organizations. As such, the courses address

mainly: (i) an overview of QM development over the last century; (ii) a set of different quality tools and methodologies, ranging from the seven basic tools to statistical process control, design of experiments and 6 sigma, which can be used in products/services and processes design and realization; (iii) the Portuguese quality system and (iv) the different standards existent to implement integrated management systems. The teaching methodologies adopted include the illustration in classes of the different themes with practical examples. Two to three assignments are proposed to students in each one of the courses, where they should apply the discussed tools, methodologies or guidelines to organisational contexts. The goal is to give students the opportunity to effectively see how QM can be applied in real life and the benefits coming out from such application. In this paper, we intend to discuss our QM teaching options by presenting the main challenges we face in trying to offer students the most fruitful learning experience. We assume that the assignments proposed to students are an effective way of promoting students' involvement with the themes covered, helping them to have a real sense of how and why should QM be practiced in organisations. We then resort to the assignments delivered by students along the last ten years to illustrate our assumption and conclude that they indeed contribute significantly for improving students' learning experience in QM courses. Finally, the connection between students' experiences in QM and the holistic approach to IEM is addressed, considering the ultimate objective of the IEM/UA: The improvement of the world that surround us. Acknowledgements: This work was supported by Fundação para a Ciência e a Tecnologia (FCT), through CIDMA within project UID/MAT/04106/2019 and through CIPES under the project UID/CED/00757/2019.

Seven Questions About Quality in Higher Education

– [John Dew](#), The University of Alabama [USA]

Abstract:

Many quality professionals would agree the measurement of quality begins with an understanding of the mission of an organization and is followed by an examination of specific processes that provide the results that enable the organization to realize its mission. The field of higher education poses some interesting problems when it comes to discussing the quality of higher educational institutions and their processes and outcomes because the function of higher education responds to so many different potential missions. This presentation will explore seven potential missions that higher education institutions may attempt to meet and will consider the implications for defining, measuring, improving, and sustaining quality based on these seven different types of missions.

P2E – Quality New Ideas and Concepts II

CHAIR: [Ana Paula Ramos](#)

What Companies practising Quality-based Management are doing regarding Environment: An Empirical Inquiry

– [Narayanan Ramanathan](#), SRF Limited [INDIA]

Abstract:

Environment – by whatever name called – circular economy, sustainability, ecology, or more generally, planet earth concerns – has not occupied the mainstream of quality yet. Its position in the criteria of awards such as the Deming Prize or the Malcolm Baldrige has been strengthening but gradually, and stays somewhat in the periphery. Business organizations pursuing quality-

based management to a respectable degree exhibit certain characteristics such as high customer and employee satisfaction, successful new products, high efficiency, vibrant improvement activities, observably high capabilities and resilience, and in some cases financial turnaround from difficult situations, or even vigorous practice of some forms of social responsibility. It is less common though to witness any exceptional outcome or capability with regard to environmental concerns. Companies practising quality do have some successes in contributing to environmental matters, using their expertise in making improvements. Nevertheless it would seem that environmental matters are not central to the process of setting their objectives. Neither the capital markets nor the award criteria seem to demand much in this direction. Nor is there much inducement from most governments, though United nations and activists have pursued many options. The paper explores environmental activities reported by some recent Deming Prize winning companies and a conglomerate which operates on the Malcolm Baldrige Model, deriving information both from literature and from personal interactions. What do such companies do, or can do with respect to product development, conserving materials, reducing energy demand, treating effluents, recycling waste, getting certified, and so on? Some actual projects of these companies would be described, with data. What are the patterns of these activities? Where in the mainstream objectives of these companies do planetary concerns stand? The paper also ends with suggestions for award criteria and companies to reorient their objectives and activities to contribute to the society and the planet even as they chalk out paths for thriving in an evolving world.

Generic model of integrated management system

– [Miroslav Drljača](#), Zagreb Airport, Ltd. & University North [CROATIA]

Abstract:

More and more organizations decide to model and implement an integrated management system by integrating the system and certifying it in accordance with ISO standards. The more complex integration of the management system is harder to model, document, implement and manage them. Each system that implements integration involves a certain management model, which essentially contains all the elements of the management function: planning, organizing, resource management, decision making and control. In complex integrations, such a situation could cause the entropy of the management system. If this did not happen it was necessary to design a generic model that encompasses all the elements of the management function and promotes the process approach. This is the result of efforts to simplify integrated management system models and facilitate the management of such systems. Prior to the appearance of Annex SL there was an attempt to create a generic model of management system, and the fundamental difficulty was that each ISO standard for management systems had a different structure. By adopting Annex SL and revision of ISO 9001:2015 and revision of other ISO standards for management systems, the preconditions for creating a generic model of integrated management system were created. The subject of this paper is a generic model of integrated management system. The main purpose of this research is to create a generic model of integrated management system that will be applicable to modeling integrated management systems in organizations in practice. By applying general and special scientific methods of cognition, the author introduces an original model of integrated management system, applicable to organizations in practice.

Holistic Rediscovering Quality related Concepts – making ‘Quality the community’s business’

– [David Hutchins](#), David Hutchins Innovation Limited [UNITED KINGDOM]

Abstract:

The title of this section is entirely appropriate for the author of this paper David Hutchins, as 2019 is the year when, David is celebrating the 50th anniversary of his membership of the British Chartered Quality Institute (formerly the Institute of Engineering Inspection), and its 100th anniversary! Also David's then burgeoning career as a Quality Consultant, author, coach and mentor in the quality sciences and disciplines. Given all that has been going on in the world politically these past three years and the fact that David Hutchins has just published a new book 'Quality beyond Borders', the paper draws attention to the possibility that 'Quality' as a business science and with the emergence of Quality 4.0 it is at a further point of inflexion right now and provides some pointers as to where it might be redirected. As a Chartered Production Engineer in the 1950s, David was at that time he first became involved in the process of Quality Improvement, responsible for the overall Quality of Production in the high-volume manufacture of high precision petrol and diesel Piston Sets. David implemented company-wide Gauge R&R, SPC and other quality concepts at a time when, in the West, Quality was perceived to be primarily a post-production inspection process. This paper begins with an explanation of his reaction to the devastating impact that the initial invasion of Japanese products had on British and other Western Industries. This included the impact on automotive, shipbuilding, and brown goods. His discovery of the distinct difference between the approach to Quality perceived in Japan with that of the West will be explained. The paper shows that over the intervening decades, how this led to the sophistication of conformance related Quality Management systems in the West, originating with the Allied Quality Assurance Publications. This eventually led to the publication of ISO 9000 and its derivatives on the one hand, and the business performance related approach which developed in Japan and the Far East on the other. It shows how this latter, resulted in highly participative approaches to business performance improvement, the origins of what many in the West today refer to as 'Lean' and 'Six Sigma'. The paper then projects a forecast as to how these various fragmented approaches might be made to merge in the future. The impact of the concept 'Quality 4.0' and the possible core role of EOQ, and its member FMOs (including the CQI) to become the lighthouses which can guide our industrial organisations to maximise their potential and to bring 'Quality' to the heart of our society for the future good of all.

The Quality Movement: Where are we going? Past, Present and Future

– [Xiaojing Sun](#), Shandong University [CHINA]

Abstract:

Great changes are taking place, and it is the right time to reflect on the quality philosophy, in order to get a deeper understanding of the quality movement and hence improving our possibilities to diagnose and discuss the future direction of the movement. This research firstly reviews the quality principles, practices, methods and tools according to the timeline, thus drawing a comprehensive and valid picture of the evolutionary history of quality management. Then, a systematic literature review of quality management research since 2001 was conducted, and the first 18 years of the new millennium were divided into three phases. Through the comparative analysis of the three stages by using VOSviewer, which offers text mining functionality that can be used to construct and visualize co-occurrence networks of important terms extracted from a body of scientific literature, this research describes how research on quality management has evolved since the 21st century. Finally, through extensive document studies (e.g. articles, research reports, standards, publications, summary documents of world-class excellent enterprises' quality management practices, etc.) and interviews with quality management researchers and practitioners, this research proposed the following six future directions in quality management: First, no longer about defect reduction, but focuses on value enhancement. Second, no longer product life cycle, but service life cycle. Third, no longer separated, but integrated. Fourth, data will become the core

resource for quality management. Fifth, there will be significant changes in the methods and tools of quality management. Sixth, the quality control power of focal companies over other actors in the supply network will be further enhanced.

A Project for Methodologies Integration to Continuous Improvement Process

– [Helena Navas](#), Universidade NOVA de Lisboa [PORTUGAL]

Abstract:

Nowadays, high quality standards are so deeply inserted in organizations' core that their customers may think they know its meaning or how to identify if a certain product complies to those standards. Therefore, it is important to keep improving business processes, since organizations rely on them for a closer connection with their customers. However, business versatility, diversity and dynamics lead to an uniformed communications network between organizations since competition and performance demand is higher. Thus, the constant need to be in contact with the client and the capacity of meeting their needs more efficiently are important values to an organization as far as value creation concerns, as well as sustainable competitive advantage.

PARALLEL SESSIONS 3 – THE QUALITY WORLD:

P3A – EOQ, European Organization for Quality

CHAIR: [Torolf Paulshus](#)

What happens in EOQ?

– [Torolf Paulshus](#), EOQ [NORWAY]

The EOQ Product Manager function

– [Avelino Brito](#), AEC [SPAIN]

PRU Updates

– [Thomas Votsmeier](#) [GERMANY] and [Cornelia Butnaru](#) [ROMANIA]

P3B – IAQ, International Academy for Quality

CHAIR: [Elizabeth Keim](#)

Report from the IAQ Planet Earth Concerns Think Tank: How Companies can Apply Quality to tackle Planet Earth Concerns – a White Paper

– [Ram Ramanathan](#) [INDIA] and [Willy Vandenbrande](#) [BELGIUM]

Rediscovering Quality in the Digital Age: Quality as a Socio-Technical System

– [Gregory H. Watson](#) [FINLAND]

How to Get Top Management Attention to Quality

– [Lars Sörqvist](#) [SWEDEN], [Gregory Watson](#) [FINLAND], [Blanton Godfrey](#) [USA] and [Elizabeth](#)

[Keim](#) [USA]

P3C – ASQ, American Society for Quality

CHAIR: [Benito Flores](#)

ASQ Update and Global Outlook

– *Bill Troy, ASQ CEO [USA]*

Quality 4.0 Takes More Than Technology

– [Benito Flores](#), ASQ Chair and Jan Nöcker, BCG Associate Director [MEXICO]

Networking Session

P3D – CAQ, China Association for Quality (SINO-EURO Quality Forum)

CHAIR: *Orlando Ferreira*

Opening Session

– *Duan Uonggang, CAQ Vice President & General Secretary*

– [Francisco Frazão Guerreiro](#), APQ President

The Application and Practice of Quality Management of Fiber-optic Gyroscope and its System Product

– *Huang Jixun, Beijing Aerospace Times Optical-electronic Technology [CHINA]*

QMS implementation: expectation versus reality

– [Ana Fernandez](#), SAFEMODE (Fidelidade Group) [PORTUGAL]

Test Scheme and Practice of Intelligent Factory

– *Sun Jichao, HollySys Technology Group [CHINA]*

Innovation Management at EDP Distribuicao under NP4457 Standard

– [Ricardo Santos](#), EDP Distribuição [PORTUGAL]

Product research and development quality expert platform based on artificial intelligence

– *Liu Dan, Gree Electric Appliances, Inc. of Zhuhai [CHINA]*

Challenges and strategy ACC in internationalisation in the Chinese market

– [Luís Miquel Ferrão](#), Amorim Cork Composites [PORTUGAL]

Delivery of certificates to the speakers

– *Duan Uonggang, CAQ Vice President & General Secretary*

Photo taking

P3E – QCI, Quality Council of India

CHAIR: [Ravi Prakash Singh](#)

Introduction

– [Ravi Prakash Singh](#), QCI [INDIA]

India & Quality

– [Rajesh Kumar Maheshwari](#), PPID, QCI [INDIA]

Zed Maturity Assessment Model

– [A. Raj](#) & [Mohit Singh](#), ZED, QCI [INDIA]

Industry Perspective: Schneider Electric

– [Satish Katti](#), Schneider Electric Pvt. Ltd. and [Ramanand Nagendra Shukla](#), ZED, QCI [INDIA]

Spiritual India

– [Rajesh Kumar Maheshwari](#), PPID, QCI [INDIA]

Closing Remarks

– [Ravi Prakash Singh](#), QCI [INDIA]

Day 2

PLENARY SESSION – FUTURE QUALITY

CHAIR: [Zoran Lekic](#)

Quality 4.0 – A new dawn for facing the Digital Era

– [Mohamed Zairi](#), [UNITED KINGDOM]

Abstract:

The 4th Industrial Revolution continues to disrupt organizations in both private and public sectors. The effect of digital technology is unprecedented and radical in its impact. Organizations are, on the one hand, expected to revisit fundamentally their approaches to deal with their customers, drive value creation and restructure to maintain focus and respond in an agile manner. On the other hand, the principles of longevity which have served successful organizations for centuries are no longer valid. Survival and sustainability are now heavily dependent on the ability of organizations to constantly renew their 'business model'. Modern organizations operating in the digital era are expected to operate as open dynamic systems through connectivity, collaboration, co-creation and leveraging. The preservation of any organization's future is no longer to be assessed in terms of 'build to last' but rather 'build for relevance'. With these emerging challenges in mind, several questions need to be answered including the relevance of Quality as we know it in the digital era, whether the emerging mindset of 'build for relevance' requires a new quality philosophy and the extent to which the concept of Quality 4.0 is viable and perhaps happening. The keynote presentation will focus particularly on one aspect of Quality 4.0 (referred to as Customer 4.0). The arguments presented will demonstrate that the most significant developments in Quality since the mid-1990 are related to the customer. Customer 4.0 is also referred to as the 'Age of Customer Happiness'. The presentation will draw from experiences in the UAE Government.

Quality 4.0 and Business Excellence

– [Joseph A. DeFeo](#), Juran Institute [USA]

Abstract:

New manufacturing technologies are making the quality management system change rapidly and quality professionals must rethink its purpose. Thanks to new technologies like manufacturing apps, defect free production is now possible. Defect free means less inspection, less audit, less corrective action and even less quality departments staff - unless you become well versed in the technology. Being well versed in the new technologies will enable quality professionals to sustain your career by becoming the "implementers" of the new techniques. In this session I will discuss how quality professionals can take the lead and drive quality management to new heights.

Quality & Brand Experience

– [Paulo Pereira da Silva](#), RENOVA [PORTUGAL]

PARALLEL SESSIONS 4 – EMERGENT QUALITIES

P4A – Data-Driven Quality II

CHAIR: [Ulf Gustavsson](#)

Paradigm Shift in Quality Management

– [Benedikt Sommerhoff](#), DGQ [GERMANY]

Abstract:

Quality Management in the view of many leaders is today a conservative, backwards oriented, precarious, ineffective field with low acceptance and a problematic image in a world that is dramatically changing. It urgently needs paradigm shifts, change, new perspectives, new approaches, new roles and new tools.

Main challenges are: How do we gain efficiency? Because we have too many failures. How do we gain acceptance? Because our image is poor. How do we cope with new requirements and potentials of the world 4.0?

Paradigm shifts in society, technology, markets, organisations and management concepts call for paradigm shifts in Quality Management: From QM and QA in one hand towards differentiation between QM and QA. From integration of HLS-subjects towards integration of QM with compliance, innovation. From independent QA departments towards integration of QA into the value creation processes. From standard, audit and certification focus towards product quality focus. From management system focus towards organisation development focus. From prevention towards quick reaction. From methodology focus towards result focus. From our classical quality definition towards a new concept of quality.

How digitalization and data liberation is shaping future business

– [John Markus Lervik](#), [NORWAY]

Abstract:

Big industrial companies are awash in digital initiatives and proofs of concept, but generating significant value from these digitalization efforts will only come once they can be rolled out at scale. Companies that adopt this strategy now will set themselves up for success. John Markus Lervik, CEO of Cognite, the fastest-growing technology company in Scandinavia, will discuss the hybrid approach shaping the industry of the future, including:

- 1) hybrid teams - how future teams will combine industry and data science competence*
- 2) hybrid models - how physics-guided machine learning is set to deliver value at scale*
- 3) hybrid operations - how engineers with instant access to the right data in real-time will optimize daily operations.*

Process Analytics for Quality Improvement

– [Marco Reis](#), ENBIS [PORTUGAL]

Abstract:

The landscape of Quality Improvement is changing as industrial processes evolve and become more interconnected, data intensive, spanning different scales of time and space (multiscale) and exhibiting non-stationary behavior [1]. The fourth industrial revolution raises new challenges and Quality Improvement methods and tools need to evolve and adapt to the new conditions, in order to keep the pace of technology and maintain their key role in sustaining the progress of industry

towards higher standards of quality, safety, efficiency and environmental sustainability. In this talk, some of the aforementioned challenges are addressed, together with references to work carried out in the author's research group to address them. In particular, the fields of process monitoring, quality prediction and improvement strategies are targeted [2].

References

[1] Reis, M.S., R.D. Braatz, L.H. Chiang, *Big Data - Challenges and Future Research Directions, Chemical Engineering Progress, Special Issue on Big Data (2016) 46-50.*

[2] Reis, M.S., G. Gins, *Industrial Process Monitoring in the Big Data/Industry 4.0 Era: From Detection, to Diagnosis, to Prognosis, Processes, 5,35 (2017) 1-16.*

Quality 4.0

– [Avelino Brito](#), AEC [SPAIN]

Abstract:

Not having had the time to assimilate and enjoy the arrival of the information and knowledge society, we are fully immersed in the 4th industrial revolution. New technologies and new values are sweeping away the rules of the game. Companies have to face new challenges. So do the board of directors, managing directors, quality managers and everyone else. New skills have to be achieved, new roles have to be carried out, and new and stunning opportunities could give the quality manager a 4.0 boost. Inside the Spanish Quality Association a Think Tank has faced the management challenges in the 4.0 era. Starting from the historical evolution of the quality function, trying to understand the impact of the new technologies and the new values, I'll present the insights about the future of the quality function that arose in the AEC Thin Tank exercise.

Software as a tool for improvement of management systems

– [Miloš Vasić](#) and [Branko Vasić](#), University of Belgrade [SERBIA]

Abstract:

Management systems, for many years, experience increasing expansion. Almost all market-oriented companies have implemented some of the ISO standards (ISO 9001, ISO 14001, ISO 27001, ISO 45001, ISO 55001 ...). On the other hand, with the parallel development of information technologies, there is a need to develop appropriate software support for document management and processes management. Literature has always recognized the need for parallel development of the information system and management system, but, what is nowadays, is the development of a software solution in the service of the management system. Those modern IT solutions brings in a new ways in runing management systems and measuring management system effectiveness.

P4B – Quality Research

CHAIR: [Margarida Saraiva](#)

How Applied Research Can Support Quality Movement

– [António Ramos Pires](#), RIQUAL [PORTUGAL]

Abstract:

The business environment is very focused on short term results, which impact negatively any management system in general terms and the quality ones specifically. The increasing complexity of management and technology creates many situations of anxiety and despair, which often translate into abandonment of proven techniques and methodologies, leading to intuitive approaches. But complexity requires more techniques and methodologies not less. Many studies in the quality management show very varied and sometimes contradictory results, so it is important to deepen the research, both to better understand the positive impacts of quality and its shortcomings. The nature, size and speed with which technological and social changes occur place the need for adaptation of existing techniques and methodologies, but also the urgency of developing new ones. There is a large consensus that the earliest phases of product life cycle have a huge impact on quality (most problems are born in) and competitiveness (round 80% of life cycle total costs stay determined). The design process implies the progressive reduction of uncertainty, which can only be achieved with higher levels of knowledge. The internet has a huge offer of information, shopping, entertainment and interaction services (From IOP to IOT and IoE? (Internet of Emotions)). The big data availability can create the illusion of knowledge (data is not information and information is not knowledge). So, in this presentation we argue that more applied research is needed to support the quality movement. Competitiveness moves rapidly from the areas of production / service delivery to those closest to the market, such as identifying needs and transposing them into products and services. Thus, quality must focus more on these areas, refining existing techniques and methodologies and creating new ones. Unfortunately, innovation is not a panacea for quick and easy solutions, but a complex process with many variables and interactions between areas of knowledge, technologies and functional areas of organizations. Even in the areas of process control, new techniques need adaptation and others need to be new to deal with new realities such as data analytics (At-the edge; In-stream; At-rest). The design of many internet products assume they: must be shocking and impressive; must trigger successive emotional states; lead to using, buying, playing, or interacting more; keep the user eager to continue. The quality movement faces a serious challenge: how to design in an ethical perspective these types of products and which techniques and methodologies are available do support design activities and what development is needed. Finally, we summarize the challenges facing research and development in the area of quality management, identifying trends, challenges and perspectives. To meet these challenges, quality professionals need to recast their training and associations need to rethink their social intervention.

A Systematic Review of Quality Improvement Education for Medical Students:

What are Institutions Teaching?

– [Anila Rao](#) and [Grace Brannan](#), McLaren Macomb Hospital [USA]

Abstract:

The publication of the Institute of Medicine's report, Crossing the Quality Chasm, in 2001 shined a light on the broken American healthcare system and the need for Quality Improvement. It also identified critical areas of change. Since that time, the different medical education accrediting bodies have incorporated the findings of the report into their requirements for training curriculum. As an example, as part of undergraduate medical education in the US, medical students must meet the Association of American Medical Colleges' Entrustable Professional Activities which outlines a list of characteristics a student must meet to be eligible to enter residency. Quality Improvement is one of the required activities. Its importance is further emphasized in residency by the Accreditation Council for Graduate Medical Education, or ACGME, where Quality Improvement is part of the Core Program Requirements residents need to meet. In addition to didactic learning, residents are required to engage in Quality Improvement projects. Earlier studies indicated general

recognition of the need and benefits of Quality Improvement training. However, challenges such as a lack of qualified educators, were also identified by these studies. Our goal was to determine the Quality Improvement content of medical education curricula in the US and international settings. This inquiry was part of a comprehensive systematic review to determine current training and curriculum opportunities and challenges in teaching quality improvement to medical students. Publications in PubMed, EMBASE, and SCOPUS from January 1, 2009 to December 31, 2018 were identified using a structured search strategy. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses, or PRISMA, guideline was followed. From 3,889 peer-reviewed journal citations identified from the three databases, this systematic review identified 29 studies with Quality Improvement training or interventions involving medical students. Various Quality Improvement approaches and tools were used in the different studies. Predominantly, most curricula included the Plan Do Study Act (51.7%) followed by root cause analysis (34.5%) and basic principles and tools (31.0%). Quality Improvement was predominantly taught as a mandatory rotation or embedded in a mandatory rotation/curriculum (51.7%). This study showed a variety of curricula using different tools and approaches. In some of the studies, Plan Do Study Act was used to implement projects that were observed to contribute to some level of organizational change and patient benefit. The different tools and approaches were taught across all years of medical education. Factors including lack of clear curricular structure, interest, and time constraints decreased the effectiveness of curricular implementation. As there is a wide range of curricula to teach, students are entering residency with variable QI knowledge and experience.

The Chain reaction of Quality Challenges in Governmental Services

– [Hasan Alsharqi](#), QPlus for Inspection and Quality Solutions [BAHRAIN]

Abstract:

This research aimed to identify the main challenges of creating a quality culture in governmental services of the Kingdom of Bahrain. With a mixed methodology that combines qualitative and quantitative methods, a survey instrument was developed using items from the literature review and experts' interviews. One hundred of quality professionals participated in the questionnaire using a web-based survey (Survymonkey.com), all the participants were working with the government from different Ministries and Authorities, the sizes of the organizations differ from below 300 employees to more than 3000 employees. The results revealed that 57% of the quality management systems used in Bahrain is based on the ISO 9001 framework followed by the School quality management system (31%), which is a national regulatory assessment framework used to evaluate Schools, Universities and Training institutes in Bahrain. The primary results pinpointed that challenges are a combination of two variables in governmental authorities;

1- lack of management's commitment to quality requirements and;

2- lack of people engagement with the quality management system initiatives.

The research also revealed that both challenges are presented in multidimensional aspects; For instance, management commitments have characters containing (lack of providing resources to people including training requirements, lack of supports and motivations, an inconsistency of messages delivered by managers to people in the context of quality management). Whereas in people's engagement, we had found that most challenges are lack of participation of people with the quality initiatives, where people are not feeling responsible for quality improvements, and they have a high resistance to accepting changes proposed by the quality management system. Moreover, People do not comprehend the relationship between quality management and

customer satisfaction. And they are less motivated in implementing quality requirements. After testing the reliabilities of each variable, sampling adequacy, and factor analysis, the variables were examined to identify the correlations and regressions. The result shows that correlation between management's commitment and people's engagement is significant; with a positive linear direction. Furthermore, the primary outcomes show that for enhancing the suitability of Quality Management to a governmental authority, the focus should be through strengthening the people engagement; and to increase the engagement of people, the organization needs to improve the commitments of management towards the quality requirements. By these results, overcoming the challenges in creating a quality culture in governmental authorities can be initiated by enhancing the leadership roles, providing the required resources to people, motivating people to implement the quality requirements; besides managers shall walk the talk to have credibility in their messages. Consequently, it is anticipated that the engagement of people will be improved and the resistance to change will be minimized and controlled. The indications of that transformation will be reflected by seeing people are having more confidence in quality suggestions and initiatives, a sensation of belonging, and ownership of quality improvements. Consequently, and as a result of that equilibrium, the suitability of the quality management system to government services is expected to be improved.

CAF's implementation by Portuguese municipalities

– [Carla Negreiro](#), Instituto Politécnico de Bragança [PORTUGAL]

Abstract:

In 1980's, the theme of quality integrated the concerns of the public sector and Portugal didn't remain alien, assuming a paradigm change: from bureaucratic and centralized administration to a service administration, decentralized and oriented to total quality. Among various approaches, the Common Assessment Framework (CAF) stood out. It is a European model that assesses organizational performance, with reference to the Principles of Excellence and focused on continuous improvement. In addition to being free, it is specific for the public sector and is implemented in Portuguese local authorities. It is important to reinstate CAF to analyse the results obtained by Portuguese municipalities CAF users and find out how these results and subsequent impacts interact and determine quality enhancement of organizations. Accordingly, the research question was: What is the impact of CAF implementation on the quality of public services provision by Portuguese municipalities? The main general objectives are based on the verification of the following: the effectiveness of CAF implementation; the level of integration of the CAF model (nine criteria of the model and eight Principles of Excellence); the results achieved and the perceived impacts through the implementation of the CAF; and the contribution of the CAF model in the perception of the overall quality improvement achieved. The research strategy underlies a naturalistic paradigm, adopting a qualitative approach through semi structured interviews with those in charge for quality in the Portuguese municipalities CAF users (in 2018), adequate to obtain data on the reality of municipal quality. In this context, and after assessing the impacts achieved by the Portuguese municipalities through CAF's users, confirming the theoretical assumptions, it was possible to achieve the seven objectives previously formulated and to execute the initial research question. Actually, the implementation of the CAF has an impact on the quality of the public services provision by the Portuguese municipalities, highlighting the following evidences: CAF is mainly located throughout the municipal organization and in full; as results obtained via CAF stand out the actions and improvement plans, good practices, citizen/customer satisfaction and stakeholder satisfaction, continuous improvement and a quality assessment and measurement system; about the impacts achieved through CAF they emerge in the achieved results, in the improvement of the quality in the organizations, in the change of culture of the

public sector centred on the citizen and towards the excellence, as TQM tool facilitator, in the practices of bench learning and benchmarking, however, the sustainable improvement of the organization and the CAF as a bridge between quality management models did not have the same unanimity; finally, the implementation of CAF model's requirements contributed to the improvement of the overall quality achieved in a large majority of Portuguese municipalities. Despite the difficulties experienced, concerning the scarce existing research about CAF's impacts and the compression of the number of municipalities under study, it has been shown that - for the first time and from the present perspective - CAF contributes to the set of results and impacts listed in the revisited theory and with this study they were validated.

Approach System of Systems (SoS) for Quality Lean Management System (QLMS)

– [Vadim Lapidus](#), LLC Centr Prioritet [RUSSIA]

Abstract:

The report develops ideas stated in the previous reports presented at EOQ Congresses and other international events. Integration concerns management systems in complex mega-systems – supply chain management, vertically integrated structures, product life cycle stages, as well as integration of management systems of individual organizations. All these aspects usually were considered in isolation, without clear understanding of their interaction. But everything changes so fast that now we realize that all these items are interconnected and should work together for integrated results. A mega-system is needed for integration, and it should be dedicated to a common goal – goal of preserving stability and business development. We want to improve management in vertically and/or horizontally integrated structures, in holdings, in supply chains, life cycle processes, and for this goal we view QLMS as an object for management from stakeholder point of view (in relations owners vs company management, customers vs suppliers management). Impact of QLMS (including impact of QMS and lean production) is shown on picture 1. At stage I the responsibility of lean production system (LPS) is to acknowledge rhythmicity, manage the rhythmicity, decrease of variability of QLMS. At Stage II – division of responsibility of big and small management systems (QLMS – defines market growth, “qlms” – defines lower cost through decrease of nonconformities deviation). The meaningful idea in development of complex integrated systems is the SoS approach, where the last S stands for double-circuit model of QLMS shown on picture 2. J. Juran⁶ approach to distinguish big Q and small q was used as one of basic ideas. But we suggest to cover the whole set of main parameters such as quality, cost and time characteristics (takt, cycle, delivery times) and to distinguish big Q, T, C and small q, t, c, correspondingly. Under big Q, T, C we understand target characteristics for business offered to the market. Under small q, t, c we understand deviation from such targets as variation, nonconforming quality, waste, excessive cost, delays and lateness. First circuit Q, T, C is market cycle, and second circuit – executive cycle. Consequently, first circuit sets business targets and its circuit does the activities using PDCA cycle trough market behavior. In particular, how target parameters of Q, T, C correspond to the market, and how corrective actions are connected with changes in planned target parameters, i.e. in this circuit feedback is locked up through market mechanisms. Internal circuit also uses PDCA cycle, but it is directed on achievement of Q, T, C targets, as well as continuous decrease of deviations of executive part of business system. Activities of the first circuit focus on achieving business results at the level of financial flows: income, outcome, profit. Activities of the second circuit focus on decrease of costs that result from nonconforming q, t, c, using method of measuring common costs due to nonconformities, and creates base for the first circuit and stabilizes its activity. During the last years our results show their applicability and acuteness to the present times.

P4C – Sustainable Quality and Circular Economies

CHAIR: [Pal Molnar](#)

The Excellence Manifesto

– [Matt Fisher](#), *The Business Excellence Institute [BELGIUM]*

Abstract:

The world is reaching crisis point on a number of different fronts – political, economic, social and technological. Trust in governments and companies is low and people are cynical. They expect authentic leadership in the organizations they do business with. We hold that management-as-usual promotes mediocrity. It is fragmented, siloed, focused on short-term gains and is prepared to sell out future generations. Management-as-usual is the enemy of excellence. It typically ignores the ecosystem that the organization is part of and produces “satisfactory underperformance”, tolerance of which results in under-achievement, sub-optimal results for stakeholders, and ultimately failure. We believe that compliance with standards and legislation is the minimum stakeholders expect. However, in the long-term, merely focusing on them is to abdicate on an organization’s responsibility, encouraging a culture of conformity which can lead to mediocrity and risk the organization’s future. Global problems require global solutions. Regulation, legislation and standardisation, by their very nature, lag behind economic, societal and technological advances. They require a significant number of precedents and examples to establish the “new normal”. Establishing that “new normal” comes down to what is morally and ethically acceptable to the majority; that requires achieving a consensus in the face of uncertainty. Non-prescriptive excellence models were developed to help people navigate the uncharted waters beyond compliance with regulations, legislations and standards. Excellence models also help document and understand case studies that enable us to understand the “new normal”. At the Business Excellence Institute, we believe that if more organizations in both the public and private sectors adopt the principles of excellence, we can overcome the global challenges we face. Excellence demands that we care for the people working in our organizations, our partners and suppliers, our impact on society, and on the world at large. It requires us – for the good of the organization and its stakeholders – to contribute actively to make the world a better place and to put the long-term benefit of stakeholders ahead of short-term gain. The Excellence Manifesto is a call to action. It calls on all organizations, regardless of size or sector, to publicly commit to the pursuit of excellence. This means striving to achieve optimal results for all stakeholders, continuous improvement, and a strategy that does not sell out future generations.

Sustainability Solutions Manager – Sustainability on new business models

– [Lurdes Brandão](#), *SGS Portugal [PORTUGAL]*

Harmonisation of Public Tertiary Education – The Mauritian Experience

– [Sid Nair](#), *Ministry of Education, Tertiary Education Commission [MAURITIUS]*

Abstract:

Public Universities in general are facing tightening budgets but with a clear expectation that they maintain or improve the level and quality of courses that they are offering. The educational literature is in agreement that this is a major challenge for the higher education sector. This paper looks at how a small but well-positioned island state in the African region, Mauritius, is approaching this dilemma at a national level to cater for the needs of the country. This paper looks

at the current situation of the Mauritian public higher education sector, the vision of the Government of Mauritius to turn the island into a higher education hub in the region and the endeavours of the Government to optimize the use of resources by implementing a harmonisation policy, in a bid to make the public higher education institutions (PHEI) operate in a complementary manner to tap the market of international students in a more efficient way, and, gives an overview of the challenges and issues regarding the implementation of the harmonisation policy, with a focus on: (a) the rationale that prompted the harmonisation policy; (b) describing the primary components of this reform effort; (c) examining the strategic forces in play in the sector; (d) investigating some of the challenges associated with the harmonisation process; and (e) propose possible mitigation measures to counter the challenges identified. The work presented here would add to the literature on harmonisation, an approach that is being planned at a national level.

Integrated Management Systems and Sustainability: A Framework Proposal

– [Merce Bernardo](#), University of Barcelona [SPAIN]

Abstract:

In management sciences, the term sustainability is not exclusively defined but rather contains a wide range of concepts like sustainable development (SD), corporate sustainability (CS), or corporate social responsibility (CSR) (Asif et al., 2013). However, academics define sustainability as being based on economic, environmental, and social dimensions (Baumgartner & Rauter, 2017; Elkington, 1994), an interpretation that is also known as the triple bottom line (Hahn et al., 2015; Montabon et al., 2016). One of the key drivers for companies to adopt sustainable practices are their stakeholders (Farmaki, 2018; Høgevold et al., 2015; Schulz & Flanigan, 2016). Nonetheless, when it comes to reporting sustainability related aspects, organizations often focus on measuring sustainability in terms of isolated indicators but lack a transparent, systematic, and reliable way of managing sustainability (Gianni et al., 2017). However, when it comes to dealing with stakeholder needs in other corporate areas like quality aspects, customer satisfaction, or risk management, companies rely on management systems (MSs) in order to address stakeholders' interests in a systematic way (Poltronieri et al., 2018). The main elements of those function-specific MSs are often, but not only, described in management system standards (MSSs) which are developed and published by national as well as international bodies, being the International Organization for Standardization (ISO) the most known (Karapetrovic & Jonker, 2003). Due to the proliferation of different MSSs and MSs, the need to integrate them into an integrated management system (IMS) emerged to reduce redundancies and to use possible synergy effects (Karapetrovic, 2002). As a consequence, IMS initiatives are increasingly implemented from the 1990s onwards (Mohamad et al., 2014). By now, IMS implementation is considered to be the best management practice for organizations having multiple MSs in place (Bernardo, 2014). However, although an IMS enables the company to deal with stakeholder needs in a systematic manner, it lacks measurement (Gianni et al., 2017). To sum it up, both concepts sustainability as well as IMS have their roots in the stakeholder theory (Asif et al., 2013) and whereas IMS is managed but not measured, CS is measured but not managed (Gianni et al., 2017). Hence, it is likely that IMS and SD are related concepts that might impact each other. Thus, the objective of this research study is to analyse, through a literature review, the relationship between the integration of MSs and sustainability in order to do both summarizing the relationships that have already been identified as well as identifying new relations and proposing a corresponding new framework. The main contribution is to enlarge the current understanding of the relationship between IMS and SD, identifying further relations between both concepts, and proposing a new framework. Hence, also managerial implications for dealing systematically with stakeholder demands and sustainability can be derived from the results of the proposed research study. However, since it is a conceptual

paper based on a literature review, the results are limited. Therefore, unfolding the proposed framework in practice represents an interesting topic for future research.

Six Sigma methodology application in transport company as an innovative way to quality services achievement

– [Michal Hranicky](#), University of Zilina [SLOVAKIA]

Abstract:

Six Sigma methodology application in specific conditions of transport companies is considered quality philosophy for achieving sustainability, productivity, profitability as well as increasing the customer satisfaction. Process of improvement through Six Sigma methodology is carried out on a step-by-step basis by selected projects as a continuous targeted improvement process leading not only to a quantified benefit to the transport company, but in particular to increase value for existing customer, maintain and acquire new customers. By implementing Six Sigma projects, the strategic goals set by the transport company will be met, as well as by maintaining stable processes in the operation itself and meeting the expectations of the final customer. The main reason for Six Sigma application in transport is increasing importance in the case of the necessity of better knowledge in the transport operation in terms of quality deviations, affecting customer decision-making in the future. The case study focused on the passenger transport process for the influence of train delay with the application of selected Six Sigma tools was one part of extensive research. This paper underlines the new quality approach and its application in transport company. The case study is elaborated in accordance with the chronological DMAIC procedure applied in completely innovative way to transport services in order to meet the requirements of customers in rail transport and ensure sustainable development of transport system.

P4D – New Quality Professionals and Leaders

CHAIR: [José Carlos Pereira](#)

The Future of Quality Managers

– [Marina Guerra](#), Siemens [PORTUGAL]

Abstract:

The fast digital development and our agile environment will change the requirements for our Quality Management Systems essentially. This is a big chance for Quality Managers to jump in an active role to influence future management systems successfully. Internal organizational structures, processes and behaviors are typically stagnating in traditional companies. It is not easy to adapt them. But now Quality Management itself is becoming part of the digital change. What is the future role of a Quality Manager? Which competences are needed in the future? How to organize a successful (Quality) management system for the future?

Quality Management for the Future

– [Åsa Rönnbäck](#), Förbättringsakademin [SWEDEN]

Abstract:

According to Quality Management research it is clear that managers have a great impact on employees' motivation, health and job satisfaction but also on business results. The complexity to manage an organization has increased in the changing global world in the era of the age of

accelerations. The challenge is not whether an organization needs to change or not, but how the change should take place. How is Quality Management in general and Quality frameworks in particular addressing these challenges? In 2015-2017 an interactive research project was conducted with the purpose to develop the Swedish excellence framework. The findings from this research project will be presented and practical recommendations are given based on this, to manage for success in the future. Detta område tangerar teman: - Quality Research (inom Data-driven Quality) - Rediscovering Quality Concepts - Quality Applications - Emergent Qualities.

Personal and organizational awareness for quality as competences of new quality professionals and leaders

– [Anton Petrič](#), TPV Group [SLOVENIA]

Abstract:

It is important to understand that customers normally want suppliers who would make them become better. To become an automotive supplier or development supplier is tough and strenuous path. Awareness for quality, understanding organizational context connected to strategy is one of key drivers that shape leadership and employees behavior. Behaviors and attitude need to be subject of constant improvement. It is a way of thinking, which need to be establish and promoted through whole organization. TPV Group as a development supplier with a 30 year history in automotive industry has evolved over the years a set of approaches to response to new sharper market demands. Some good practices, which set up company from one of ordinary supplier in supply chain to development supplier for OEM's will be presented.

What is Quality for CEO's?

– [Ed Van Siclen](#), VEEVA [USA]

Abstract:

In our collective quest to foster a corporate culture of quality, Veeva sponsored a recent survey on the CEO's impression of QUALITY in their companies. We will reveal those findings during this session. Learn what is "top of mind" for CEO's, so you can be more effective in creating a culture of quality at your organization. During this session we will reveal answers to such survey questions as:

- *For your company, are quality processes an essential, important or secondary issue?*
- *In your opinion, can developing quality processes in a company ...?*
 - *Improve the financial performance of the company*
 - *Slow down the pace of production*
 - *Improve customer satisfaction*
 - *Reduce margins of the company*
- *Do you agree or disagree with each of the following statements about quality processes?*
 - *Quality processes are challenges that lead to finding innovative solutions*
 - *Quality processes are constraints on the functioning of a company*
 - *Quality processes are above all sales pitches to attract new customers*

Quality Leadership in the V.U.C.A.World

– [Ömer Özkan](#), Petkim Petrochemical Holding Corp [TURKEY]

Abstract:

As we enter the 21st century, many quality professionals have serious questions about what the future will hold. Who will lead the next quality revolution? Scope of quality management system is expanding with industry 4.0, artificial intelligence, digitization, internet of object. Next generation leadership is about leading in the most turbulent of times, and successful next generation leaders will be masters of change and resilience. Leadership in the 21st century will be influenced by constant change, geopolitical volatility, technological disruptions, and economic and political uncertainty. Mastering and staying on the top of these major forces of change will be the defining characteristics of next generation leaders. Defines a leader in total quality management as a person who inspires, by appropriate means, sufficient competence to influence a group of individuals to become willing followers in the achievement of organizational goals. Leadership is the one of the important item of quality management principles. All quality initiatives are destined to fail without support from leadership. ISO 9001:2015 requires top management to demonstrate both leadership and commitment to the quality management system. Top management must drive continual improvement. However, a lot of quality professionals feel top management are not fulfilling their requirements – 67%, in fact (according to the Global Quality Survey 2017). One of the new concepts that have been brought into the latest version of the ISO 9001:2015 standard is that the Quality Management System (QMS) of a company needs to include an understanding of, and alignment with, the strategic direction of the company. The strategic direction of the company comes up four times in the ISO 9001:2015 requirements in relation to understanding the organization's context, ensuring the quality policy & quality objectives are compatible with the strategic direction, verifying that the quality policy supports the strategic direction, and confirming that the management review checks that the QMS is in alignment with the strategic Direction. In this presentation, the mission of quality professionals in the V.U.C.A (Volatility, Uncertainty, Complexity, Ambiguity) world has been defined and mentioned some ways to design the future of quality.

P4E – Education

CHAIR: Rui Pulido Valente

Integrity for ensuring quality in education in the digital era

– [Ansie Harding](#), University of Pretoria [SOUTH AFRICA]

Abstract:

Integrity, or soundness of moral principle, has formed the backbone of a functioning society for centuries. In education, and in particular in higher education, the phrase academic integrity has been coined as baseline for quality in education. Lack of academic integrity manifests itself in students following dishonest practices such as copying from a fellow student in an examination and committing plagiarism when compiling a report. There are also issues from the teacher's side such as presenting the subject as a training exercise rather than as an intellectual enquiry and preparing students for passing an exam rather than teaching the basic principles of the subject. Hybrid learning or blended learning is the teaching paradigm of combining face-to-face learning and online learning. Hybrid learning is at the order of the day in higher education and lauded as the way forward. This paper focuses on what we term the hybrid dilemma and the role that integrity play in the effectiveness of hybrid learning. The possibilities brought about by using technology in a science field in higher education demand integrity for success and are hampered by a lack of integrity. Two practices, namely online homework and online assessment are discussed in particular in this presentation, illustrating the hybrid dilemma and focusing on the role that integrity plays in maintaining quality. A notion that is prevalent in higher education is that students

only do an activity if it counts for marks and if it does count for marks students will do anything to obtain the marks, often even when challenging their academic integrity. Online homework, firstly, offers the ideal opportunity for cultivating independent learning through the anytime / anywhere availability, the repeatability feature of exercises and the immediate feedback. The purpose of online homework is to present a learning opportunity for the student outside of the classroom. Yet, the opportunity also exists for students to copy freely from each other and even use available software to get to answers, not mastering the method and theory underlying the problem at hand. The student requires integrity to fully use the opportunity and without it the activity is diminished in its purpose. When teaching large classes marking is problematic because of manpower issues. Online testing offers a solution. Most universities do not have computer labs large enough to accommodate students for doing these online tests under supervision and students are therefore required to do these tests in their own time. Yet the primary consideration for students is to gain marks and the assessor's task then is to devise strategies for minimizing opportunities for unsound practices such as randomising questions. The lack of integrity displayed again jeopardises the usefulness of online testing. In a words of JH Newman, in The idea of a university, dating from 1873: "But education is a higher word; it implies an action on our mental nature, and the formation of character; it is something individual and permanent."

Integration of Learning Outcomes into Quality Management and Harmonization of Quality Standards in Vocational Education and Training in Europe

– [Joao Alves](#), ATEC [PORTUGAL]

Abstract:

Many improvements, developments and recommendations have been implemented at European and national levels regarding quality assurance and the learning outcomes approach and further developments are needed to improve transparency and comparability of qualifications to support coherent credit systems. However, less attention has been given to the operational level where the action really takes place: the VET providers level. A partnership of six VET organizations - Stichting Regionaal Opleidingen Centrum Aventus (Netherlands), ATEC - Associação de Formação para a Industria (Portugal), BBS Syke EUROPASCHULE (Germany), bit Schulungscenter GmbH (Austria), West Lothian College (Scotland) and Kainuun ammattiopisto (Finland) – was created to develop a project to share, compare and evaluate practices implemented within each quality management system with regard to either guidance, education or examination, and provide the needed support for its practical implementation and to further integrate the learning outcomes (ECVET approach) as part of the quality assurance systems. Although representing a wide variety of European regions, all partners are focused on improving the quality in their organizations in order to deliver the best possible education, but all using different approaches. During the project period (September 2018 – August 2020), each of the five partners will organize a project week in order to study how their own quality approaches work in practice by using the SWOT analysis tool. Partner's experts will use this methodology to discuss, analyze and evaluate in detail at least one practice per partner, with regards to either guidance, education or examination and with recommendations for step-by-step implementation. Within the project one main output - the Quality Management Toolkit – will be developed which provides step-by-step practical recommendations to enable implementation of best practices into different quality management topics for VET providers. The intention is to bridge the gap between more theoretical level of quality management in general and the real life circumstances of day to day reality. Interim and final outcomes can be found at: <https://www.ventus.nl/gms4vet> It's expected that this Toolkit will guide readers to implement best practice examples into their own organizations, enhancing transparency and quality improvement, building trust for the sustainability of network and

improving the ECVET approach. The outcomes of this project together with the dissemination activities will inspire other parties to work on their quality assurance systems and contributing to raising awareness of other organizations to this important issue. This will be achieved, as all partners work very closely with the district/regional/national bodies responsible for the quality assurance in VET to make the results available to other providers. Four multiplier events will be organized in June 2020 in order to share the outcomes of this project.

The role of Quality Councils in HEIs: in search of a conceptual framework

– [Patrícia Moura e Sá](#), CICP & University of Coimbra [PORTUGAL]

Abstract:

Over the last decades, higher education institutions (HEIs) have implemented structures to deal with the implementation of quality management on an organization-wide basis and to respond to the needs and requirements of national and international accreditation and certification schemes. Quality councils (QC) have been created in many institutions aiming at the coordination and strategic decision-making in relation to the quality management systems' implementation (Cardoso et al. 2018), including monitoring quality initiatives and ensuring that those initiatives are aligned with the institutions' missions and strategic goals. However, the competencies, composition and hierarchical positioning of such bodies in the governance system of HEIs is far from being homogeneous and significantly vary even within the same country. Simultaneously, and although the existing literature tends to define the concept of the 'quality council' as "a structure that fosters employee participation and clearly defines the leadership roles needed to evaluate and implement improved processes" (Tackett, 1991, p. 30), not much has been written on the role of these structures in higher education, especially at the institutions' level. The aim of the current paper is twofold: a) to analyse the various roles assigned to QC of a relevant sample of Portuguese HEIs and b) built on the Portuguese case, to propose a conceptual framework that can potentially be used to map the quality structures created by educational institutions of other countries. The research is based on the analysis of the certified quality management systems (QMS) of the Portuguese public universities looking in particular at the bodies that make the structure they created to run the QMS, their competencies and the way they relate to the governance bodies of the institution. Therefore, the research uses data collected from the institutions' websites and other institutional documents available to the general public. Findings show that while in some institutions QC essentially play a strategic role leaving more operational tasks to quality units/divisions, in some others QC are very much involved in daily routines and procedures associated with the collection and analysis of quality indicators and with the preparation of quality reports. Moreover, there are different understandings regarding the composition of QC, with some institutions clearly specifying the need for external stakeholders to be members of these bodies, as a signal of independence and legitimacy. In certain cases, these external members are regarded as quality experts or advisors. The concern to have a multidisciplinary QC is also visible in some HEIs. Besides, institutions adopt different arrangements to ensure that the various schools and organisational units are aligned with the strategic guidelines discussed and approved by the QC. Some dimensions/features emerged from this analysis which were then used to create a conceptual framework that can, in future studies, be applied to describe the roles of quality governance bodies created by HEIs of different countries. This would contribute to the external validation of the instrument proposed. Additionally, further works can explore possible associations between the typology of QC that results from the suggested framework and other characteristics of the institutions.

Creating Quality in South African schools

– [Paul Harding](#), South African Quality Institute [SOUTH AFRICA]

Abstract:

We explore how quality principles that are normally applied in large organisations can be used to improve the South African school system through the use of a Quality in Schools Model, initiated in 2005. Adoption of the model by schools is voluntary. We explore the structure of the model and how effective the implementation has been. The model was designed by a team of educationists, policy makers as well as people from the industrial sectors under the guidance of the South African Quality Institute (SAQI). The question addressed was: “Is it possible to design a Quality model for Schools that can be applied successfully in any South African school irrespective of financial conditions?” The majority of the current 29 750 South African schools need radical improvement to become institutions providing learners with world-class quality education. Although official grade 12 pass rates have been seen to improve, the country has one of the highest unemployment rates in the world at 27.5%. Although the purpose of the model is to improve the quality in school education the broader purpose is to create better higher education opportunities for learners and better career prospects. In so doing society could be transformed through education. The model is based on five organisational pillars comprising Values, Leadership, School Improvement Plans, Communication and Tools and Techniques. These pillars can be implemented in any classroom in any school and do not require huge amounts of money. What the pillars do need from the practitioners is common sense and commitment. Each pillar is separate and crucial to the structure of a quality school. We focus on two of the five pillars, the first one being Values and the second being Tools and Techniques. The Value pillar is based on the values enshrined in the Constitution of South Africa and on the School values system. It has been particularly challenging to implement the values enshrined in the Constitution of South Africa when the example set by political leaders in the country has often been declared unconstitutional by many of the courts in South Africa. The second pillar, Tools and Techniques comprises Benchmarking, Brainstorming and Affinity diagrams, Fishbone diagrams, Flow charts, Force-field analysis, Histogram, PDCA cycle, Quality circle and circle time and Quality improvement teams. The challenge is enormous but success has been achieved, although limited in general but particularly noticeable with younger learners. Pockets of excellence are highlighted and challenges discussed. It is important to remember although techniques by themselves do not solve problems. People solve problems.

International student journey: a data driven quality approach

– [Silvia Costa Lopes](#), Universidade de Lisboa [PORTUGAL]

Abstract:

The high volatile work environment for which high education aim to prepare their graduates demands a high and flexible curricula. Based on the data from the last five years for national and international students enrolled in specific subjects we are able to set up a pilot project aiming to increase the attractiveness of specific subjects and a definition of a journey for the students seeking specific subjects in the Faculty of Pharmacy of University of Lisbon. Data gathered and information drawn from it, serves as a background for the international student journey project. Based on available data and experience drawn from hosting international students including data from their previous high education, languages skills and social cultural differences, alongside time

constrains linked to their length of stay the project identified relevant improvement items for the student journey. From 2013 to 2018 there was a remarkable steady increase to 179,50% accompanied by an increase of nationalities. The trend from Portuguese speaking countries is now shifted to central European countries and also Italy and Spain. Students from Bangladesh, Iraq, Syria and China are also present in the recent years. Based on the data analysis perform a pilot project is being drafted to be implemented during the next academic year that with the help of the students involved aims to improve the quality of students journey and experience and the visibility of the Faculty and Portugal. Specific activities already implemented or being implemented throughout the Faculty Campus to improve the quality of the international students' journey includes:

- Identification of staff with a better command of the English language
- The website with an increase of better and greater English languages presence
- Notices with office hours in Portuguese and English

PARALLEL SESSIONS 5 – QUALITY CONTESTS:

P5A – European Quality Leaders

CHAIR: [Torolf Paulshus](#)

[Mark Bazinet](#)

– *The Quality in «direct current» [FRANCE]*

Abstract:

Expert in Quality management from more than 20 years, Marc BAZINET has been working in the domain of improving business performance (Quality, Environment, Risks, Internal Control, Social Responsibility ...). He is an EFQM assessor. He has managed several assessment of winner organizations of the French Quality Award. He has been chairman of the French mirror committee for standardization (AFNOR), in charge of the revision of ISO 9001:2015, Head of the French delegation TO ISO TC 176 for writing the new ISO 9001 and the previous versions of this standard from 1994. He has been teaching at the University Paris Est - Marne La Vallée since 1997, as associate professor - educational manager during the last 15 years - how to lead certification projects, global approach to management, TQM including synergy with internal Control, excellence management based on the EFQM model and self-assessment. Marc BAZINET is author of several articles and books. He has been Quality director in a French electricity utility (EDF). Currently, he is involved in the "French Quality Performance Association" (AFQP), as general delegate to the awards – member of the executive office, in charge of the creation of the trophies of the French Quality Leader in 2019. He piloted the whole of recognitions at French level (Books, Students, Best Practices, and Prize for the Enterprises...).

[Nataša Gladović](#)

– *Corporate quality management, ATLANTIC Grupa [SLOVENIA]*

Abstract:

Corporate quality management director Her professional career spans more than thirty years, and has always been dedicated to quality issues, since the early beginning when she started to work in chemical food control laboratory. As Director of Corporate Quality Management at Atlantic Grupa (AG) since 2012, she's responsible for realization of strategic and annual goals regarding the

integrated quality management system of the entire company (group). Beside leadership and management, her main technical competencies are: expertise in food composition and hazards, risks and crisis management and expertise in different quality/excellence/sustainability standards and models (such as ISO9001, IFS, FSSC22000, EFQM, GRI), using them in a complementary manner. In December 2018, she applied for the European Quality Leader award for 2018.

[Frank Schreier](#)

– Executive Director Quality Assurance, ŠKODA AUTO [CZECH REPUBLIC]

Abstract:

Mr. Frank Schreier, is the Executive Director of Quality Assurance of ŠKODA, the traditional Czech carmaker, and a member of VW Group. During his professional career, which started at VW Wolfsburg in Germany more than three decades ago, Mr. Schreier gathered deep experience in car production and especially in quality management, where he subsequently performed different leading functions. Mr. Schreier's technical skills, expert knowledge of technologies, passion for innovations so as his enduring attention to detail left his imprints in innumerable improvements of essential Group's products. When not working, Mr. Schreier enjoys travelling, visiting theatre or relaxing on golf greens.

P5B – MSc Presentations

CHAIR: Jorge Marques dos Santos

Semantic comparison of requirements – A method to structure requirements by using Artificial Intelligence (AI)

– [Lisa Ritter](#), BMW Group [GERMANY]

Abstract:

Reusing requirements is an efficient procedure in adaptive development projects. Often requirements and full specifications are copied and pasted from the preceding product. An implementation of a requirements catalogue shall optimize the reuse. But the challenge is, how to structure and categorize requirements in a catalogue based on a historical grown database consisting of a large number of specifications? This contribution presents a method to structure requirements automatically by analyzing their appearance in different development projects and their distinctions. Therefore, a semantic paired comparison of the requirements in the different specifications is used. By preprocessing the requirements for this comparison, the challenge is the granularity of requirements. This contribution reports the ideas and experiences in training an Artificial Intelligence (AI) for a semantic comparison of requirements.

Planning field surveillance of measurement instruments based on risk assessment.

– [Railson Motta](#), INMETRO [BRAZIL]

Abstract:

In Brazil the control of measuring instruments, the conformity of products and of pre-packed products are performed by the National Institute of Metrology, Quality and Technology - Inmetro. Motivated by the great territorial extension and the complexity in managing this structure, the country opted for a decentralized operational network performing in all 27 states. Over the years, this model has been consolidated; currently more than 20 million checks are carried out annually, mostly through a fee collection. Legal Metrology permeates all levels and sectors of a developed

nation, where a large number of measuring instruments are subject to metrological regulation. The main objective of metrological regulation is to provide the balance between the parties involved in a relationship based on a measure – which means to protect the consumer as a buyer of measuring products and services and regarding health, safety and the environment, and also to protect the seller as a product supplier. It is the role of metrological control to establish adequate transparency and trust between the parties, based on impartial testing. Risk management allows action planning by taking into account the likelihood of undesirable events and the severity of their consequences. At the same time, the increasing availability of data and the ability to perform updated sophisticated correlations call for the use of data analysis. Both techniques have been applied in practical cases in the most diverse fields of activities. While respecting the peculiarities, these principles can also be applied to field surveillance, a form of supervision of measuring instruments which happens to be a specific activity of Legal Metrology. This study seeks to define indicators to guide the selection of the instruments to be examined in field surveillance programs, replacing the current empirical criteria with more concrete ones. The developed methodology benefits from several years history of the test results to define the risk indicators, which allow for directing the field surveillance to groups of instruments with greater probability of presenting irregularities. The SGI - Inmetro Information Management System (SGI in Portuguese) maintains traceable databases of measurement instruments regulated by Inmetro in the country. However, this information is not yet fully exploited for the purpose of measuring instrument supervision. By seeking an appropriate use of this broad information base, indicators were searched and developed to guide inspections more consistently. The case study, based on the analysis of historical data, presents a way of forecasting probabilistic occurrences of irregularities. The results show that if the planning for 2016 had been made based on the forecast presented, keeping the same number of field watch inspections, more irregularities might have been identified in the process. It is concluded therefore, with this work, that the methodology presented, if adopted, can guide the direction of inspections, optimize the use of resources and, at the same time, increase the effectiveness and efficiency of the field surveillance activity.

Evaluation on Urban Quality Development level

– [Deng Ji](#), SAQM [CHINA]

Abstract:

Quality reflects the comprehensive strength of a city, reflects the core competitiveness of enterprises and industries, and reflects the degree of urban civilization. The essence of the quality of urban development is the handling of the relationship between "people and people", "people and resources" and "people and environment".

Multivariate Short Run Control Chart as a tool to detect contaminations in ICP-MS

– [Filipe Gomez](#), FCT-Universidade Nova de Lisboa [PORTUGAL]

Abstract:

This paper presents a methodology for monitoring and assessing the stability of blank samples for cobalt, nickel and chromium analysed through inductively coupled plasma mass spectrometry. The proposed methodology grounds on the Statistical Process Control, where a multivariate short run control chart was designed to detect possible contaminations in the measurement process. The validation results, obtained based on three corresponding univariate short run control charts, suggest that there is a correspondence between the multi and univariate control charts. Despite the increased mathematical complexity, this multivariate control chart proved to be an appropriate Internal Quality Control tool.

P5C – Process Improvement Projects

CHAIR: Paulo Sampaio

Portal PRIO Top Service

– Cristina Graça, Prio Energy [PORTUGAL]

Abstract:

A PRIO é um importante player no mercado de distribuição de combustíveis em Portugal que privilegia a gestão direta dos postos de abastecimento. Tendo preocupação central no foco no cliente e na qualidade do serviço, tem um programa de “Cliente Mistério”, externo e independente, que monitoriza a qualidade de serviço Prio e dos concorrentes diretos. Com uma atitude de busca incessante pela melhoria contínua e excelência operacional, era reconhecida a necessidade de um acompanhamento mais regular à Rede de gestão direta e de profissionalização da partilha de resultados, designadamente através da eliminação de múltiplas rotinas manuais, reconhecidamente geradoras de ineficiência operacional, e criação de uma plataforma única de monitorização e análise de resultados. Conceção e implementação de um Portal destinado a suportar a atividade da rede de postos de distribuição combustível e agregar os fluxos de comunicação com todos os intervenientes envolvidos na gestão da rede, nas suas múltiplas dimensões. Pela diversidade de interfaces foi um projeto exigente que obrigou ao levantamento e sistematização de processos de gestão das principais áreas funcionais (financeiro, manutenção, qualidade, marketing, etc.) e ao seu enquadramento numa perspetiva de melhoria contínua e comunicação estratégica dos resultados e da partilha de informação por toda a equipa envolvida no negócio.

Process improvement initiatives using Lean methods to increase performance of the Fresh Products Markets at a Portuguese retail company

– [Pedro Marques](#), Auchan Retail [PORTUGAL]

Abstract:

The retail industry is one of the most important sectors for both the Portuguese and the European Union economies. As retailers face increasing competition due to adjacent consumer-focused sectors, e-commerce and technology disruption, and increasing power from customers, they recognise the need of adopting effective continuous improvement and innovation strategies to deal with such fast-paced context. According to the 2019 Deloitte Retail Outlook, Auchan Retail is ranked within the top 20 of the largest retailers around the world, being the 5th European company of this sector in this ranking. Recent data from Jornal Económico reveal that Auchan Retail Portugal is placed third in the country with 9,5% of market share. As part of its strategy, Auchan Retail is fully committed in developing and deploying continuous improvement programs based on Lean principles in every of the 17 countries where it operates. In Portugal, the Lean journey started in 2017. During 2018 and 2019 a set of improvement projects were selected and conducted comprising the following strategic markets of the Fresh Products department: cold meats, fruits and vegetables, and free fishmonger service. Three process improvement initiatives involving the mentioned markets will be described. Together, they led to more than 200 thousand Euros in savings. The scope of these projects and the corresponding methodological approaches were the following:

1. Reduction of the cold meat losses due to breakage and damage. Project approach followed; Gemba Kaizen Event.

2. Efficiency increase of the replenishment process to fulfil the fruits and vegetables shelves. Project approach followed: Value Stream Management.

3. Capacity increase in the production of packed fish in cuvettes. Project approach followed: Lean Six Sigma.

In addition to the savings, and probably more important, these initiatives contributed to the increase of a continuous improvement culture.

Development of a Foundation for Evidence in Rehabilitation – Rehabilitation after Cerebrovascular Diseases

– [Shogo Kato](#), Keio University [JAPAN]

Abstract:

Japan has been a super-aged society as more than 27% of the population is 65 years or older in 2017. Among the increasing risk of diseases and injuries, rehabilitation is an important treatment that affects the prognosis. Rehabilitation intervention process depends largely on the individual therapists rather than medicines and/or instruments, and there are few quantitative indices. Therefore, standardization of rehabilitation intervention processes has yet to be fully achieved, and there are some differences in intervention processes and outcomes between individual therapists, rehabilitation colleges, and hospitals. In this study, we aim to develop a foundation for collecting and accumulating basic data for standardization, by recording rehabilitation intervention processes after cerebrovascular diseases among multiple hospitals. We performed standardization of rehabilitation clinical processes and assessment-intervention by therapist, through visualizing and structuring of the inherent / empirical knowledge of the medical professionals, by the research group consisting of medical doctors, therapists, nurses and engineering researchers those belong to multiple acute stage hospitals, recovery stage hospitals and research institutes. For rehabilitation after cerebrovascular diseases, we proceeded to develop the standard rehabilitation contents, through organizing responsible lesions by medical doctor's diagnosis, disorder structure based on responsible lesion, assessment-intervention needed for each disorder. Responsible lesions by medical doctor's diagnosis were structured for cerebral infarction and cerebral hemorrhage. Dysfunctions inferred from responsible lesions were structured, and the relationships between dysfunctions and responsible lesions were expressed in matrix. Clinical processes of therapists were structured, focused on basic motion acquisition process and work activity acquisition process by physical / occupational therapists, assessment-intervention process for dysphagia and language disorder by speech and language therapists. Assessment items, which should be evaluated by therapists in each clinical process, were structured in the hierarchy of dysfunction and disability, and the relationships between assessment items and disorder structure were organized. It becomes possible to carry out assessment-intervention standardized on patient conditions, as the relevant positions such as the therapist and the nurse perform the routine medical care, based on the rehabilitation contents standardized for each disorder, which is specified based on responsible lesions by medical doctor's diagnosis. By accumulating assessment data based on standardized items, it is possible to compare and verify the transition of patient conditions. There are many issues such as school style and variations due to experience in standardization of rehabilitation intervention, but by accumulating assessment data based on standardized items, it becomes possible to consider the timing of intervention that maximizes the effect of intervention, in addition to evaluate the effects of implemented interventions. Thus, the environment where basic data for standardization can be collected and accumulated is expected to be the foundation of evidence in rehabilitation. JSPS KAKENHI Grant Number JP 19H02381.

A Design for Gree's "Comfort and Energy Saving" L1 wall-mounted air conditioning

– [Wu Mingxi](#), Gree Electric Appliances, Inc. of Zhuhai [CHINA]

Abstract:

Gree's "Comfort and Energy Saving" L1 wall-mounted air conditioning design project is developed according to the Six Sigma IDDOV process, identifying customer requirements for collection and analysis, applying QFD quality functions to determine the key quality characteristics and key process characteristics of the product, laying a market foundation for the project. The project members applied advanced quality control tools and design methods such as DFMEA reliability design, DOE test design, variance analysis, simulation analysis, lean design optimization, normal distribution analysis and process capability analysis to complete the L1 Six Sigma project with the theme of comfort and energy saving. The L1 wall-mounted air conditioners have fast cooling/heating functions, cooling under high temperature and operating with low noise. At the same time, the system is optimized to make the air conditioner more energy efficient. The L1 series air conditioners have achieved a 200% increase in natural monthly sales, and won 3 domestic patents and 5 international patents, which are the technology harvest for the Gree, and promoted the development of technology in the air-conditioning field.

Improve the Anti-corrosion Reliability of Air-conditioning Gas-liquid Separator

– [Chen Peixia](#), Gree Electric Appliances, Inc. of Zhuhai [CHINA]

Abstract:

The gas-liquid separator separator is an important component of the air conditioner. It is a large-volume steel container installed on the suction pipe of the compressor. The different density between gas and liquid particles will produce different inertia, that could separate the liquid from gas-liquid mixing. That's the principle of the gas-liquid separator for how to prevent compression from excessing liquid particles. Due to the function of the vapor-liquid separator in the refrigeration system and the need to withstand the high pressure of the system, its quality plays a vital role in the reliability of the operation of the air-conditioning. Our company has proposed a 6-year warranty policy that breaks through the industry standard. According to the product quality and after-sales service information tracking, the main feedback gas-liquid separator after sale is corroded and rusted. According to the failure rate statistics of the returned faulty products, it can analyse the gas-liquid separator bathtub curve and the average pre-failure time, the analysis result show that, the bathtub curve is far from the ideal curve, and the reliability needs to be improved. From the research on competitors, we found that, after the surface coating of the gas-liquid separator was corroded for a long time in the market, the steel body would be thinned, even cause cracked. The most serious consequences of the cracked will lead to a security incident. The anti-corrosion reliability of air-conditioning gas-liquid separator can be measured by the international standard "ISO 9227 Corrosion Test in Artificial Environment - Salt Spray Test". According to the anti-corrosion time of the salt spray test and service life, the anti-corrosion time of the vapor-liquid separator is 500h, and rust generally in about 3.5 years. To meet the environmental corrosion resistance of 6 years, it is necessary to increase the anti-corrosion time of the salt spray test to 1000h. The project team visualizes the entire process of the project through SIPOC, identify the scope of the project, including suppliers, inputs, processes, outputs, customers, and related information. Through the FTA analysis, the potential failure mechanism of vapor-liquid separator corrosion rust is found, and the key data is used to narrow down the problem and find the key cause of the problem: the Faraday effect in the stent welding structure affects the spraying, and the coating formulation does not meet the corrosion resistance requirements. The project team conducted MSA analysis on key measurement systems: salt spray test and coating thickness

test. The measurement system is stable and reliable and can be used as a benchmark for fair evaluation. By optimizing the welding structure, which from a flat lap joint to a three-dimensional lap joint ,could avoid poor spray coating caused by the Faraday effect. At the same time, DOE design of the spray coating formulation to find the best corrosion resistance coating formulation.Design and analyze the full factor test for the curing oven temperature and time to find the optimal parameters. To guaranteed the effectiveness and continuous improvement,flowing measures were taken:

1. The best welding structure had been witten in the design specification of the gas-liquid separator.
2. Testing the composition of the coating each batch to ensure the mixture meets the standard requirements.
3. Monitoring the furnace temperature time curve of the curing furnace to ensure the execution of the optimal process parameters.

P5D – New Products/Services Projects

CHAIR: [Carlos Barata](#)

Quality Appraisal & BSC: Achieve organizational excellence by maximizing internal audits' efficiency – [Cláudia Nabais](#), Quidgest [PORTUGAL]

Abstract:

The continuous demand for performance improvement inside organizations enables them to sustainably adapt to the context dynamics in which they develop their activity, to its full extent. Such adaptations are crucial and require accessibility of systems to monitor the performance indicators and the measures intended to improve this achievement. To support the dynamics and versatility of these systems, in which the management of multiple indicators is a key factor, technologically evolved platforms are required. The BSC & QApp systems, built on the modern technology platform Genio®, have a deep impact in the pursuit of the objectives of excellence that aim to meet the expectations of the stakeholders. Strategy communication and alignment throughout the organization and the creation of solid bridges between evidences and (as many) appraisal criteria as required, are some of advantages of this symbiosis.

Scorecard systems as tools to improve H&S performance

– [Manuel Carrasqueira](#), Qualiseg [PORTUGAL]

Abstract:

Although in the last ten years the general trend of fatal work-related accidents has declined, currently their occurrence seems to be increasing again. In order to reverse this trend and move towards a sustained reduction in work-related accidents, it becomes crucial to consider new approaches that fit organization contexts and market demands. The indicators used to design preventive strategies cannot only measure the number of accidents or near-misses. Although such reactive monitoring is still helpful, organizations need more proactive indicators and/or new tools to promote better safety practices.

Scorecards are an example of management tools that can be applied to promote effective management control, and/or to follow up the implementation of a strategy focused on both collective and individual performance. The “point system” (score system) used on drivers’ licenses, for instance, has been a positive contribution to road safety in the countries that have implemented such system. The most ancient drivers’ penalty or demerit point systems belong to Germany and the New York State, having been implemented in 1974. By 2010, at least 19 member states of the European Union had already enforced this system for drivers.

In practice the point systems implemented in different countries of the American, European and Australian Continents, are quite similar and are based on a number of points criteria, in which the subtraction or increase of points is supported by objective events: in the first case is the detection of infractions to road regulation and, in the second case, is a given time interval without the detection of infractions. It is a simple and transparent system that promotes the adoption of safer and more responsible driving behaviors.

The good results obtained with the application of score systems concept to road safety constitutes an opportunity for transposing such approach to Occupational Health and Safety (OHS) systems, in which there is a need to develop new approaches, adjusted to the actual market, and in line with today's thinking. A personal scorecard applied to behavioral safety is a potentially useful methodology for monitoring the performance of employees at all levels, in OHS matters. The underlying philosophy is that it would enable the development and improvement of workers' risk perceptions and, subsequently, to prevent potential occupational accidents and professional diseases. This strategy applied to OHS systems, could play an important role in the well-being and occupational health of employees in different industrial sectors. The scorecard tool allows employees, OHS managers, and company leaders to know, at any moment, the individual and collective performance, as well as positively disseminate across the organization the best performances and practices, thus constituting a catalyst for the remaining workers.

Quality Management System: Steel Services Plants Registration Success Case

– [Vladimir Passarelli](#), SCS Qualidade [BRAZIL]

Abstract:

This paper aims to present the challenges, risks, opportunities and results of a case study conducted at Steel Services Partners Plants located in Brazil. Those aspects faced by Services Plants during implementation and maintenance are highlighted. Although, all the companies have actual registration, they were motivated by an external mandatory need to obtain confidence with supply chain providers since the manufacturing until outsourcing services. The companies` plants have each one with unique characteristics and had a simultaneous recognized implementation process. The experience cases on internal auditing were used to achieve the objectives. Information obtained from the case study was collected from various data sources including interviews and informal conversations with the operational plant managers, purchasing, manufacturing, technical personnel, attendance on project meetings, company documents, plant tours, and observations of the manufacturing process and product samples. These sources provided information that were useful for developing and implementing a successful quality system. The experiences conducted at Steel Service Plants revealed a number of issues related to the implementation of a quality management system. While studies have shown that the ISO standard should be applicable to small businesses, this study shows that the implementation of the standard's requirements benefited all he companies significantly. Also, it should be noted that, when the companies believe in all of the results intended, those will be reached, because there are process and methods to make it happen. This paper will be useful to quality managers, quality assurance and/or quality control practitioners, as well as researchers seeking for understanding

quality practices and issues surrounding them. This study will also be beneficial to organizations that are planning to implement ISO 9001, are in the implementation phase, or already practicing or registered with ISO 9001. While some of the findings presented in this paper are not new, they confirm the results of prior researches on the organizational barriers that companies face in the process of implementing a quality management system and the value of a stakeholder need. Finally, it provides a description of steps taken by steel services plants prior to implementing and certified ISO 9001. It shows the hurdles faced, and proposes how they are eliminated

P5E – PhD Presentations

CHAIR: [Teresa Guimarães](#)

Quality management in higher education: a trend towards integration?

– Maria Manatos, CIPES Centre for Research in Higher Education Policies and University of Aveiro
[PORTUGAL]

Abstract:

The purpose of our research is to look for theoretical and empirical evidence of the trend towards the integration of quality management in universities. We understand integration as the development of quality management as part of organisations' global management systems, covering different processes, organisational levels and quality management principles. Our main purpose is operationalised in four specific goals, which aim to understand whether: i) there is a trend in the literature towards the integration of quality management in higher education; ii) the European Standards and Guidelines (ESG) is an integrative quality management model; iii) the ESG are important and are being implemented in universities; and iv) universities are developing their quality management systems in an integrated manner. Our research is developed in four main stages, corresponding to four main research goals, which we answer using different methodological approaches, developed in four research papers. We triangulate multiple sources of data: quantitative and qualitative, using different methodological strategies: survey and case study, different data collection techniques: systematic literature review, questionnaire and semi-structured interview; and different data analysis techniques: content analysis and descriptive and inferential statistics. The literature seems to be approaching quality management in an integrated way but has to define the next step in the drive for a 'total' and effective integrative approach to higher education quality management. The ESG do not seem to effectively integrate all the core processes of universities and to be a systemic quality management model. The Portuguese academics have, however, positively 'welcomed' the ESG, consider that they are important and that they are to a large extent being implemented in their universities. Universities show positive signs of quality management integration but they still have some way to go to reach full integration. This is an innovative study, which highlights a trend in quality management in higher education: that of integration, and it offers theoretical and empirical evidence as to the level and extent of the phenomenon.

Predictive Analytics in the Petrochemical Industry: Forecasting the Research Octane Number (RON) from Catalytic Reforming Units

– [Tiago Dias](#), Galp [PORTUGAL]

Abstract:

In the Industry 4.0 era, there is a rising of interest in the exploration of the huge amount of industrial data being collected and stored. The Petrochemical Industry is a sector where significant gains can be anticipated, given the high leveraging of mass production for even small/moderate improvements arising from data analysis. In this communication, we test and compare advanced predictive approaches for estimating RON in the context of the catalytic reforming processes. We consider a data set containing information collected from the process, such as feed and hydrogen flow rates, average temperatures and pressures in the reactors, temperatures and pressures in the distillation columns, etc. Also collected was the RON, which is a key parameter for specifying the gasoline quality. It measures the gasoline ability to resist engine knocking as it burns in the combustion chamber. Like other quality attributes, RON is obtained offline by laboratory analysis with a significant delay when compared to process measurements. The acquisition rate of RON is also much lower, creating a sparse data structure (also known as multirate data) [1]. The industrial data set used to build the models was preliminarily treated in three stages [2]: stage 1 was about detection and removal of outliers, plant shutdowns and values associated with sensor malfunctions; stage 2 establishes the granularity level for both process and quality variables; stage 3 implements missing data imputation techniques to fill in the empty slots of data at the selected resolution. After these three steps, the data set is then suitable for model building. A wide range of predictive methods were considered, representing different classes of modelling approaches with distinct underlying assumptions which can be classified into four classes [3]: linear regression with variable selection (MLR and MLR with stepwise), latent variable methods (PCR, PCR with stepwise and PLS), penalized regression (Ridge Regression, LASSO and Elastic Net), and tree-based ensemble methods (Bagging of Regression Trees, Random Forests and Boosting of Regression Trees). Variable selection methods assume that only a subset of the predictors carry relevant predictive information regarding the response. Methods relying on latent variables consider variability to be driven by a set of underlying unobserved variables, which can be estimated through linear combinations of the measured variables. On the other hand, penalized regression methods use a regularization factor to decrease the model's variance and stabilize the regression coefficients. Finally, tree-based ensembles are based on regression trees which approximates the relation between inputs and outputs by a piece-wise constant function, forming blocks for constructing the ensembles of predictors. To assess the variety of modelling structures under analysis, a rigorous comparison framework was applied based on a double Monte Carlo cross-validation scheme. The results, presented in Figure 1, illustrates that there is a clear indication that non-linear methods for predicting RON have an edge of the linear ones. It is also possible to confirm a very interesting prediction capability of RON from process data, with cross-validation Root Mean Squared Error (RMSE) of 0.43 for Random Forests.

2018 World State of Quality results: an overview

– [Catarina Cubo](#), Universidade do Minho [PORTUGAL]

Abstract:

The World State of Quality (WSQ) aims to assess, analyze and rank countries according to their levels of multidimensional quality performance, namely the macroquality. It was established in 2016 for the European Union countries based on a model composed by 10 dimensions and 21 indicators, which was then reformulated according to the data availability of online databases for each indicator and each country. The WSQ intends to be a worldwide approach considering the possible widest geographical coverage and the up to date available data related to the chosen indicators. This approach consists on a conjugation of 16 indicators and 10 dimensions and the

ranking position that each country gets for each indicator in order to get an overall score. This overall score is an average weight that reflects the position that each country gets to the majority of the considered indicators. The dimensions that are considered in the WSQ are organizations, research, professionals, education, health, competitiveness, innovation, social cohesion, sustainability, and satisfaction. Each dimension comprises one or two indicators. The 2018 WSQ edition encompasses 118 worldwide countries that were divided in 6 groups, depending on their overall score. Countries were categorized in 6 groups: leading, follower, moderate, modest, lagging, and beginning. The first position belongs to Switzerland with an overall score of 18.302, while in the last position is Yemen with an overall score of 93.836. The leading group is composed by 27 countries (overall score from 18.302 to 34.236), the follower group is composed by 16 countries (overall score from 37.428 to 45.793), the moderate group is composed by 12 countries (overall score from 48.714 to 52.965), the modest group is composed by 21 countries (overall score from 55.613 to 65.280), the lagging group is composed by 20 countries (overall score from 67.155 and 78.631) and the beginning group is composed by 22 countries (overall score from 79.000 to 98.836). In spite of the performance of each country across the different dimensions, the overall score ranges from around 18 to 98, it is easily understandable that no country under or outperforms the others for all the considered indicators. Each group comprises a variety of countries, however some geographical similarities can be found enhancing the similar behaviors of countries of the same geographical context with similar overall scores. For example, the leading group is mainly composed by European countries, while the moderate group is composed by countries from the Europe, America, Asia and the beginning group is mainly composed by African countries. The WSQ will support countries in the definition of policies, strategies and deployments of quality, as it highlights quality related areas of each country as well as their strengths and areas of improvement.

Rediscovering Quality in unstable and complex business environments

– [André Mendes de Carvalho](#), MIT Portugal [PORTUGAL]

Abstract:

In a marketplace in constant change, Quality has come under the spotlight to demonstrate it is still able to lead to improved performances. In fact, and for some time now, Excellence models or Total Quality Management tools and initiatives have been facing claims of lack of fit to increasingly complex business environments. Several studies, however, show that Quality and Excellence still offer effective approaches for achieving organizational success. What is missing, then, from the perspectives of those who question their validity? In order to understand the performance of Quality initiatives in a VUCA (Volatile, Uncertain, Complex and Ambiguous) world, we promote a study focused on three main concepts:

- *Operational Excellence, focusing on the frameworks and principles that help to optimize operations and truly deliver Quality through performance;*
- *Organizational Culture, as a vital factor for successfully deploying Excellence in any organization;*
- *Organizational Agility, as the industrial and operations paradigm for highly mutable markets.*

We start by studying the current state of Excellence initiatives, exposing megatrends and discussing their usage and reception in different markets. Following that, we review the literature on the association between Excellence and Organizational Culture, and model the relationship that, through time, leads to the creation of a cultural orientation to Excellence, and to the sustainability of Quality initiatives throughout time. Finally, Organizational Agility is brought to the orbit of Operational Excellence, concluding a conceptual model that relates these three parts. With this theoretical proposition defined, we took our theory building efforts to the field. In order to do so, a total of 6 case studies were performed, both in Portugal and in the United States, in

different industrial sectors. Through the use of multiple data collection methods, these organizations were assessed in their capabilities in deploying and sustaining Excellence. Similarly, we evaluated the existence of enabling elements of Organizational Agility. Results help to clarify how Operational Excellence, Organizational Culture and Organizational Agility combine to deliver superior performance in a long-lasting way. From a more practical perspective, this study allowed to identify how each of these concepts and their enabling elements can be managed and manipulated to achieve superior success in today's marketplace. In the end, findings reinforce the idea that organizations that are able to align their Operational Excellence efforts with organizational culture will have clear leverage when pursuing agile strategies, being able to more efficiently manage change efforts and meet shifting market requirements. This work shows the results of a Ph.D. project that involves the University of Minho (Portugal) and the Massachusetts Institute of Technology (United States). It was initiated in January 2016 and is reaching its conclusion by the end of 2019. The first author wishes to acknowledge the support of the Portuguese Foundation for Science and Technology (FCT), MIT Portugal Program and ALGORITMI Research Center.

Benchmarking the effectiveness of hip replacement among 12 Belgian hospitals

– [Fabian Dehanne](#), CHU UCL [BELGIUM]

Abstract:

The need to allocate quality care combined with cost control then becomes more and more important. There is currently no inter-hospital comparison in Belgium that simultaneously integrates economic and qualitative elements to determine the cost-effectiveness of a hip replacement [2]. This study aims to propose hospital benchmarking through the use of cost-effectiveness indice (DALY) in the management of hip replacement surgery in 12 Belgian hospitals. The number of years lost due to disability (YLD) is calculated by multiplying incident cases by the duration and weight of the disability for a given disease from the Global Burden of Disease [3] or Jha [4]. The calculation of the DALY for deceased patients was carried out according to the Belgian life expectancy [5]. A DALY has been assigned to stays readmitted within 30 days. The costs of this study are the hospital costs from Pasha benchmarking [6]. The adjusted values (costs and DALYS) were obtained by relating the observed value to the predicted value obtained from the linear regression model, standardized to the Charlson index, age, admission diagnosis and sex. We register 137 DALYS for complications - deaths during the first stay and 32 DALYS for readmissions within 30 days. The average loss (ET) of DALYS per stay is estimated at more than 0,070 DALYS (0,67 DALYS). The average cost (ET) of a stay is 8.013 euros (4.304€). Hospitals 984, 989 and 995 are the least cost-effective hospitals with the highest mortality (4,35%), readmission (11,96%) and complication (14,1%) rates in the group. The high number of stays in intensive care and the length of stay contribute to the high average total cost of the hospital 984. In 2025, Belgian hospitals (all other things being equal) could lose more than 2.280 years of life lost to hip replacement surgery [7]. The creation of our index integrating both the notion of cost and the notion of lost life years provides a unique insight into the cost-quality relationship in hospitals. The descriptive approach, through the use of indicators in the Donabedian mode, then makes it possible to translate the overall index for the benefit of managers-providers to understand and support the corrective measures of the sector concerned. The DALYS have allowed us to weigh the complications of stays, it being understood that they do not all have the same impact on the patient and the hospital. The integration into practice of hospital actors involved in the care process could perhaps increase communication [1], which seems to be an issue in the fight against adverse events. As Thakker [8] demonstrates, regular presentation of results encourages teams and ensures the implementation of corrective actions. In view of the reimbursement policy started in Belgium [9], and the variability

of costs observed within the institutions, our analysis invites the authorities to create guides to good practice for common diseases. Despite the fact that our method needs to be refined, we are convinced of the usefulness of our index to assess the cost-effectiveness of hospitals in other care settings.