

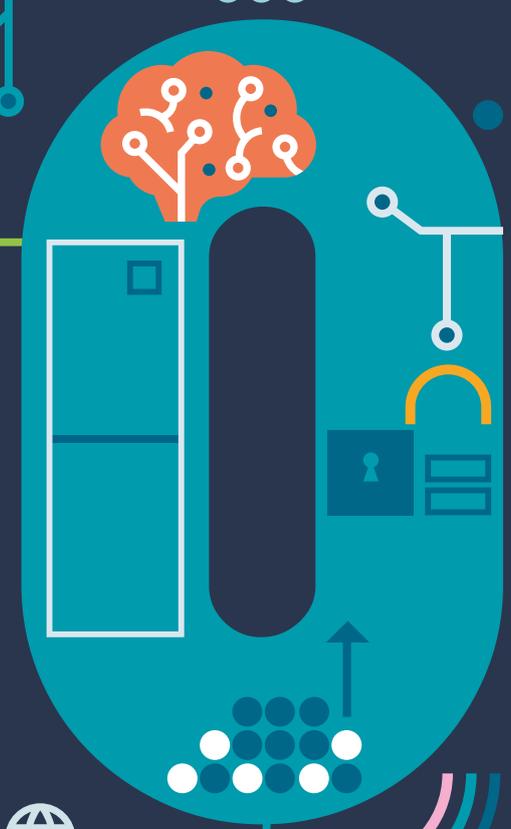
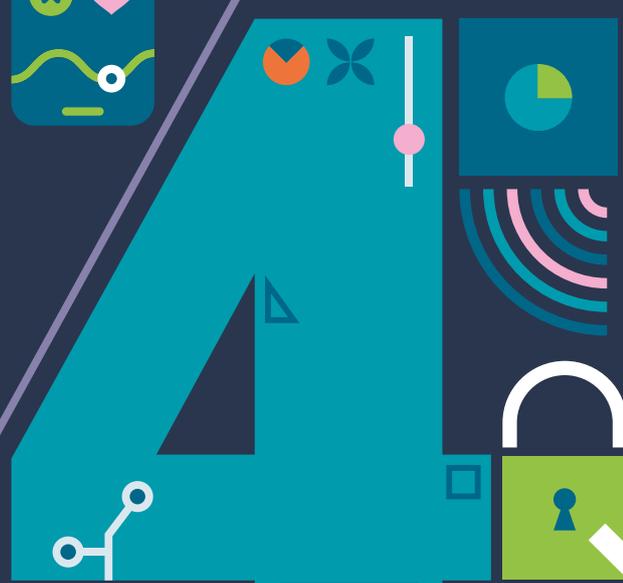
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FROM THE EDITOR



Quality professionals have heard a great deal about Quality 4.0 recently. It has the potential to be a significant driver of change in our profession, but until now, we have lacked a clear, unified definition. On p24, John Oakland and Mike Turner explain the CQI's research project to define Quality 4.0. The infographic on p32 explains the eight supporting principles of Quality 4.0.

Some significant changes are already here, as organisations embrace artificial intelligence. On p12, Carol Long explains why it's important that quality professionals understand how to get the best from it and prevent reputational risk to their organisations.

Corporate social responsibility (CSR), sustainability and the environment are areas that are part of the new world of quality. On p40, David Finney explains the benefits of CSR and how to put it into practice in your organisation. Sustainability is the theme for this year's World Quality Week, and the CQI is working on setting up a Special Interest Group in this area, as our Chief Executive Vincent Desmond explains on p4.

Of course, Covid-19 is still presenting challenges as people return to offices and leisure activities. Staff at the National Theatre in London explain how they are preparing to reopen to the public on p34.

Our popular webinars continue and we have a full programme coming up. Please see our events calendar at quality.org/events-calendar.

Do get in touch with me at editorial@quality.org if you would like to host a webinar or contribute an article or if there is a topic you would like us to cover.

Tracy Tyley

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QW takes a look at key updates in the world of quality

BSI reports supply chain disruptions as a result of Covid-19

A new report from the BSI examining the trends and risks that are likely to impact global supply chains in the year ahead has revealed food fraud and safety as ongoing challenges to supply chain resilience. The *BSI Supply Chain Risk Insights Report 2021* also noted economic hardship,

which increases the risk of labour exploitation; drug smuggling; and regulatory changes that will test organisational adaptability, as other key trends affecting supply chains.

The Covid-19 pandemic caused initial problems with panic buying, stockpiling and disruption to food supply chains, but these generally settled down after the early weeks of the pandemic. However, the Covid-19 pandemic also exacerbated existing flaws in global food



supply chains, whereby fraudulent products can be introduced into legitimate supplies. These are of paramount concern, as the pandemic significantly affected governments' capacity to enforce food regulations, worsening an existing problem whereby staff and funding shortfalls had meant some European countries had already been forced to reduce food safety checks.

TO READ THE REPORT, GO TO: bit.ly/2Tdhj00

UKAS and ASI sign partnership agreement

UKAS and Assurance Services International (ASI) have signed a Memorandum of Understanding, with the intention of bringing together UKAS accreditation and ASI assurance for future collaboration in the field of sustainability.

UKAS has developed a framework for cooperation between ASI and UKAS to implement the ASI Two-Tier Assurance Program in the UK, for ASI partner voluntary sustainability standards and sustainability initiatives.

Matt Gantley, UKAS Chief

Executive, said: "UKAS is delighted to be partnering with ASI, a body that has earned a reputation for excellence and integrity in the sustainability sector. The MoU represents an opportunity to combine our strengths and experience, and should provide a wide range of benefits for all parties. The signing of the agreement is very timely, coming in the year when World Accreditation Day (#WAD2021) highlights the role of accreditation in supporting the implementation of UN Sustainable Development Goals."

BRIEF

Updated ISO standard for energy management systems audit

The International Standards Organization has published an update to its energy management systems standard, ISO 50003:2021 Energy management systems — Requirements for bodies providing audit and certification of energy management systems. The standard is designed to be used alongside ISO/IEC 17021, and provides the energy-based requirements for the audit planning process and aims to ensure that the auditors are appropriately skilled.

FOR MORE INFORMATION, VISIT: bit.ly/3fsg60



Working from home and mental health during Covid-19 pandemic

A global report by Lloyd's Register has revealed that people working from home during the Covid-19 pandemic have higher stress levels and are concealing mental health conditions from their employers. The study also found that improvements to work-life balance are not translating into gains for employee wellbeing. In addition, employees believe employers need to consider changing their approach to mental health and physical safety.

DOWNLOAD THE REPORT HERE: bit.ly/3fSB2PU

MY AGENDA

Vincent Desmond

CHIEF EXECUTIVE



Standards, conformity assessment and Quality 4.0

The recent news that ISO will not review ISO 9001 right now has been met with a variety of responses ranging from relief to disappointment. Changing a standard like ISO 9001 attracts significant cost for users and the associated benefit must be compelling. The vote by national standards bodies indicates there is no globally accepted need for change yet. At the same time, there is much head scratching as the global quality profession considers what impact technology might have on the management of quality. In this respect, the decision not to commence a review of ISO 9001 does give us the time to scratch the Quality 4.0 itch and be clear if, and to what extent, a change is required – at least from the technology point of view.

In the UK, the Department for Business, Energy and Industrial Strategy (BEIS) is moving ahead with its Industry 4.0 planning. In March, I represented the CQI as the BEIS road tested its 'Standards for the Fourth Industrial Revolution Action Plan'. This promising plan forms part of a wider effort to ensure the UK's infrastructure of regulation and standards to ensure it supports the rapid commercialisation of innovation while protecting people and planet.

Quality and sustainability

Sustainability is the theme for this year's World Quality Week (learn more at quality.org/article/world-quality-week-2021). World Quality Week coincides with the UN Climate Change Conference in Glasgow in November. The link between quality and sustainability will not be lost on our profession; I am grateful to those members who have offered their support and to those who have registered their interest in forming a Special Interest Group to provide a forum for members to work on sustainability. I was also pleased to meet with the Society for the Environment recently to start discussing collaboration between our professions.

Brexit: supply chains and skills

In March, I hosted a Brexit webinar with UKAS, the Federation of Small Businesses, and Republic of Ireland-based Mercury Engineering. The event underlined the importance of managing supply chain risk as we approach 1 January 2022, when the UKCA and UKNI marks must be used for relevant goods being placed on the UK and Northern Ireland markets. The cost of having both marks may result in some suppliers electing not to supply the UK. You can watch the recording of this webinar at: bit.ly/35bqaba. Brexit also featured at our first Corporate Partner roundtable of the year, which took place in February. Many employers are finding that Brexit has exacerbated the quality skills deficit in the UK because EU workers have returned home or are more difficult to recruit.

Annual General Meeting calling notice

Notice is hereby given that the 20th Annual General Meeting (AGM) of the Chartered Quality Institute will be held virtually on Friday 10 September 2021, 11:00–12:00 British Summer Time (BST).

AGM agenda

1. To receive the minutes of the 19th AGM, held on 9 September 2020.
2. To receive the annual accounts for the year ending 31 December 2020.
3. To receive and adopt the annual report of the Board of Trustees for the year ending 31 December 2020. (The Chartered Quality Institute Annual Report 2020 will be available on the CQI website, quality.org/cqi-agm-2021, in July.)
4. To confirm the appointment of the Institute's auditors until the next AGM and to authorise the Board to fix their remuneration.
5. To report the composition of the Institute's Board of Trustees and Membership Council for the following year.
6. To transact any other business relevant to an AGM, details of which have been received in writing by the director general seven days before the date thereof.

By order of the CQI Board of Trustees.

Vince Desmond,
Chief Executive/Director General

Notes to the notice of the AGM:

1. Registration for the AGM and voting details: All CQI members and IRCA certificated auditors are welcome to attend the AGM and will receive an email with a link to register to the virtual event. Only Chartered Members (FCQI, MCQI) of the Institute are eligible to vote. They will have the option to register a proxy or vote on the day, via an email sent to them from our AGM voting platform provider, Mi-Voice. Details on how to register and vote will also be available online at: quality.org/cqi-agm-2021

2. Appointment of proxies: Voting members (FCQI, MCQI) are entitled to appoint a proxy to exercise all or any of their rights to virtually attend, speak and vote at the meeting. If you are a voting member (FCQI, MCQI), you will receive email instructions from Mi-Voice about registering for proxy voting and voting on the day.

3. Any Proposals for Resolution or items of any other business must be lodged in writing with the Chief Executive, governance@quality.org, no later than five working days before the meeting.

The CQI's new Standards Coordination Committee

Following the review of CQI Sponsored Standards Activity at the end of 2020, the CQI is pleased to have recruited a new CQI Standards Coordination Committee. The Committee comprises CQI members, IRCA auditors and representatives from the CQI's Executive Team, and will be responsible for coordinating the new CQI sponsored standards regime. This regime retains a coordinated overview of all CQI standards activity, focusing core resources on those standards of most importance to the CQI and its members. It will also support subject matter specialists and enthusiasts to pursue specific interests for standards which are not sponsored by the CQI.

CQI standards activity was previously managed by the CQI Standards Panel. Through the endeavours of this group of standards makers, the CQI is recognised by the BSI and ISO as an organisation that is competent and willing to make meaningful contributions to the production and revision of a diverse range of management system and

auditing standards – standards that are adopted by millions of organisations across the globe.

While we look ahead to a new regime for engaging with standards development, the CQI would like to thank the former members of the CQI Standards Panel for their dedication, enterprise, and expertise:

- Mark Braham, CQP FCQI, Head of Risk at Veolia UK/Ireland
- Estelle Clark, CQP FCQI, Governance, Assurance & Improvement Strategist at Strategic Arrow Ltd
- Angela Cunningham, PCQI, Management Systems Coordinator at CCEP
- Richard Green, CQP FCQI, Managing Director at Kingsford Consultancy Services Ltd
- Ricky Leask, PCQI, QHSE Coordinator, InterMoor
- Mike Pearson, CQP FCQI, Managing Director, Pearson Associates Ltd
- James Pink, CQP MCQI, Senior Director, Health Sciences for NSF International
- Sharon Shutler, CQP FCQI, Quality Director, QMS Services.



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Ian Mitchell Chair, CQI Board of Trustees (2015-2021)



As I prepare to step down as Chair of the CQI Board of Trustees in September 2021, I reflect on my journey over the past six years and the work I have so enjoyed doing for both the CQI and the profession.

When I became Chair, my priorities were to improve the CQI's governance, which is so fundamental to organisational sustainability and success, and to help develop its strategy, which is the bedrock for creating value.

It has been good to witness the improvements that the CQI has made to its corporate governance, in line with the Charity Governance Code and with the establishment of two key trustee committees: Finance & Remuneration and Governance & Risk. Consolidating our Advisory Council and Regional Operating Panel into the CQI's Membership Council has also unlocked the power of our member community. I am delighted to see the fruits of this with new member-led networks coming online to support topic, sector and geographical interests.

With the support of our Nominating Committee, the CQI has also made great strides in creating a much more diverse Board of Trustees which now boasts a broader range of backgrounds

and experience. This has set a positive tone that the quality profession in turn needs to reflect. Furthermore, it is heartening to know that our trustee-led Equality, Diversity & Inclusion Working Group has started the CQI on an essential journey of improvement in this area.

In 2018 I commissioned a review of the institute's strategy. Both the CQI's Royal Charter, which gives it a mandate from the UK Government to champion quality management for the benefit of society, and its pending 100-year anniversary served as an important backdrop. The strategy review process recognised that the profession and the CQI would need to respond to the changing external environment, which included the impact of technology and shifting customer expectations.

I feel privileged to have played a part in devising the CQI's 2030

satisfaction scores have increased and the CQI is attracting more members, especially next generation quality professionals.

The Covid-19 pandemic, which shifted my focus to supporting the CQI through these testing times, has brought positives alongside the challenges. Our volunteers and staff, who pivoted so fast and so well, have shown an abundance of resilience and commitment that has filled me with pride. In fact, the most satisfying aspect of leading the Board has been listening to and learning from the members, volunteers and CQI colleagues that make up our diverse global community.

I would like to thank my fellow Board colleagues and our President, Lord Jamie Lindsay, for their support and contribution and for enriching the time I served as CQI Chair and Trustee. My departure also coincides with my

“The most satisfying aspect of leading the Board has been listening to and learning from the members, volunteers and CQI colleagues that make up our diverse global community.”

strategy, which sets the agenda for the profession as well as the institute. It is satisfying to see the investment in our 10-year strategy being realised as we develop the principles and practices of Quality 4.0 and embrace sustainability through a range of activities, including this year's World Quality Week.

During my tenure there have been numerous highlights: from the establishment of the CQI's International Quality Awards in 2016; to the creation of business improvement and quality apprenticeships; through to our work with ISO and BSI on quality and corporate governance standards. We have progressed our digital agenda by introducing an online mentoring platform and through the ongoing improvement to our member portal and digital content. As a result, member

retirement as a quality professional after over 30 rewarding years.

We have reached an inflection point as the profession enters the digital age, but the CQI has the future firmly in its sights. And I have every confidence that, with Amanda McKay as our new Chair, the Institute will continue to successfully champion quality management, lead the profession, and increase its value to members and society.

Top right: Ian Mitchell presenting at the International Quality Awards 2019.
Bottom right: David Hutchins, CQP FCQI, Chairman and Principal at David Hutchins International, receiving the CQI Honorary Award from Ian.



Photos: Ernest Simons

POLICY UPDATE

Mike Turner

HEAD OF PROFESSION



I am delighted to report that the first project in our 2021-2022 roadmap is complete. We now have a working definition of Quality 4.0 from which we can further explore what it means for quality management practice and for the knowledge, skills and behaviours needed by a quality professional in order to thrive in the digital age. On p24 of this issue, you will find an article that explains what we have developed and where we intend to go next. We have built such a head of steam that we will continue onto the next stage (stage 2) ahead of our original schedule and reach our goal of describing the new Quality 4.0 competencies before the end of 2021.

At the time of writing, we are finalising the selection of the research partner with whom we will develop the Competency Framework 2.0. We intend to integrate Competency Framework 2.0 with the stage two work of Quality 4.0 and launch the new version of the Competency Framework (CF 2.1) before the end of 2021.

This work will also contain an exploration into the ways in which quality professionals can further contribute to the environmental, social and governance (ESG) agenda of their organisations or those of their clients. This is rapidly growing in importance, as evidenced by the actions of leading asset management companies like Blackrock, and Legal & General. These large institutional investors are demanding that boards publish their goals and plans for ESG and put these to a vote. The growing importance of ESG to consumers and the public are likely to drive this agenda into brand values and consumer choice. This provides a big opportunity for quality professionals to describe and demonstrate the relevance and value of their work to this aspect of organisational performance, and to derive personal satisfaction in the process. We plan to help you to seize this opportunity.

Last month, the ISO technical committee responsible for ISO 9001:2015 – Quality Management Systems – Requirements confirmed that there will be no changes to the standard at this point. While this was not a complete surprise, it has nonetheless caused some debate. With the rapid pace of change in business, society and technology, there is a case to be made for ISO 9001 needing revision if it is to continue to offer value to users. Quality 4.0 and ESG are just two of the factors changing the context in which ISO 9001 operates. ISO TC176's future quality concepts, and user demand for greater clarity in the standard about topics such as risk, further argue the case that ISO 9001 requires revision sooner rather than later if it is to retain and improve its value, integrity and relevance. Whatever the future of ISO 9001, the CQI will be an active participant.

At the time of writing, we are forming the new CQI Standards Coordination Committee, which will build on the excellent work and expertise of the Standards Panel. It will cement the CQI's influence and reputation as an invaluable partner in standards development and harness the voice of members through a new approach to member engagement and participation.

This is part of the CQI's new standards regime, which is now going live and is designed to engage members in planning and coordinating the CQI's standards strategy. It also offers new opportunities for members to contribute directly to the development of a wider range of standards through working groups and member consultation activities. The CQI Standards Coordination Committee will support members in contributing not only to the most used and recognised standards, but also to pursue sector-specific interests, and those outside the ISO/national standards body sphere of influence.

CQI NETWORK EVENTS

CQI Wales Branch - Summer 2021 Master Class

When: Saturday 3 July, 9:15am – 11am
Venue: Online
Register: bit.ly/3pUf1VH

CQI Leicester and Coventry Branch: IATF 16949 Automotive Quality Management Standard. Success or failure?

When: Wednesday 7 July 2021, 6:45pm – 8pm
Venue: Online
Register: bit.ly/3zuZLDd

CQI Deming SIG - Wisdom From Numbers

When: Tuesday 27 July, 4pm – 5:30pm
Venue: Online
Register: bit.ly/3gynidM

Correction notice

In the Spring 2021 edition of *Quality World*, an error was made in Suzanne Hill's interview on p25.

Suzanne did not say: "It was crucial for me to secure this award because of my range of volunteering experience, and the many people that I'm supporting in the work that I do."

She said: "It was an honour to receive this award. My volunteering for the CQI is wide ranging and I am supporting many people in the work that I do."

The changes to the text that were made without her knowledge, altered both the meaning and the tone of her comments.

We apologise to Suzanne for this error. The corrected interview is available in the online version of *Quality World* Spring 2021.

Membership Council Vice Chair



Thank you Suzanne Hill

The CQI would like say a huge thank you to Suzanne Hill, CQP FCQI, whose three-year term as Vice Chair of the Membership Council (MC) came to an end on 13 May 2021. Suzanne decided not to stand for a second term to allow for smooth

succession planning, so that she and the MC Chairman wouldn't both have their terms expire at the same time. She will be succeeded by Mark Edyman, CQP MCQI, who has been elected by the MC as the new Vice Chair.

Suzanne's work as a volunteer on the MC has helped the CQI achieve some huge milestones. She has been pivotal in developing and supporting CQI networks' use of technology during the first Covid-19 lockdown – helping CQI volunteers to navigate their way around new technology, and also guided many of the CQI's hybrid online/in-person events. In addition to this, she has excelled in her organisational capacity, improving the MC meeting structure and creating a visual management system to track MC member terms. She has worked well with MC Chairman Dave Smith, who she describes as an "innovator" and herself as the "organiser" in their respective roles. Speaking of her time on the MC, Suzanne said: "I have enjoyed my time as Vice Chair and hope that I can continue to contribute to support and represent the CQI membership going forward as a volunteer."

The CQI is immensely grateful for Suzanne's hard work and dedication as a volunteer. As Chair of the Nominating Committee and Chair of the CQI Derby and Nottingham branch, we know it will not be farewell, and she will continue to enhance the profession.



Welcoming Mark Edyman

The CQI is delighted to welcome Mark Edyman, Founder and Lead Consultant at Six Pillars Consulting, UK, as the new Membership Council Vice Chair.

Eydman who will be overseeing future developments within the Membership Council, commented: "I am delighted to have been elected to serve as Vice Chair. I am a passionate advocate of the quality profession and the Chartered Quality Institute. My hope is to use this new position as an opportunity to leverage this enthusiasm and enhance even further the value being provided by the CQI and IRCA membership and activity." Mark is well known among CQI members for his work as Chair of the CQI's Leicestershire and Coventry Branch, and Chair of the Midlands region. In addition to his professional accomplishments, he regularly contributes content and ideas to the CQI's webinars, Knowledge online and *Quality World*.

KNOWLEDGE

Check out some recent highlights from the CQI's Knowledge Online articles



The benefits of the CQI mentoring programme for regrade

Abigail Cooper, CQP FCQI, Quality & Improvement Manager, Otis Elevators, and Gaurav Bijlani, CQP MCQI, Production Test Equipment Manager, Hanover Displays Ltd, discuss how mentoring support helped them with regrading.

bit.ly/3xmoWWz



It all starts with study

Mitch Beedie, a freelance researcher/writer, suggests a study, decide, plan, do (SDPD) cycle.

bit.ly/3cC7buy



Selecting the right problem-solving strategy

Derek Scott, CQP FCQI, Quality Manager at Rubberatkins, Scotland, takes a look at models and strategies for problem-solving.

bit.ly/3wcwEi



Engagement of people

Raffat Khatoon Mohammed, CQP MCQI, ISO 9001, 14001 and 45001 Lead Auditor at Qatar Primary Materials Company, explains how the use of "engagement of people" helped the company to overcome staff and skill shortages during the Covid-19 pandemic.

bit.ly/3pH0eeZ



Avoiding auditing pitfalls

Stanley O Donnell, IRCA Principal Auditor, has experienced many pitfalls when auditing and shares some of the obstacles auditors should avoid.

bit.ly/3v5B6Sc



FOR MORE ONLINE KNOWLEDGE ARTICLES, VISIT:
QUALITY.ORG/KNOWLEDGE

MEMBERSHIP UPDATE

Gareth Kingston
HEAD OF MEMBERSHIP



What do you want?

I am writing this update from the CQI's new offices on Chancery Lane.

Like many organisations, the pandemic challenged us, and through our response we have found new ways of working that suit our needs. As a result, our new offices reflect this.

I am sure that this will be a familiar story for our members.

For some of you, there has been a radical change to your work life, while for others there have been more subtle changes. All of this means that what we once knew about our members may no longer be correct.

Therefore, we need to know if what you want and expect from us has changed. As Head of Membership, I would love it if you could tell me about what you want from the CQI.

If there are new quality management developments that we should be aware of, please tell us. From new networks to new ideas, we want to know about your experiences.

I'm also interested to know how your experiences from outside your work life might offer us insights into how we can improve as an organisation. I know from my personal experience that the way that my main hobby has adapted to online life offers some ideas, but the ideas I most want are yours. So, please give us data, insights and ideas.

As W Edwards Deming said: "Without data, you're just another person with an opinion."

Once a year, you are asked to complete a membership survey, so do fill that in. But don't feel that you have to wait for the survey to have your say. I would like to speak to a group of members about their experiences during lockdown. If you are able to share yours, please email me at gkingston@quality.org

We want to make sure that we are as closely aligned to your needs as possible. As an organisation, we want to keep improving and developing. You can play a crucial role in all of this.

I look forward to hearing from you.

EMAIL: [GKINGSTON@QUALITY.ORG](mailto:gkingston@quality.org)

It's time to submit your CPD

Members selected as part of the continuing professional development (CPD) sample group must ensure they submit their CPD by Monday 2 August 2021.

The CQI's Membership Team has been conducting CPD sampling over the past month, by reaching out to groups of members and asking them to submit their CPD from the previous year. The aim of the sampling is to ensure that members are continuing to maintain and enhance their professional knowledge and skills, and to offer them support with this process where necessary.

As part of the CQI's Royal Charter, "Chartered Quality Professionals are required to record Continuing Professional Development (CPD) in a manner prescribed by the Institute to maintain their membership grade", which is mandatory across all Chartered Member and Fellow grades. However, all members, regardless of their grade, are encouraged to undertake and record their CPD as it is a vital part of maintaining skills and supporting development needs.

Christopher Porter, CQP MCQI, Product and Services Quality Lead at Cavendish Nuclear, who was asked to submit his CPD for the 2020 CPD sample, told Quality World he finds the process of completing the CPD record to be "a very beneficial exercise as it forces you to take a step back from the day-to-day pressures and focus on the direction you are going in your 'quality' journey".

He added: "You identify more clearly what you have already experienced and achieved, then build on this by giving yourself relevant targets and goals (objectives). Revisiting these entries later, can be very rewarding to see how you have progressed."

Speaking of his CPD submission experience, Peter Church, CQP MCQI, Project Manager at NVP Energy, said: "It was very easy and straightforward to submit my CPD to the CQI. The online system with supporting instructions made the process clear and simple.

"In the latter part of my career, my job roles have often changed. I found that preparing a CPD programme and carrying out the noted activities – be it courses, research or learning, and recording the outcomes – gave me a structured approach to analysing new skills and knowledge required to carry out my job. The whole process became invaluable."

He offered the following advice to other CQI members: "Use the CPD process to analyse your own shortcomings and work out a structured system for improving skills and knowledge to enable career progression. Life is easier recording this in real time."

The Membership Team are available to help members assess their individual development needs by supporting them in setting clear quality objectives to achieve their goals using the plan, do, check, act (PDCA) cycle, which is used for members to log and keep track of their CPD.

FOR MORE INFORMATION OR HELP ON SUBMITTING YOUR CPD, VISIT [QUALITY.ORG/CPD](https://quality.org/cpd) OR EMAIL THE MEMBERSHIP TEAM AT [MEMBERSHIP@QUALITY.ORG](mailto:membership@quality.org)

CQI's latest webinars and virtual events

The CQI's webinars and virtual events aims to support members with their continuing professional development. If you missed an event, you can catch up by watching the recording via the Members' Area.



On 17 May, the CQI presented a webinar about the CQI regrading process. Viewers were walked through the application process and requirements, provided with tips, and had the opportunity to have their questions answered. The presentation specifically looked at Practitioner, Member and Fellow grades.

[TO WATCH THE PRESENTATION, VISIT: YOUTU.BE/8H-FGDU0IH7](https://youtu.be/8H-FGDU0IH7)



On 5 May, Keith Leslie discussed how managers and businesses can support the mental health of their employees in a time of crisis.

[TO WATCH THE WEBINAR, GO TO: YOUTU.BE/YL1IBDN9_LQ](https://youtu.be/YL1IBDN9_LQ)



On 28 April, CQI trustee David Straker reviewed the modern quality domain and revealed the criticality of psychology for the quality professional, both in terms of application and skill.

[FOR THE RECORDING, VISIT: YOUTU.BE/UQKFZMIAYFY](https://youtu.be/UQKFZMIAYFY)



On 21 April, guest speaker Professor Perry Shard, UK Construction & Group Civils, spoke to the Nuclear Next Generation group about behavioural quality and how behaviour can be used to drive understanding of the root cause of error and used to mitigate repeated mistakes.

[TO WATCH THE MEETING, VISIT: YOUTU.BE/WPC1T5GA-RO](https://youtu.be/WPC1T5GA-RO)



On 20 April, Jonathan Blanchard Smith, Fellow at SAMI Consulting, presented four post-Brexit scenarios, and looked at the opportunities and risks for the UK and what this means for CQI members.

[VIEW THE WEBINAR AT: YOUTU.BE/NHM-085YB74](https://youtu.be/NHM-085YB74)



FOR OUR FULL LIST OF WEBINARS, GO TO: [BIT.LY/3V5XDB6](https://bit.ly/3V5XDB6)

Tengizchevroil joins as a CQI Corporate Partner

Tengizchevroil (TCO) is the latest international oil and gas operator to join the CQI Corporate Partner programme. The company, headquartered in the city of Atyrau in western Kazakhstan, operates the world's deepest super-giant onshore wells in Tengiz and Korolev fields. It was established in 1993 as a joint venture between Chevron and Kazakhstan. Today, TCO is a partnership between Chevron (50% share), ExxonMobil (25% share), KazMunayGas (20% share) and LukArco (5% share).

Speaking about the partnership, TCO Capital Projects Manager Michael 'Mick' Kraly, who has been a strong advocate for quality throughout his extensive career, commented: "I view this as an opportunity for our local resources to broaden quality awareness and competencies, which enables future projects to be supported from locally resourced project quality professionals."

Ian Howe, Head of Commercial Development at the CQI said: "I'm delighted to welcome TCO into Corporate Partnership, the programme they have put in place with its alignment to the CQI Competency Framework will be of great benefit to both their quality professionals and key stakeholders, and the Corporate Partnership further underpins TCO's wider commitment to the quality management profession."

TCO is currently in the final phase of completing one of the world's largest major capital projects, the US\$45bn Future Growth Project and Wellhead Pressure Management Project, which supports the operator's vision of achieving 1m barrels of oil equivalent daily production.

The company has also recently commenced an internal quality management training and mentoring programme, which aligns with the CQI Competency Framework. Participants who successfully complete the programme may be nominated for CQI Chartered membership status. The programme has been designed to provide a broad quality management foundation to support long-term quality competencies, which enable TCO projects to be delivered by national resources in the years ahead.

TO FIND OUT MORE ABOUT CQI CORPORATE PARTNERSHIP, VISIT: [QUALITY.ORG/ARTICLE/CQI-CORPORATE-PARTNERS](https://quality.org/article/cqi-corporate-partners)

ARTIFICIAL INTELLIGENCE AND THE QUALITY PROFESSIONAL

Artificial intelligence is becoming more prevalent in the era of Industry 4.0. Although AI is bringing a wealth of benefits to businesses who have adopted it successfully, there is still some work to be done in the quality profession to bring quality professionals up to speed and help them reap the benefits of this emerging technology

Words: Carol Long

Artificial intelligence (AI) is changing our world and the ways in which our businesses operate. Although it is bringing some major benefits to organisations who are adopting this tech, AI system developers can sometimes accidentally implement questionable moral standards, encouraging a wealth of negative press. There are examples of digitised identity recognition systems that distinguish between skin colour, fitness

monitors that discriminate between men and women owing to physical differences, and recruitment systems that embed biased hiring decisions that favours recruits from the university that current employees attended.

What does a quality professional need to consider to avoid bad publicity? What skills do we already have that can support us in the current era of Industry 4.0? How can we get a head start in understanding what is possible with AI and how we can develop our careers? ▶

AI explained

In layperson's terms, AI is computer software that creates algorithms to make decisions that approximate how a human might deal with that data. AI techniques were developed in the 1980s, and those AI systems required programmers to take human knowledge and convert it into a set of rules or logical statements that can be programmed into the code. The system then used those rules and combined them to make decisions based on data. Sometimes the AI would encounter complexity in the data that led to it giving unexpected answers because the model algorithms based on the rules were not comprehensive enough to reflect the range of real-world data. Developing those systems took a considerable amount of time and effort from experts to uncover their implicit and explicit working knowledge. That effort took them away from their usual roles.

Rule-based machine learning was and is a pragmatic option for healthcare professionals, because their activity followed logical steps from diagnosis to treatment. These medical steps were easily translated into a set of rules that could be programmed to look at medical data and draw conclusions. Some early applications of these rule-based systems were used in oncology for that reason.

“There is potential for quality professionals to use AI to look for anomalies or recurring themes in the data they use in their own process monitoring”

Other professions have less structured decision-making processes, and the expert would need to understand why they made the decisions in the way that they did before their rules could be defined. Drawing out assumptions and implicit knowledge was significantly harder in those contexts. When the AI produced unexpected answers in testing, it was useful in helping the experts recognise that they hadn't specified some of the decision rules that they would instinctively apply in more unusual situations. These rule-based AI systems were expensive to develop because of the efforts required.

A parallel development path proved more successful. Taking the data that humans had already worked on, AI could find patterns in that data that would lead to the same result as humans. Instead of following the experts' methods, the software found its own. Using this training, the AI model could process larger amounts of data than the human expert and to a similar accuracy. This is then tested in a safe environment under human supervision, before being used in less controlled environments. One example is the joint work between Oxford University Hospitals and University Hospitals Birmingham, who are developing a screening process for a biochemical and physiological signature of Covid-19 in patients' blood samples.

Prevalent technology

After many years of development, AI tools are now usable for many businesses. One of the most common is an automated chat functionality – designed to help website visitors navigate information quickly and efficiently. This system takes the form of a 'bot' (instead of a human), and it is used on the website to analyse what people are interested in and show them similar items. For example, Facebook uses AI to learn what individuals are interested in so that more about that particular subject can be included in that Facebook user's feeds.

This technology is also used inside business systems to analyse customer transactions and requests, using patterns found in previous customers' data to predict potentially dissatisfied customers and pre-empt complaints with more appropriate customer care actions, or to encourage the customer to engage in alternative services better suited to them. Credit card processing has started to use AI to identify transactions outside the customer's usual behaviour patterns to avert fraudulent transactions.

The development of AI tools has three areas of cost:

- developing the toolset
- collecting suitable data to train the tools
- specific application developments based on that training.

From a business perspective, AI is now accessible technology because a large portion of the initial costs of

developing the toolsets have been taken on by larger organisations, such as IBM, Google, Amazon and Microsoft. All these organisations are now keen to involve businesses in the use of their tools and target some of their marketing budgets to promote their successes.

Along with successes, there have also been some major failures. This includes:

- Microsoft's conversational chatbot function which became antisemitic, misogynistic and foul-mouthed within 24 hours after it interacted with certain users.
- IBM's Watson for Oncology miscalculations on treatment paths, suggesting potentially dangerous treatments for cancer patients.
- Amazon wanted its recruitment algorithm to take bias into consideration when finding new hires. Instead, the algorithm favoured male recruits because their existing engineering teams were predominately men.
- Google indexed racist material and presented this as reliable information. These examples of failures started out as well-intentioned AI automations.

They encountered conditions that challenged the original intent when processing complex data. Google did not intend to present racist material when a user searched for organisations that protested against racism. The Google AI simply learned that those offensive terms were associated with anti-racism sites in the same way that ingredients are associated with a cooking recipe. The complexity in that data was beyond the intelligence of the search tool's AI.

AI is not the only technology that is emerging from specialist areas and moving into more general applications. Other examples are:

- process automation
- Internet of Things (IoT) and the associated sensors
- robotics
- wearable devices
- cloud computing
- mobile data and unified communications
- electronic currencies (not only cryptocurrencies, but also cashless transactions).

These technologies have been evolving since the 1990s.

Unfortunately, none of them were initially developed with a social agenda in mind. This leads to complexity in integrating them, causing interesting and unexpected developments. There are likely to be some unpleasant surprises, but some eventualities can be predicted. For example, we are becoming increasingly aware of the interaction between big data, the IoT, and AI, and its capacity to embed insidious biases in future wearable devices.

The quality professional's role

Quality professionals have a role to play in the development and implementation of AI. Professionals who review business cases for operational improvements will need to be ready for the increasing uptake of AI. Acquiring a basic understanding of how AI works will help quality professionals assess whether or not the claims of advantages made for the developments are overblown, or if the ambition of a system design is overreaching. There is a lot of hype around AI, and early adopters of this technology tend to be over-enthusiastic and optimistic.

Those who spend more time looking at legal and compliance risk will recognise that innovation can cause complications. For example, a person with a limited understanding of their organisation's digital AI tools and AI's risks and capabilities could see an increase in liability issues. In this scenario, the person in charge of an implementation could be held responsible if an AI issue takes place on their work premises.

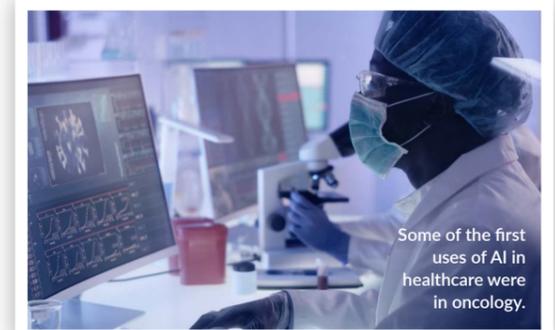
Data protection

AI will need appropriate technical and management safeguards around its use. This includes making sure that people have given their consent before using or analysing their data for a particular situation.

There will also need to be frameworks and guidelines for appropriate and ethical use, the management of artificial intelligence-related intellectual property, and a careful watch on the interaction between AI applications and other technologies that may cause

unexpected results. For example, AI monitoring production may misinterpret an unexpected reading from a IoT sensor, calling it a major failure and forcing a factory shutdown, whereas mature integration would raise a maintenance request for the sensor and an advisory note for those reviewing the process.

Data management and data quality



Some of the first uses of AI in healthcare were in oncology.

is the biggest risk area. There are two main aspects to this; the first is the quality of data within the dataset that will be used to train AI. For this, the standard questions around currency and validation are only part of the areas to be investigated. It is vital that any operational data that is used to train AI is evaluated in a wider context. For example, using customer data to identify the characteristics of good customers is selective in that it only looks at your existing customers and it cannot tell you about the characteristics of potential customers who may be important to your future business.

“Quality professionals have a role to play in the development and implementation of AI”

The second aspect is as AI applications extend based on current regulations and practices and start to draw data in from elsewhere (eg, pooling customers' social media accounts to assess creditworthiness), the AI's models may be applied in areas for which they were not designed. This means that consumer protection, compliance with the General Data Protection Regulation (GDPR) or questions about ethical business practices could become a concern. ▶



Critical thinking

Perhaps the biggest area where quality professionals will find their expertise being valued is in critical thinking. We are well-trained in recognising the difference between cause and effect and that there is a difference between causality, coincidence, and correlation. By providing constructive feedback, we can help educate other colleagues about the logic in AI and those businesses who are developing it.

It would be quite easy for the technical teams involved to become intensely focused on the work to be done, and not have the wider viewpoint needed to validate the ideas and question the scope of them. Modularisation, software objects and reuse are so embedded into development practices that we

“There is potential for quality professionals to use AI to look for anomalies or recurring themes in the data they use in their own process monitoring”

often encourage developers to adapt existing tools, protocols and code as a way of speeding up and improving product development.

We do not stop to consider the history of the tools we use. In the context of AI, this could be problematic. If a data tool analyses medical indicators for a sports team, reusing it to monitor the health of elderly patients may be entirely inappropriate, even if the same factors need to be modelled.

The issue with this is that what is normal for a highly trained athlete could be a danger signal in an elderly person. Understanding the source and provenance of the AI tools being deployed for this and similar situations will become an important part of long-term maintenance and management of an organisation's AI assets.

When data mining and analytics were first used, a pattern was detected where Sunday newspapers were often bought by

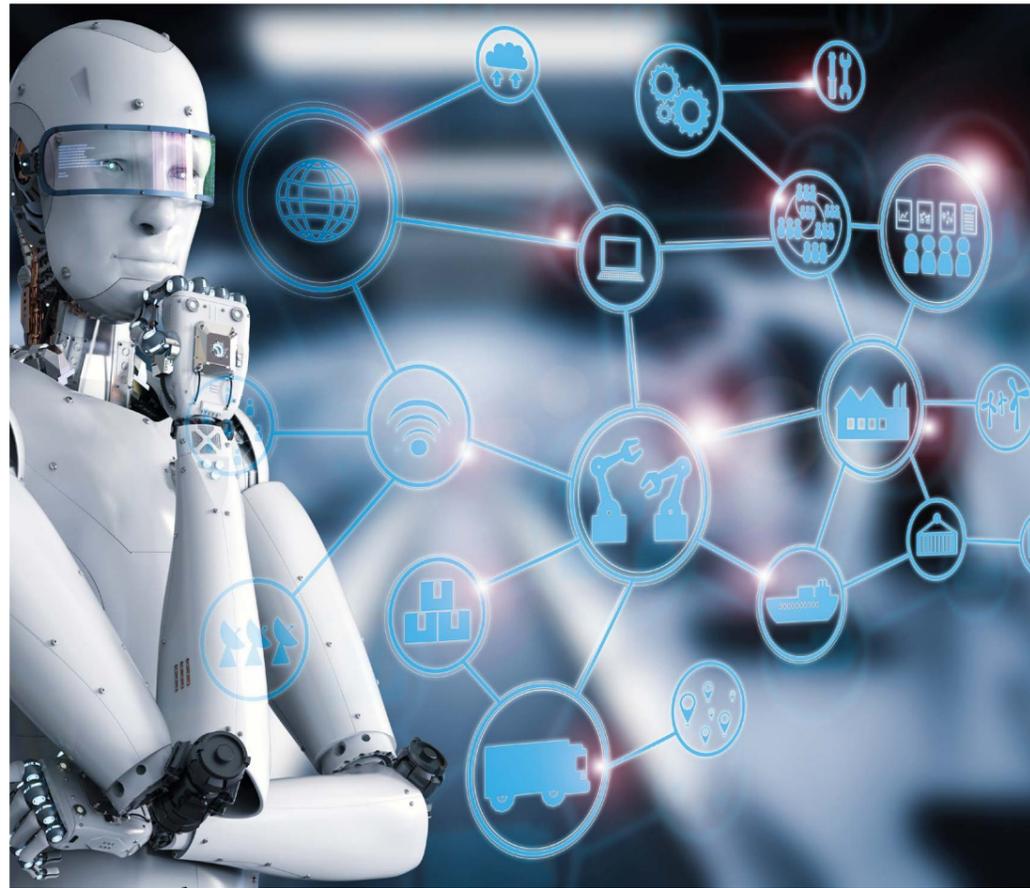
people who went for a walk. Was this a coincidence simply because both Sunday newspapers and walking only happened together on Sundays and not on other days of the week? Was this causal, in that going to get a Sunday paper meant that people had to walk because of the lack of public transport? Or was it causal because walking to the shops on a Sunday meant people coincidentally bought a newspaper? All those questions said something specific about the social structure of those who bought Sunday papers. At the time, these were simple marketing questions based on patterns that had been noticed in customer data. Using AI technology, such patterns could be used to shape business decisions and communication with consumers on a global scale.

Similarly, false positives and false negatives are familiar concepts to some quality professionals, and they know that these are not equally important in some situations. In Covid-19 testing, a false positive will inconvenience one person and their close contacts, who will need to quarantine. In contrast, a false negative could cause a person to be released with an unrealistic confidence and risk, which may result in that person infecting vulnerable people, thus spreading the virus.

During any development, a quality professional could be an independent voice that considers the balance between striving for the perfect model in the AI algorithm and having something that is effective without taking on unnecessary risks. This independent voice is something quality professionals do in other contexts.



AI systems for rapid one-hour Covid-19 screening in hospital emergency departments are being further trialled in Oxford and Birmingham, after promising initial results.



Auditing with AI

There is potential for quality professionals to use AI to look for anomalies or recurring themes in the data they use in their own process monitoring.

Something similar has been done in the accountancy world, where auditors have produced transaction analytics for their client organisation (the auditee). In the past, such transaction analytics would highlight many false positives as unusual behaviour in the accounts. Applying AI can reduce the volume of anomalies to be reviewed by the auditor by assessing other patterns within the transaction record to evaluate if the unusual behaviour is a coherent action within context of the whole set of accounts. This is a valuable time saver for both the auditor and auditee, allowing efforts to be focused on transactions or patterns of transactions that might reveal more risky behaviour, such as potential expense frauds or internal revenue recognition within a group or overextending cashflows.

AI systems, like all other IT systems, will require supervision and

maintenance, which will fall into the following categories:

- Systems where the model will be fixed and training changed only when retraining is deliberately applied (eg, testing a traditional application before an upgrade).
- Systems which continue to evolve and learn based on transactions and data with which they interact (the organisation cannot exercise change control).

The second of these will require more overt monitoring. In the 1990s, it became a common understanding that every IT system needed monitoring and maintenance. In the 2000s, management became accustomed to their systems being relatively stable, as demonstrated by features such as Plug and Play becoming ubiquitous.

Their experience of AI will be more like the systems of the 1990s or plant and machinery that needs to be monitored to ensure that these systems stay within their intended performance limits. Some quality professionals know about the common and special causes of exceptions from training in statistical process control

(SPC). This knowledge will need to be adapted for AI systems to be able to determine when the AI is truly broken and when it is within scope but has found an unusual situation.

Governance and Leadership

Governance will continue to be an area where thought is needed. If decisions are automated, who is responsible and who holds the accountability?

We are still in the early stages of this technology's use outside of research facilities. The transparency of “explainable AI” extensions helps here. These are relatively new extensions to the AI building toolkits. Those using AI for business purposes are now able to have some record of why a decision is made by the AI. How the decision is made is recorded, showing what data drove the weighting for each part of the decision. This is useful if a decision is challenged: the objectivity of the system is laid bare. Legislation has prompted and supported this approach (eg, GDPR article 22 guards against profiling that can't be explained).

Standards development has and will continue for AI. The first standard initiative was started by the Institute of Electrical and Electronics Engineers (IEEE) five years ago (IEEE 7000 family) and standards for AI and robotics have been published or are currently in final drafting stages. Other countries are now following the UK Government's lead in providing support for AI development for their key industries.

The National University of Singapore developed a tool that uses AI to customise training content to individuals providing accelerated learning.

Similar systems could be used to train people within organisations and perhaps by quality professionals themselves in ways that avoid ‘sheep-dip’ process training tactics.

Professional development

There are a growing number of AI courses available to bring quality individuals and organisations up to speed. The National Careers Service (bit.ly/3byPQkl) has some basic skills courses, which explain some of the

fundamentals to help individuals acquire new skills and support their continuing professional development.

A *guide to using artificial intelligence in the public sector*, published by the UK's Government Digital Service (GDS) and the Office for Artificial Intelligence (OAI), reminds us that AI can be applied in many sectors and that there is considerable commercial reach. The guide has case studies from banks,

“Governance will continue to be an area where thought is needed”

market research, transport, utilities and the public sector. Reviewing this document in your organisation's context might be useful to help you start thinking about what would be applicable and where some of the risks might arise in your business.

There are also useful intermediate AI courses being run by the Microsoft AI School, Google AI Education, IBM Watson Academy, Amazon Machine Learning University and Facebook AI, to name a few. In addition, more in-depth courses are now available from FutureLearn (in conjunction with the Open University and the Institute of Coding, some of which are free) and there are now universities offering postgraduate courses in AI technology, including Oxford and Cambridge Universities, as part of their computer science programmes.

AI is software engineering, data and probability applied to test a theory of the way the world works, and is a technology that will increase in use over the next decade. There will be new automations using AI implemented in areas not yet imagined. Quality professionals are well placed to move into this arena. This is because most quality professionals are educated in applicable skills, such as statistics, testing, process development, risk management and engineering. They can extend their skills to develop their careers while helping organisations navigate getting the best from AI technology without stumbling. ■



To learn about the effects of digitalisation in the workplace, read the CQ's report *The Future of Work*, available at: quality.org/future-of-work

Building a robust quality culture

Quality World chats to Martin Davies, project quality director at smart infrastructure solutions company Costain UK, to find out how its Quality Culture Programme is making a difference to large complex infrastructure projects

ILLUSTRATION: ANDREW ROBERTS

We live in a world where pressure to deliver value for money on high-performing, complex infrastructure projects is relentless. According to *The construction productivity imperative*, a report published by McKinsey in 2015, an estimated 98 per cent of megaprojects experience cost overruns of more than 30 per cent, and 77 per cent of projects are at least 40 per cent late. Additionally, a 2017 research paper by Professor Bent Flyvbjerg, a Danish economic geographer, revealed that nine out of ten megaprojects experience cost overruns. He added that overruns of up to 50 per cent in real terms are common and over 50 per cent are not uncommon, and overruns have remained high and constant for the past 70 years.

The UK Government formed the Infrastructure and Projects Authority in 2016 as a response to the growing need to bring together the financing, delivery and assurance of projects ranging from large-scale infrastructure projects to major transformation programmes. Of the major projects identified between 2013 and 2019, the number of projects classified as “probable of a successful delivery” had fallen sharply from 48 per cent in 2013 to just 17 per cent in 2019.

Delivering to plan is of increasing importance on a political and financial level. Projects running over estimated budgets and timescales have knock-on effects on the client, customer and the supply chain. These issues have led to a plethora of potential remedies being developed, where quality has emerged as a key enabler for success – improving performance and enhancing personal and organisational reputation. By investing in planning, integrating risk management and quality management early on, clients and their supply chains have the best opportunity to deliver faster, better and greener

projects at a lower cost. In 2016, the Get It Right Initiative (GIRI) was established with the aim of eliminating potential risk to both the public and investors, by improving quality and productivity, and reducing costs and waste.

GIRI – comprised of the UK’s major construction companies – adopted a multidisciplinary approach to raising awareness, with a focus on changing culture and attitudes by improving knowledge, decision-making powers and planning skills. To support this approach, Costain – a GIRI member with a representative on the board – developed a Quality Culture Programme to assist both project teams and stakeholders.

Quality World talks to Martin Davies, Project Quality Director at Costain, to find out how the programme is being used to spearhead quality and productivity and, most importantly, change quality culture across multiple infrastructure projects.

Quality World: What are your principal duties at Costain?

Martin Davies: I am primarily responsible for quality management across multiple projects within our defence and energy sectors. I have been working at Costain for the best part of seven years, and in that time, I have been fortunate to have been given the responsibility for managing quality on two of the largest and most complex civil and defence nuclear infrastructure projects in the UK.

QW: Could you tell us more about your work in the civil and defence sector and why you believe a robust quality culture is paramount to its success?

MD: We are working on several major infrastructure projects, across both nuclear sectors (civil and defence) where the ▶

“Top-level commitment and buy-in to quality management is what drives a leading quality culture”



QUALITY CULTURE

scope of our work ranges from decommissioning of existing plants to supporting major complex construction projects.

As with any project, the goal is to complete the project on time, to the correct specification and leave a successful legacy (which incorporates high standards of safety and quality). Due to the complexity and scale of a large project, with its wide-ranging scope of supply, manufacture and construction, there are risks. We have a tried and tested management system to identify and address various risks through defined processes. However, as with any good management system, people's compliance with the requirements, ownership and engagement is vital to getting the desired outcome. At Costain, we identified the importance of culture, and specifically a quality culture, to the success of the project.

QW: What have been some of the main challenges you've identified on those large-scale projects and how did you overcome them?

MD: One of the recent projects we were working on was data rich, which meant we had to spend time analysing the quality assurance and quality control data, before we could decide on how we were going to approach it from a quality management perspective.

From our own inspection reports, observations and audits, we discovered there were several nonconformance issues across the supply chain that were not being detected until further down the line. After a detailed investigation and speaking with our client's project quality director (my counterpart), we found that the main cause of this issue was the perception from people that correcting the nonconformity at source was enough, hence not communicating it to be actioned through root cause investigation and preventing recurrence elsewhere. Our further investigation into this revealed that a possible root cause was the lack of engagement between leadership and their employees in the supply chain.

The results of our investigation pointed to a review of the culture, ie, what was the prevailing culture and how would we find out?

We had a light-bulb moment when we realised that one of the core elements of the client's management system is "nuclear professionalism". This includes six important attributes – leadership, communication, compliance, competence, personal values and ethics.

After conducting a review of our management system on the project last year, we investigated those elements of nuclear professionalism and what they would look like in the context of quality. This involved trying to identify the expectations and behaviours that would support those elements as well as how the latter could be transposed into other sectors.

This led to the development of our Costain Quality Culture Programme in June 2020.

We introduced a suite of behaviours and expectations for measuring the quality culture on this project and others in Costain's portfolio.

QW: What steps have been introduced to measure the quality culture for this project correctly?

MD: The Costain quality team decided that a survey was the best approach. Although we had some data, it was beneficial for us to find out more about the perspective of the individuals and determine the cultural maturity at all levels of the project team.

The quality team identified and agreed the key leadership attributes and expectations to explore through the survey. We provided statements – things that people could easily see, believe or act upon and asked the participant to rate them in order of importance.

We issued our Quality Culture Survey to circa 800 project personnel in September 2020. A total of 14 companies participated in the survey with responses from senior leaders and management through to technical leads, supervisors

“By investing in planning, integrating risk management and quality management early on, clients and their supply chains have the best opportunity to deliver faster, better, and greener projects at a lower cost”



Costain and Balfour Beatty were the main contractors for the London Bridge Station redevelopment. The station received the RIBA London Award 2019 and was also named RIBA London Building of the Year 2019.



Costain, together with Skanska and Balfour Beatty, delivered a new and improved section of the A14, eight months ahead of schedule.

elements as well as the more routine compliance elements that are critical to the project's success.

Quality culture elements are the things that we collectively decide we will measure to gauge the current culture, such as leadership, competency and communication. In our case, we used our client's nuclear professionalism characteristics and developed them in a quality context. For example, the competency element became "Secure in your competency in nuclear safety and have completed all SQEP (Suitably Qualified Experienced Personnel) assessments".

The routine elements are those you would expect to find on infrastructure projects, such as compliance with specifications and procedures.

QW: How have you been maintaining cultural inputs and outputs for this project and others through Costain's Quality Culture Programme?

MD: We introduced culture and desired behaviours from the beginning, which included inductions with Costain employees and supply chain representatives for the projects that we work on. This included training on leading quality and behavioural management.

As part of our Quality Culture Programme, we have KPIs that are regularly reviewed. The results are addressed at the organisation's monthly Quality Leadership Forum to support and underpin the cultural aspects that we measure through the survey. The survey is updated and sent out every quarter.

QW: Could you tell us more about Costain's Quality Leadership Forum and the changes you've implemented to improve business relationships across small- and large-scale projects?

MD: In general, we found that we were working a little too independently within the confines of our projects, and that it would be beneficial to develop a common language, platform and areas of focus to improve the quality culture. This led to the launch of our Quality Leadership Forum ▶

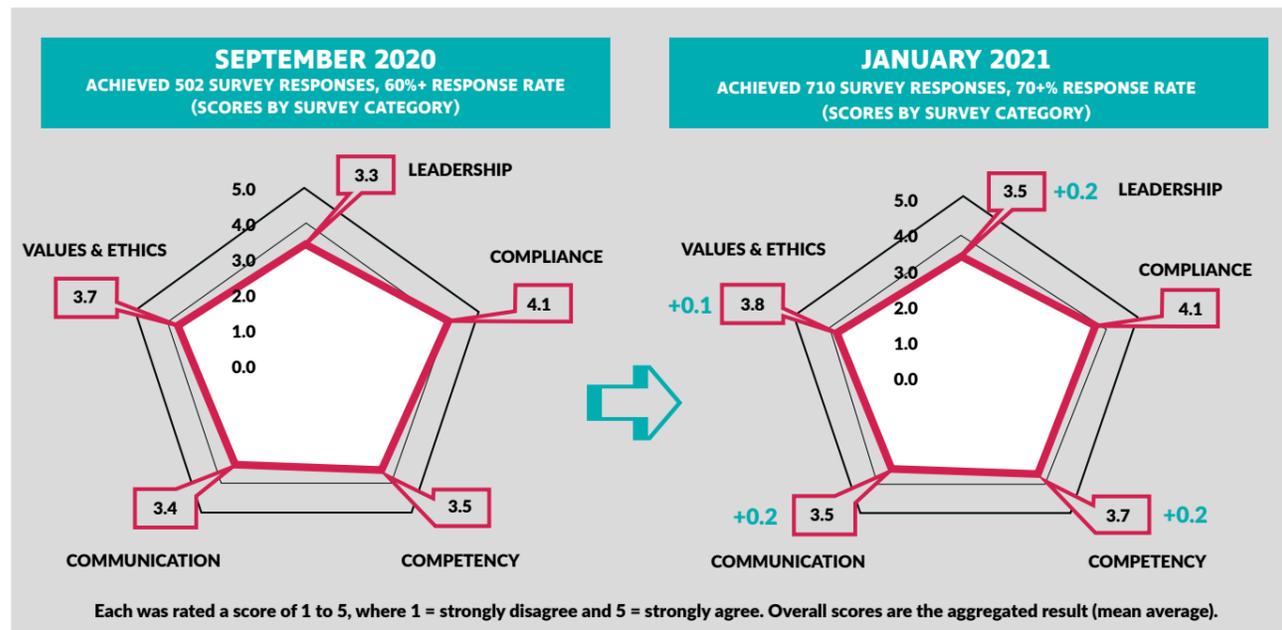
and specialist experts. We had a 60 per cent response and completion rate, which was in part due to the survey being accessed in hard copy at site as well as online for office-based personnel.

Independent data analysis was conducted by our partner INCIGHT Ltd to ensure impartial results.

QW: How does the culture survey tie in with Costain's Quality Culture Programme and your core expectations of leadership, compliance, communication, competency, personal values and ethics?

MD: I hear leaders talking about quality daily. This top-level commitment and buy-in to quality management is what drives a leading quality culture. Leaders need to be overtly championing quality every day to keep it at the forefront of their projects and teams' minds. The outcome of the survey directs the strategy for the year on our complex projects and is an inherent and vital part of Costain's Quality Culture Programme.

When we set out our quality strategy with the client, we worked with them to incorporate the key quality culture



The charts show a marked increase in engagement and scores from the first survey in September 2020 compared to the second in January 2021. The Quality Culture Survey results are based on individual responses to a series of 40 statements.

where we were able to start discussing quality at leadership level. We already had Costain's senior sponsors on board, who understood and supported a more coherent approach to quality management, and our client's quality leader was fully behind our approach as well.

We now have other working groups in place, such as the Project Quality Forum, which is a monthly meeting to review and discuss data derived from inspections and internal audits, as well as provide a platform for leaders to share their experiences of quality management.

We also have a Director Quality Forum which takes place within each project. Costain has handed over the traditional project quality meetings to the project directors of the companies who are delivering the projects to further embed and change the perception of quality being one team's job – it is everyone's responsibility. Costain's quality team continue to offer support to the quality directors as and when required.

Some of the initiatives that have come out of Quality Director Forums include behavioural training, rewards, an improved SHEQ (safety, health, environmental and quality) card process to encourage better behaviours in identifying potential hazards, large group engagements (socially distanced) and feedback.

QW: What standards does Costain work to and how do they tie in with Costain's Quality Culture Programme?

MD: We work in accordance with the ISO 9001 and 14001 series of standards. Costain's Quality Culture Programme is very relevant because it has been developed and aligned to the standards' leadership, communication and competency frameworks as well as the CQI's core competencies (Governance, Leadership, Assurance, and Improvement).

QW: What are the main challenges facing the defence and energy sectors and how will Costain's Quality Culture Programme help to address them?

MD: As well as the ongoing challenges and impacts of Covid-19, many organisations are adapting to the biggest challenges in our changing world such as ageing infrastructure assets, increased connectivity and use of digital technology and the increasing impact of climate change.

Quality runs through everything we do, and it is the quality that largely determines the overall cost, where better quality leads to better outcomes. A standard set of key criteria will

allow us to benchmark performance, understand how we can improve (encompassing other tools that Costain use), and ensure we become the best we can be across all markets. For example, during the coronavirus pandemic, we were able to utilise our technology capabilities to conduct remote inspections. This meant we were able to maintain and deliver all inspections with 100 per cent completeness, ensuring little or no impact to our schedule.

QW: Why are other businesses interested in adopting Costain's Quality Culture Programme?

MD: In the words of one of our key supply chain leaders: "Poor quality impacts the bottom line". The excellent work by GIRI suggests that 21 per cent of construction costs come from unnecessary costs (for example, reworks, poor quality, etc). Continuous support and focus on quality not only minimise risk, but can also reduce cost and time when proactively managed and prioritised by all on a project.

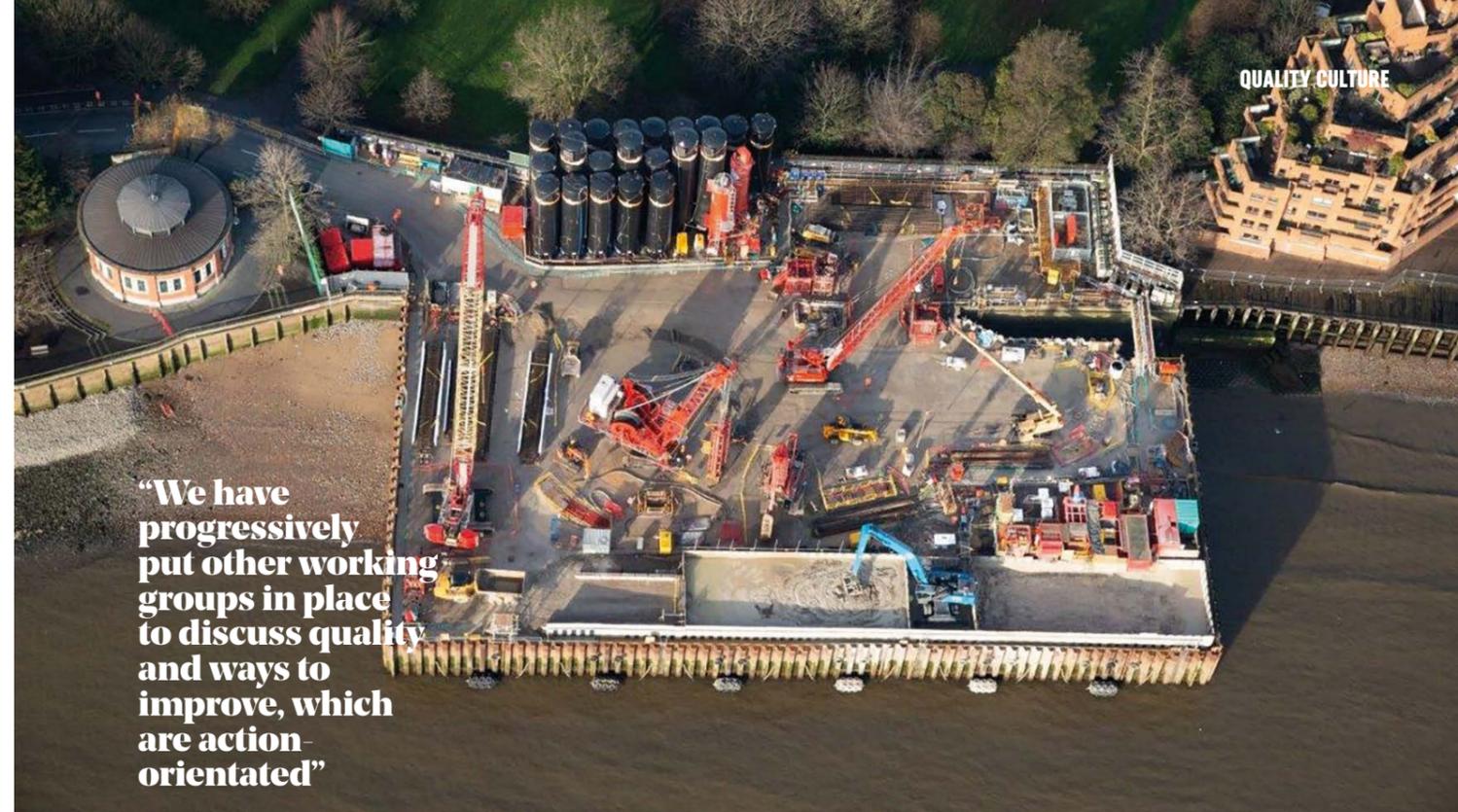
Comments gathered in our survey demonstrate the impact a good quality culture can have on a programme, such as "it is an exceptional environment in a very challenging project" and "this project has the strongest leadership I have experienced in 40 years in the construction industry".

Our data tells us that by focusing on the culture and not just the procedures and processes, we can improve our "right first time" delivery. Businesses can learn about their quality culture and understand not only the impact it has on the now, but also the potential positive impact an improved quality culture could have.

QW: How are you taking the Quality Culture Programme forward this year?

MD: Our aim is to ensure everyone understands what quality culture is. The Costain Quality Culture Programme will act as a useful roadmap to help other businesses move towards that goal of understanding and enforcing a robust quality culture.

To do this, businesses need to agree what it is in their organisations that best describes their culture and what they need to measure. I personally want to make as many organisations aware of the initiative as possible, to help quality become a top priority. I believe the programme is the first of its kind in the nuclear, defence and construction sector, so the opportunity to share this leading-edge approach and encourage others to adopt a similar process is again part of the culture of quality management.



"We have progressively put other working groups in place to discuss quality and ways to improve, which are action-orientated"

Above: The Thames Tideway Tunnel is a £3.8bn, 25 km super sewer. Costain has been working alongside client, Tideway, and in joint venture with VINCI Construction Grands Projets and Bachy Soletanche on the east section of tunnel.

Right: In a joint venture with Skanska (CSJV) on behalf of National Grid, Costain has constructed approximately 32 km of a high voltage electricity cable tunnel to create a new electricity superhighway deep below London.



QW: What advice would you give to other businesses who are trying to create and maintain a robust quality culture?

MD: Approach it like any project by identifying and involving your stakeholders. Engage leaders to gain commitment for change and action, be clear on the initial scope and agree what you want to see that defines the quality culture (there are many commonalities but some differences that you may want to pull out).

Leaders and leadership teams should set out a timeline of activities that build structure and capability. Measure what they deem as important to creating a strong quality culture and then communicate, communicate, communicate!

Additionally, by involving everyone in the process via training, surveys, submitting feedback cards, rewards, toolbox talks, workshops, among other initiatives, will develop the expectations, routine, and over time, the behaviours and habits that support a strong quality culture.

We hope that our Quality Culture Programme will help to drive positive change by reiterating the importance of quality and ensuring that it is the central driving force for any project that is undertaken. ■

QUALITY CULTURE ACTIVITY TIMELINE (2020/2021)





DEFINING

QUALITY 4.0

Quality 4.0 has the potential to be a significant driver of change for the quality profession, yet it has no universal definition. The CQI embarked on a significant three-month research project to clearly define Quality 4.0 in order to help address the quality challenges of the future. Professor John Oakland from The Oakland Group, and Mike Turner, CQI Head of Profession, explain the journey

ILLUSTRATION: ALBERTO ANTONIAZZI



QUALITY 4.0 AND THE QUALITY PROFESSION

Businesses and organisations are continuing to evolve out of necessity, responding to an onslaught of disruption, new business models and technology. This continuous change, including that precipitated by Covid-19, is affecting business operations at all levels, with customers demanding real-time interactions, regulators applying increasing levels of scrutiny and governance, and stakeholders requiring continued assurance in this complex and dynamic risk environment. The technology revolution has been referred to as Industry 4.0 (I-4.0) and digital transformation, and includes some increasingly well-known technologies, such as artificial intelligence (AI), machine learning and robotics. It is challenging traditional approaches to quality management and their relevance, effectiveness and efficiency.

Digitalisation and the highly connected nature of global systems means that organisations now operate in a complex and tightly coupled environment. A single flaw in one part of the system can rapidly cause catastrophic systemic failures, such as ones that then lead to the need for product recalls. (In 2020, the Organisation for Economic Co-operation and Development reported 3,759 product recall cases. These spanned all industries including aviation, automotive, clothing, electronics, food and medicines.)

In contrast, the impact of the same significant flaws could perhaps more easily have been contained in previously complex but loosely coupled systems. Tight coupling is being increased by I-4.0 related technologies, something which quality professionals need to be aware of and prepared for.

What is clear is that business models will continue to change dramatically over the coming years. As well as responding to the longer-term implications of short-term changes, business leaders will need to be focused on aggressively seeking out opportunities to innovate within rapidly changing environments and increasing risk. As the risk landscape becomes more complex and fast-moving, it will be crucial for organisations to identify and respond quickly and effectively to emerging events and threats. If Quality 4.0 (Q-4.0) is to be part of the solution, it needs to be properly understood, defined and developed to play a key role in helping organisations manage during this evolution. Moreover, there should be a role for Q-4.0 in helping organisations maximise the opportunities that such an evolution will present.

When contemplating I-4.0 and Q-4.0, there are innumerable possibilities for the quality professional to collaborate with other professions

and functions, such as chief designers, chief information officers and IT directors. The quality professional has the opportunity to develop roadmaps that help optimise governance and assurance across organisations, and to lead improvement around new and emerging technologies. This also presents an opportunity for the quality profession to redefine itself and cement its position; not only as a provider of assurance, but also as a function that advises and anticipates. Q-4.0, when properly defined and understood, will help the profession fulfil its governance and assurance responsibilities. This is combined with the opportunity to advise organisations on their anticipation and measurement of risk, particularly around Big Data, using data governance, data engineering and analytics. These are likely to be the critical elements of Q-4.0 in the future, and will help develop the profession to focus on the most relevant and impactful risks to, and opportunities for, their organisations.

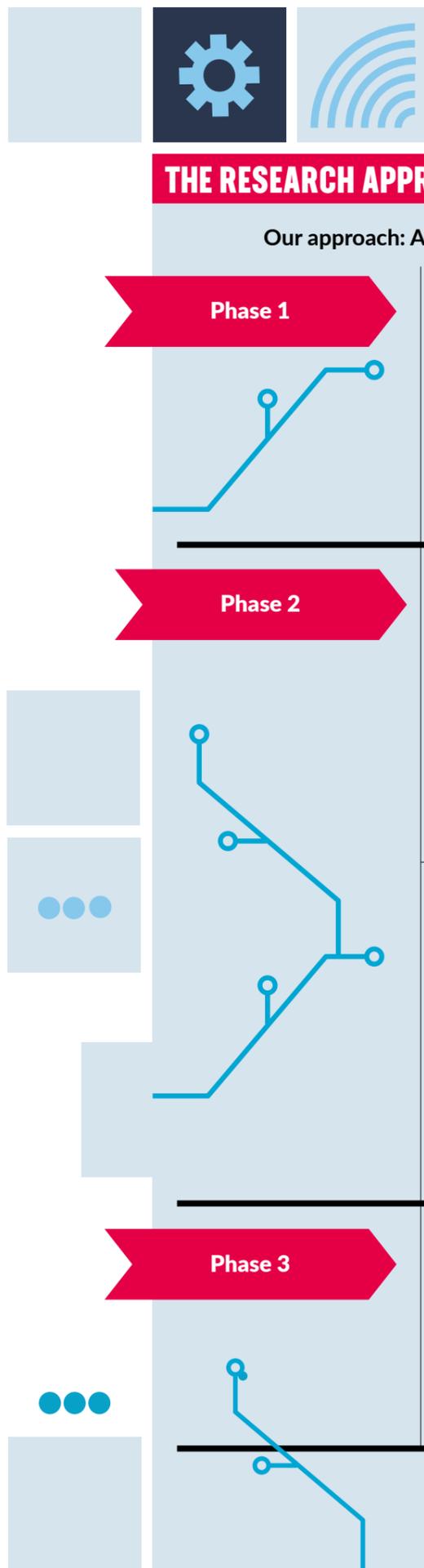
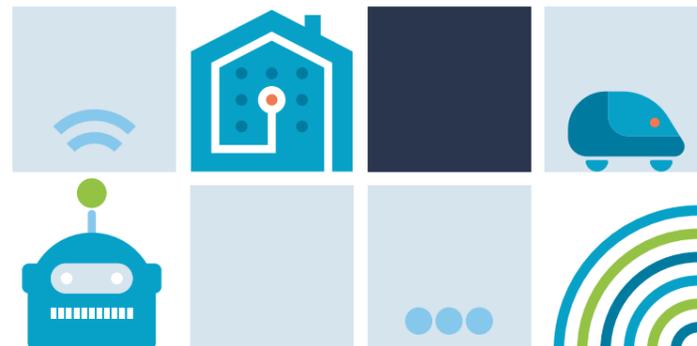
WHY THE CQI RESEARCHED QUALITY 4.0

The traditional principles, practices and tools of quality management that have proven to be of value over hundreds of years are undergoing huge transformations. The CQI believes that professional institutions, leading thinkers, academics, quality professionals and other managerial-level people expect many of these principles, practices and tools are going to be significantly challenged by digital transformation.

The CQI is committed to preparing its professionals to respond to the ongoing emergence of the digital age, helping them to identify, acquire, and demonstrate the value of the new skills and knowledge required to deliver enhanced benefit to their stakeholders and thrive in the future. It has invested in a research programme comprising a series of projects to ▶

Figure 1: Overview of proposed methodology for the research.

“Q-4.0, when properly defined and understood, will help the profession fulfil its governance and assurance responsibilities”



THE RESEARCH APPROACH AND OBJECTIVE

Our approach: A three phase, iterative approach was central to this research project

Phase 1



LITERATURE REVIEW CONDUCTED BY A TEAM FROM THE OAKLAND INSTITUTE AND LEEDS UNIVERSITY TO ESTABLISH CURRENT VIEWS OF WHAT QUALITY 4.0 IS.

Phase 2

SURVEY AND INTERVIEWS WHICH EXPLORED THE DEFINITION AND HOW IT MIGHT BE CHANGED.

TAKING IN CONTRIBUTIONS AND INSIGHTS FROM ADVISORS AND PRACTITIONERS FROM ACROSS THE GLOBE



27 INTERVIEWS

71% OF 41 RESPONDENTS EITHER 'STRONGLY AGREED' OR 'AGREED' WITH THE EMERGING PRINCIPLES DEFINITIONS



Phase 3

VALIDATION AND SHARING OF A POTENTIAL NEW DEFINITION WITH CQI MEMBERS AND PEER ORGANISATIONS



OUR OBJECTIVE
To develop a working definition of Quality 4.0



address some of the fundamental questions concerning the future of quality professionals in the digitally enabled age.

As part of this project, the CQI is developing individual and corporate assets that its members and Corporate Partners can use to develop the necessary competences, such as a revision of the CQI's Competency Framework.

Initial explorations into published literature and conference proceedings on the subjects of Quality 4.0, Industry 4.0 and Supply Chain 4.0, together with discussions with thought leaders around the world concluded that there was no single accepted definition of Q-4.0. Professionals have been contemplating the proposed definition from several different perspectives, causing some confusion for practitioners. For this reason, the CQI decided to start a research project to develop a working definition of Q-4.0, which in turn will help CQI members to better understand what it is, how it is developing and the implications Q-4.0 could have for quality management. The intention was that the definition should not be limited to specific sectors, ie, be universally applicable, and be accompanied by identified core principles.

THE SCOPE OF THE RESEARCH

The CQI commissioned a consortium comprising Leeds University Business School and The Oakland Institute for Business Research and Education, led by Professor John Oakland and supported by Professor Chee Yew Wong, to work with Mike Turner, CQI Head of Profession, to carry out this work.

The main parts of the initial research (shown in Figure 1) were to review published literature and gather the experiences of leading stakeholders in the field of Q-4.0 to develop a working definition. The research sought to delve beneath the surface of the digital transformation of quality by using a systematic approach to investigate, clarify, validate and build a working definition of Q-4.0. Having diverse participation from individuals with a range of knowledge bases and approaches helped uncover assumptions that were not explicit or obvious to others, and helped to promote an understanding of Q-4.0 and develop a common working definition.

PHASE 1: SYSTEMATIC LITERATURE REVIEW

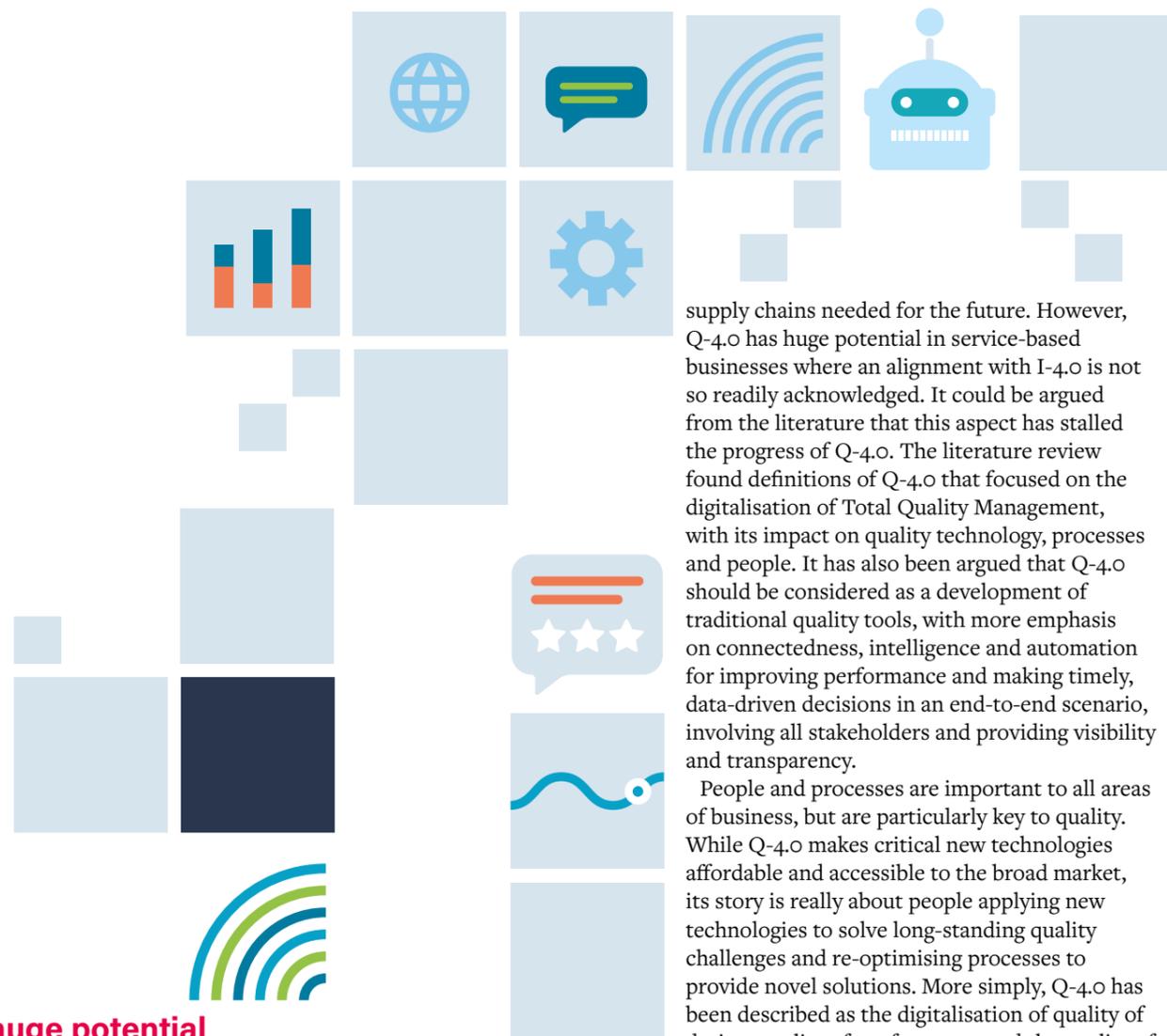
The systematic literature search sought to establish any pre-existing definitions of Q-4.0. It was structured to locate literature from three overlapping disciplines: general industry (I-4.0), quality (Q-4.0) and supply chain (SC-4.0). Less academic and more commercial sources were also selected if they formed conclusions that were based on data acquired through reasonably sound survey techniques. An initial pool of 75,000 references drawn from the ProQuest academic library search engine was filtered and reduced to the most relevant (nearly 300 in total) across the three disciplines. To increase its veracity, the literature search also encompassed other "fourth generations", such as Customer 4.0, Education 4.0, Finance 4.0, Food 4.0, Agriculture 4.0, Healthcare 4.0 and Made in China 2025, which had relevance to Q-4.0, I-4.0 or SC-4.0. A number of important conclusions have emerged from this review.

Definitions of I-4.0 have developed as part of an emerging narrative involving consultants and practitioner associations. These definitions highlight enhanced customer focus, increased connectivity, transformation of value chains, the merging of real and virtual worlds, and the emergence of cyber-physical systems. It has been said that I-4.0 is a new model in which cyber-physical systems are interconnected with each other over the Internet of Things, developing what is termed a "smart network". The literature recognised that I-4.0 is a transformation of a live and complex system, not a steady state. I-4.0 is also not simply about a narrowly focused adoption of technology within a function or an organisation.

It is important to recognise that there are three forms of integration within I-4.0. They are described as: **horizontal integration** along the entire value creation chain, **vertical integration** alongside the production or operational systems within a single organisation, and **end-to-end integration** along the entire product or service life cycle. Applying quality management within these axes of integration requires technology to be optimised to support clear workflows, interoperability of systems and value-driven collaboration. This presents a key opportunity for a discipline that has historically developed an end-to-end value chain influence and perspective.

Previous attempts to define Q-4.0 have tended to focus on the possible structural relationship between I-4.0 and the digital world of Big Data, AI, machine learning, robotics, etc, and the

"Q-4.0 has huge potential in service-based businesses where an alignment with I-4.0 is not so readily acknowledged"



supply chains needed for the future. However, Q-4.0 has huge potential in service-based businesses where an alignment with I-4.0 is not so readily acknowledged. It could be argued from the literature that this aspect has stalled the progress of Q-4.0. The literature review found definitions of Q-4.0 that focused on the digitalisation of Total Quality Management, with its impact on quality technology, processes and people. It has also been argued that Q-4.0 should be considered as a development of traditional quality tools, with more emphasis on connectedness, intelligence and automation for improving performance and making timely, data-driven decisions in an end-to-end scenario, involving all stakeholders and providing visibility and transparency.

People and processes are important to all areas of business, but are particularly key to quality. While Q-4.0 makes critical new technologies affordable and accessible to the broad market, its story is really about people applying new technologies to solve long-standing quality challenges and re-optimising processes to provide novel solutions. More simply, Q-4.0 has been described as the digitalisation of quality of design, quality of conformance and the quality of performance, using modern technologies.

This review, therefore, concluded that, although there is a range of Q-4.0 definitions, many of which are associated with I-4.0, no one single definition has been commonly adopted.

The work then set out to formulate a working concept definition from the researched literature.

The initial attempt sought to encompass all of the essential content of existing definitions. The definition initially used in the survey was:

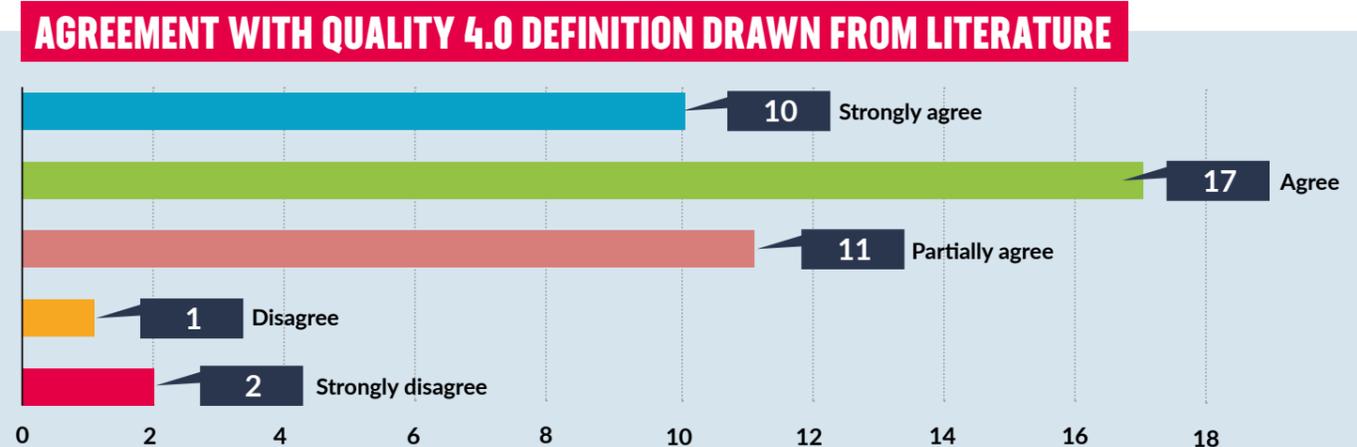
- Quality 4.0 refers to the future of quality and organisational excellence, through digitalisation and its impact on organisations' processes, people and technology.
- It builds upon traditional approaches and tools by considering connectedness, automation and intelligence for improving performance and reducing risk. It leads to better, more timely data-driven decisions in an end-to-end scenario, involving all stakeholders across supply chains to provide visibility and transparency.
- Quality 4.0 includes the digitalisation of quality of design, quality of conformance and quality of performance using modern technologies, and data-rich approaches to managing transactions and meeting customer expectations.

The team also carried out a detailed analysis of the findings of the most relevant sources and discovered a set of 10 core emerging principles in Q-4.0. This is considered vitally important to the understanding of Q-4.0 and its application within any context. With reference to approaches such as Six Sigma and Lean, our profession knows the value of understanding the core principles behind these approaches, as they are necessary to guide thinking. This ensures that the adoption of any improvement approach will suit the context and not be reduced to blindly following a playbook that has been learned from elsewhere.

PHASES 2 AND 3: SURVEYING AND SOCIALISING

The working concept definition and emerging core principles were then cross-examined using an online survey and interviews with practitioners and experts/advisers, together ▶

Figure 2: Level of agreement with the concept definition of Quality 4.0.



with a focus group discussion with members of the European Organisation for Quality. Please note that we are very grateful to all respondents for their contributions. These lines of enquiry were focused on addressing:

- the extent to which organisations have a clear vision and strategy, which includes Q-4.0;
- levels of agreement to the proposed working definition;
- opinions on the level of importance and usefulness of each of the 10 emerging core principles;
- whether each of the 10 emerging core principles are necessary, and together are sufficient;
- the extent to which knowledge of Q-4.0 is developed throughout organisations.

The analysis also captured the qualitative comments made by participants about the proposed definition and 10 emerging core principles.

The overwhelming feedback from the online survey was one of positive agreement with the draft definition. Of the 41 responses to the question, “Does the definition reflect the concept of Quality 4.0?”, 66 per cent agreed or strongly agreed, 27 per cent partially agreed and only three respondents disagreed or strongly disagreed (see Figure 2).

However, the length of the definition was considered to detract from its purpose. Through successive iterations, the research team developed a simpler working definition:

“Quality 4.0 is the leveraging of technology with people to improve the quality of an organisation, its products, its services and the outcomes it creates.”

Nine out of the 10 emerging core principles

were regarded by over 80 per cent of respondents as “important” or “very important”. One of the principles was deemed “unimportant” by two of the 41 respondents, and three other principles were each regarded as “unimportant” by just one respondent. Figure 3 shows the extent of importance afforded to each of the 10 emerging core principles.

As a consequence, the team developed a revised set of eight emerging core principles (see p32).

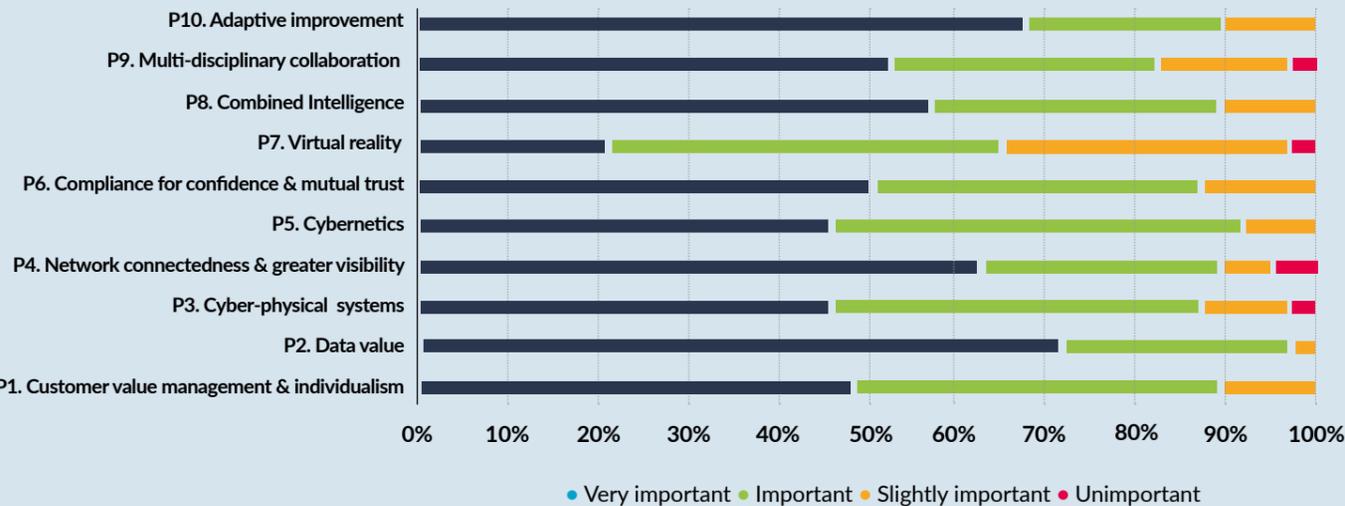
Other key findings from the online survey are as follows:

- The adoption of Q-4.0 is still in its infancy in respondents’ organisations (only 20 per cent of respondents strongly agreed their organisation had a clear vision and strategy which includes Q-4.0, while nearly 53 per cent disagreed or strongly disagreed – see Figure 4).
- Where organisations are not adopting Q-4.0 principles and practices, there is an intent to do so.
- There is the need for quality professionals to collaborate with fellow “driving forces” (collaboration is a core leadership role in the CQI’s Competency Framework). However, some quality professionals are not being consulted, highlighting the threat that the Q-4.0 agenda could be driven by other disciplines.
- Cost reduction is not a primary pressure for these changes.
- There is a need for a new vocabulary in order to enable quality professionals to collaborate with

“Quality 4.0 is the leveraging of technology with people to improve the quality of an organisation, its products, its services and the outcomes it creates”

Figure 3: Summary of responses on the 10 emerging core principles of Quality 4.0.

SURVEY RANKING OF DRAFT PRINCIPLES DRAWN FROM THE LITERATURE



OUR ORGANISATION HAS A CLEAR VISION AND STRATEGY THAT INCLUDES QUALITY 4.0

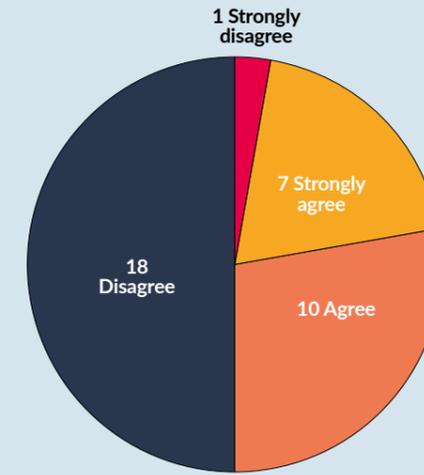


Figure 4: Level of agreement from respondents on whether their organisation includes Quality 4.0.

- other disciplines that are involved in Q-4.0.
- It is important to align a Q-4.0 intent with the overall corporate strategic plan – this is a key element of Q-4.0.

OUTCOMES OF THE RESEARCH

As a consequence of this project, the team have developed a Quality 4.0 infographic (see p32) that shows a short concept definition, and the supporting eight emerging core principles. It also contains some examples of the principles in practice.

The objective of this infographic is to expand the profession’s understanding of Q-4.0 and provide the basis for discussions with colleagues and clients concerning where these principles apply within each organisational setting. This should, in turn, lead to a discussion about the impact these core principles will have on the quality management practice. For example, a principle of cyber-physical systems is designed to lead the professional to think about how best to continually combine technology and people to improve the outputs of any process. This could lead to a redesign of end-to-end assurance approaches that completely transforms what is done and achieved.

This contrasts with blindly accepting and implementing remote audit as a new Q-4.0 practice, out of necessity or pressure from stakeholders; it should be more about intelligent and agile design.

WHAT’S NEXT?

The eventual aim of this programme of research is to identify the competences that a quality

professional will need to thrive in the digitally enabled age. Given the momentum, the CQI is moving on to an exploration of Q-4.0 practices, technologies, tools and competences. A project will soon be launched to address the following research questions:

- To what extent do the current principles of quality management map to the eight emerging core principles that have emerged and what does this mean for the future of the discipline?
- What are the most relevant Q-4.0 technologies and tools that quality professionals will need to know about, engage with, participate with, adopt, and lead the use/development of?
- What are the skills, experience, knowledge, and behaviours required to define the competence of a quality professional who can thrive in the digitally enabled age?
- What constitutes the Q-4.0 version of the Competency Framework for a quality professional that is fit for the digitally transforming age?
- What could be the value to an organisation of a quality professional whose competence is fit for the digitally enabled age?

The CQI recognises that Q-4.0 is a gamechanger for the profession and this properly structured, wide-ranging and systematic research creates the need for quality professionals to engage with the outcomes to build a personal development plan. The CQI believes that it is vitally important for quality professionals to embrace Q-4.0 in their work. Some commentators even go as far as suggesting that, unless the quality profession understands and acts upon the impact of this digital age on what they do, the future of the profession could be at risk. The opposite of this is that the future holds huge opportunity for the quality professional to play an even more valuable role at organisational and societal levels. ■

Acknowledgements: Mike Turner and John Oakland are indebted to significant and extensive contributions to this article from the research team from the Oakland Institute (OI) and Leeds University Business School (LUBS) – Chee Yew Wong, Professor of Supply Chain Management at LUBS; Ian McCabe, Fellow of the Chartered Quality Institute (FCQI) and a Chartered Quality Professional; and Dr Katey Twyford, Research Associate at OI.

QUALITY 4.0

Co-creation of value

Customers and society are constantly redefining the value they require, and how and where they want to consume it. Customer value co-creation is increasingly through digital servitisation.



Uber applies this principle – firstly by transforming the traditional taxi service into one which offers on-demand transport and effortless payment from a smartphone; and secondly in the way it collects real-time feedback on driver performance and engages with customers to solve problems and introduce new services and features. Many customers are no longer excited by just owning a product or using a service. Instead their interest lies in how it can serve their needs and outcomes.

Cybernetics

Data is captured from multiple sources across vertical, horizontal and end-to-end supply chains. Interconnected and smart networks in ecosystems are increasingly used to dynamically regulate and improve total system performance, including behaviours, inputs and outputs.



The Smart Home is an example of first and second order cybernetics in action. For example, by using systems such as Amazon Alexa, Hive or Nest, a person with a goal can act to set that goal for a self-regulating device, such as a thermostat in their home.

Transparency and collaboration

The value chain is increasingly an integrated 'smart' network of interrelated and interconnected cyber-physical systems.

The ecosystems transcend traditional legacy boundaries and increasingly create whole-life circular economies. The customer, an active part of this network, requires both effective risk management and greater transparency and collaboration across multiple disciplines as technology networks expand.



Fitness trackers are an example of transparency and collaboration in action. They can guide you on your run, tell you how far you've run, where you ran and how fast. However, this highly connected network can also present a potential risk. In 2018, an interactive map of tracked fitness activities of people who use the Strava app inadvertently revealed the location of military bases overseas. This caused the US military to review its employees' use of personal fitness tracking devices.

Cyber physical systems

The balance and integration of human effort and machine effort, in the broadest sense, continually changes over time, automating some previously human roles and creating new ones around the co-design of cyber-physical quality systems.

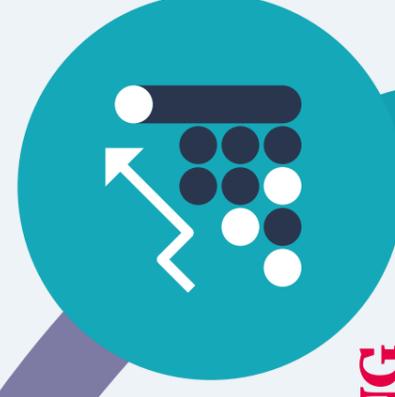
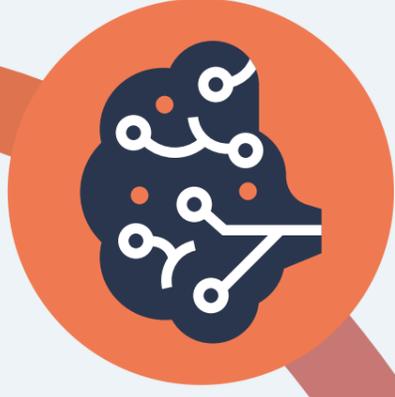
The Auto Pilot is a trusted and proven example of the cyber physical system used by avionics today. The move towards self-driving cars is another example of such a system. Take Tesla cars which all now feature, as standard, advanced hardware capable of providing autopilot, and full self-driving capabilities.

a working definition



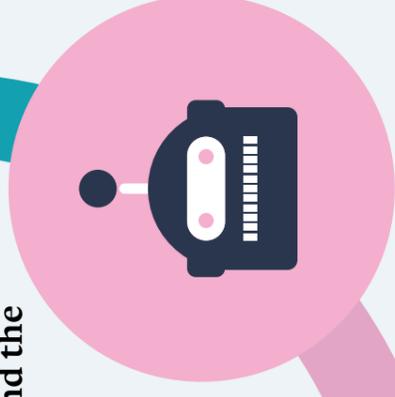
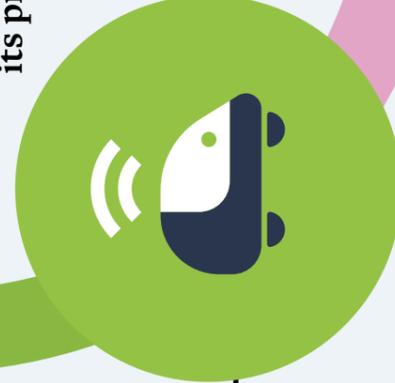
OUR OBJECTIVE

To develop a working definition of Quality 4.0



OUR WORKING DEFINITION

Quality 4.0 is the leveraging of technology with people to improve the quality of an organisation, its products, its services and the outcomes it creates.



Technology and combined intelligence

The vast array of enabling technology, machine learning and artificial intelligence augment human intelligence. The symbiotic human and machine relationship, in which virtual and real worlds co-exist, enables them to react, learn, make decisions and optimise quality processes.



The BMW Group's use of AI to evaluate component images from its production line is an example of this principle in action. This use of technology is allowing it to spot, in real time, deviations from quality standards.

Mutual trust

Mutual trust is vital to drive out fear of surveillance and fraud, and digital tools enable transparency in partnering and contract executions. Inter-system compliance is authenticated and immutable to give assurance and confidence leading to greater resilience.

Effective data systems should engender trust in:

- the infrastructure for collecting and storing data;
- the people, systems and machines using data;
- how organisations use data.

Rapid adaptive learning

Continuous and rapid adaptive learning from data characterises innovation and improvement in value creation. Changing customer expectations are met based on new predictive capabilities rather than being reactive. Quality of design, conformance and performance is increasingly managed and communicated virtually, together with agile development and integration of systems leading to greater connectedness.



Airbnb has more than 100 machine learning models running on its website. It uses the data it collects to help improve and personalise every aspect of a customer's experience. When applied correctly, this principle sees organisations elegantly using data

to better identify and recommend the most appropriate content or products, inspiring customers to buy.

Data value

Data is increasingly a contextually dependent strategic asset, requiring quality professionals to be knowledgeable in data governance, data architecture, data engineering and data analytics.

For the data to have value, it must satisfy some basic premises. It must be identifiable and definable, promise probable future economic benefits and be under the organisation's control. (Putting a value on data, PwC, 2019.)

THE EIGHT SUPPORTING PRINCIPLES

These principles underpin our working definition of Quality 4.0. They enhance the established quality principles, which provide a focus on customer needs, expectations and satisfaction.

Shining the spotlight on Quality

The performing arts has been one of the worst-affected industries since the coronavirus outbreak began. While the UK Government has made great progress with the vaccine, many theatres remain dormant and are continuing to face financial pressures and even permanent closure. Daniel Moore speaks to the National Theatre – one of London's most prestigious performing arts venues – to find out how it's demonstrating resilience against the coronavirus, as the organisation prepares for its public reopening

The UK's theatre industry has been experiencing a torrid time. Since the first national lockdown in March, last year, West End shows and independent productions have been put on hold, rescheduled or cancelled, as the government tries to control and stop the spread of coronavirus. This hiatus has left theatres in a financially volatile position, particularly as most rely on box office sales to pay production, rent and maintenance costs for their venues. According to the Creative Industries Federation's *Projected Economic Impact of Covid-19 on the UK Creative Industries* report (2020), theatres faced a £3bn loss and 12,000 job cuts after being closed for most of last year. ►

Similarly, a study released by international arts management consultants TRG Arts and UK arts data specialists Purple Seven (bit.ly/3dJS08C), revealed that out of a sample of 212 organisations – comprising concert halls, art centres, West End and regional commercial theatres – there was a 92 per cent drop in the number of sold tickets and a 91 per cent fall in box office income between 16 March (when the UK went into its first national lockdown) and 15 September 2020, compared to the same period in 2019.

Even though things looked dark for the sector, a glimmer of hope came when the Prime Minister Boris Johnson introduced the national three-tier system in October, which allowed theatres in less affected areas (tier one and two) to reopen and operate at a reduced capacity (50 per cent). Described by some theatre bosses as a “whiplash” effect to the industry, this period was short lived when lockdown 3.0 was effectuated in December, forcing theatres to shut their doors once again in addition to dealing with an influx of customer refunds for pre-booked shows.

Despite the negative repercussions of Covid-19, one venue that has demonstrated resilience during these turbulent times is the National Theatre (NT). As part of its business continuity plan, the organisation’s Artistic Director and Joint Chief Executive Rufus Norris told *The Guardian* in April last year, that the business had furloughed 85–90 per cent of its workforce, due to Covid-19. In his interview with the newspaper, Norris explained that the NT only had “months of reserve funds remaining in the theatre’s coffers”, which the business was looking to stretch across to the end of 2020. To make ends meet, the organisation also halved its production budgets and made cuts to capital expenditure to stay afloat.

In December, the NT launched its ‘National Theatre at Home’ streaming service to claw back some money for the business and its artists. Through this platform, users have a choice of subscription options, which will provide access to a plethora of NT performances that can be downloaded and streamed from their TV, tablet or smartphone.

The organisation says it has been adding more shows to this service each month, so that viewers will always have something new to watch and enjoy from the comfort of their own home or on the go.

The impact of Covid-19 has also resulted in the organisation stepping up its health and safety and facilities management to ensure staff, visitors and performers are protected from the virus, especially on their official return to the venue this year.

Chris Snow, Head of Support Services at the NT and the NT’s Head of Facilities Kieron Lillis caught up with *Quality World* to discuss their health and safety protocols, as well as the organisation’s plans for reopening the venue in a safe and secure fashion.

Situated on London’s South Bank, the NT is a publicly funded, not-for-profit organisation that has been entertaining audiences for over five decades. From William Shakespeare’s *Romeo and Juliet* to Thomas Heywood’s classic folktale, *Dick Whittington* – the theatre has shined the spotlight on renowned and emerging actors to promote talent and diversity across the performing arts sector. The NT hosts over 1,000 performances for more than 600,000 people each year across its three auditoriums – the Olivier Theatre, Lyttelton Theatre and Dorfman Theatre.

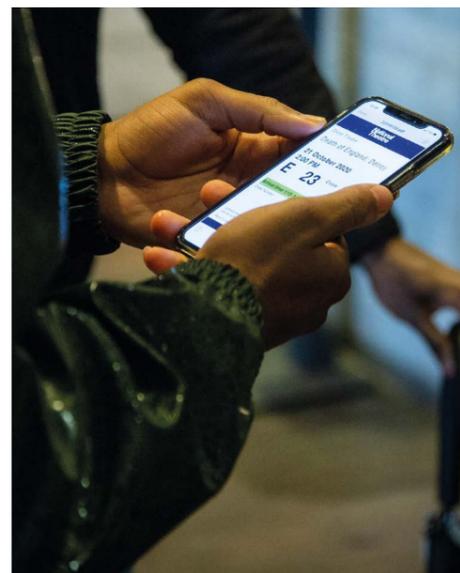
Statutory compliance

However, when the coronavirus took centre stage, the theatre was forced to cancel shows and shift its focus to protecting the health and safety of staff, performers and customers. “Although the theatre was closed to the public and majority of staff, the building itself still required statutory and general maintenance,” says Lillis. “At the beginning of the coronavirus outbreak, the main issue for the NT’s facilities team was getting staff to come in to maintain the building and making them feel safe so they could carry out their work.”

After identifying this issue, Lillis came up with the concept of “splitting the facilities team into two groups, so if one team ever went down through illness, the other one could come in as back-up,” he explains. “We have since alternated both teams by having one



“The focus of our team has changed from the look and feel of the theatre to safety, which has been quite positive in many ways”



James Bellorini Photography;
Cameron Slater Photography;
Philip Vite.



Left: Chris Snow says that health and safety team developed innovative cleaning approaches.
Right: Kieron Lillis split the NT’s facilities team into two groups to help the staff stay safe.

group working in the building each week, while having a mix of others on furlough or working from home. This has helped to keep employees safe and overcome this challenge quickly, thanks to the dedicated team that we have in place.”

The NT works in accordance with the Health and Safety Executive’s *Managing for Health and Safety* (HSG65) guidance (bit.ly/3k85jvV), which incorporates the plan, do, check, act (PDCA) cycle. With some additional planning to prevent employees and external parties from catching and transmitting the virus on-site, the facilities team have been able to effectively carry out general maintenance, as well as fire system and insurance checks – alongside their specialist contractors and surveyors.

Lillis quips: “As dull as portable appliance testing sounds, it’s been much easier and quicker to do it in a building with far less people because in normal circumstances, we would usually have to go to someone’s PC and say: ‘sorry, I’m going to have to turn this off to test it’. But certainly, it’s a tragedy at the same time not having all our colleagues under one roof.”

Communicating best practice

In a similar vein, Snow says that health and safety has also taken a front seat in the Support Services department – particularly in recent months – where the team have had to develop an innovative approach to cleaning to meet the government’s guidelines. Previously, their cleaning regime was centred on tackling dust in offices and walkways, but in Covid times, the team’s attention has turned to dealing with potential virus droplets in high-risk areas.

“The focus of our team has changed from the look and feel of the theatre to safety, which has been quite positive in many ways.” Snow elaborates: “For example, we have stopped hoovering as much because it’s not an essential part of Covid safety. Instead, we now focus more on cleaning touch points (eg, doorhandles) in frequently used areas such as toilets and corridors.”

Snow has been actively communicating the importance of self-cleaning across various departments of the organisation, by encouraging employees to clean and sanitise their

own desks and workstations/zones.

This, in turn, has helped to reduce time for the support services team, so that they can concentrate on other critical areas in the building. Some of these places have included the theatre’s washrooms and kitchenettes, where the team have been using a two-step approach to eliminate any potential virus droplets. This process, Snow notes, consists of one treatment of cleaning, followed by a treatment of sanitising, using the most appropriate cleaning agents for each surface.

Ensuring all cleaning standards are adhered to, the support services team have introduced “Covid cleaning boxes” in every office space in the building. Akin to a first-aid box, the Covid-19 ones contain a range of health and safety essentials, including sanitisers, wipes, various sprays and disposable face masks, all of which are checked and refilled on a regular basis.

“Cleaning is now a part of day-to-day life that’s ‘visible’, rather than being the ‘invisible team’ that comes out at night when the offices are empty,” says Snow, adding that his staff’s concerted efforts to keep the virus at bay has improved the profile of the Support Services department in the business.

Adding to his sentiment, Lillis admits “the service from Chris’ team has been great. As a customer, every time the Facilities Team puts a request in for extra items or consumables, they almost immediately turn up!”

Both Lillis and Snow are involved in weekly management meetings, where they provide regular updates about the building’s performance as well as any recent changes that have been made. These catch-ups have proven valuable, Snow notes, especially for those who haven’t been on-site in over a year, as it’s kept them informed and connected with the rest of the organisation and, more importantly, each other.

Improving air quality

Another critical objective has been improving the theatre’s air quality and circulation. According to Lillis, the NT’s facilities team have been collaborating with the health and safety team to work out how many people can safely be in the ▶



“Cleaning is now a part of day-to-day life that’s ‘visible’, rather than being the ‘invisible team’ that comes out at night”



The fogging process (top) has been used for cleaning upholstered seating. Visitors returning to the NT will notice new hand sanitising stations and socially distanced seating, both in the foyer and the auditorium.

Cameron Slater Photography

“Theatres need to make sure they’re prepared for that light at the end of the tunnel”



theatre’s auditoriums at a time, depending on the ventilation systems that have been installed. The facilities and health and safety teams ironed out this issue by upgrading to a new filtration system, which was done in ample time before the theatre’s reopening in October 2020, following the UK’s second lockdown.

Lillis recalls: “We’ve got a good and very straightforward air supply and extract system in our auditoriums. The air changes that were required each hour were effective, as there was only half the amount of people in our auditoriums due to social distancing.”

He adds: “In the auditoriums, we turned the air handling units on two hours before the place was occupied and kept them running until two hours after the spaces were vacated. Those were the kind of things that we were putting in place in the background to ensure the ventilation systems were working beyond how they’d normally operate pre-Covid.”

Nooks and crannies

Under the government’s guidelines, theatres are expected to frequently clean their auditoriums as a prerequisite, paying close attention to

touchpoints that audiences are likely to come into contact with (eg, arm rests). Unlike other surfaces that can be wiped clean, upholstered seats require special attention.

Snow expands: “During our reopen to the public in December, we started ‘fogging’ the auditoriums before the shows started. We found that fogging – or E-spraying as it’s otherwise called – was our most effective way of cleaning the upholstered seats and other areas that couldn’t be traditionally wiped clean.” He laughs: “My team would dress up like ghostbusters in heavy PPE, where we’d have the auditorium to ourselves while we spent around 30-40 minutes applying this mist chemical on all the seating areas.”

The NT has since received widespread support for this initiative after publishing a video of the cleaning process on its website and social media channels.

In parallel with this, the organisation also published its Front of House and Rear of House Risk Assessments on its website. This public document was produced to demonstrate the lengths the theatre has gone to, to control the virus, and also to assure customers that they’ll be in safe hands when they return to the theatre in due course.

The organisation has its own “robust” risk assessment, which was created in-house to reflect the government’s guidelines. This document was issued to all staff and contractors who are responsible for reading and understand its requirements, before signing and sending it back electronically. Lillis explains to *Quality World* that a team is appointed in-house of whom are responsible for holding weekly meetings to discuss any changes/amendments or new research that could impact the NT’s operations. In the event of any update(s), the team will amend and reissue the guidance accordingly, ensuring staff and contractors are made aware of this additional information, as well as any further obligations or duties that are expected of them.

Forming part of the risk assessment, a QR code scanning system is in operation for all staff and contractors.

The system asks multiple questions about a person’s health and has since been enhanced by asking individuals ‘if they feel unwell in any way?’ because “Covid symptoms have gone beyond the loss of taste/smell, high temperature and coughing”, Lillis asserts. “As a precautionary measure, we’re asking anyone who isn’t feeling well to not enter the building at all.”

Customer bookings

Together with its health and safety protocols, the NT has been focusing on keeping customers informed of its progress/movements through its social media platforms (eg, Facebook, Twitter, Instagram and YouTube). The box office team have also been handling customer bookings effectively by sending out email updates to ticket holders and offering customers – if things have changed or are rescheduled – the opportunity to receive a credit note, which can be used towards a future booking. In addition to this option, customers also have the choice of receiving a full refund or donating the ticket value.

Snow highlights that the NT is delighted to have received some “generous ticket donations” from its supporters, which has helped to inject some cash back into the business during these difficult times.

During the pandemic, the NT has been keeping members informed with business updates and show news and information through emails, its digital newsletter and online events and extras. It has also been encouraging potential visitors to sign up to one of many membership packages on the organisation’s website. Additionally, members have been offered priority access to bookings for socially distanced performances at the NT, which will be taking place in the future.

Welcoming back visitors

A question on the minds of NT supporters is what can they expect on their return? According to Snow, visitors will experience a similar set up to last year’s opening night for *Death of England: Delroy* in October, where guests were assigned different time slots for their arrival, so that many people did not enter the premises at one time. There will also be hand sanitising stations that customers will

have to go through before they’re escorted to a specific seating area in the foyer. Once seated, customers will be able to pre-order any snacks or beverages, which will be brought over to them by a front-of-house member, as they wait to be ushered into their designated auditorium.

Additional signage will be introduced for directing customers through walkways in the foyer and auditoriums, while front-of-house staff ensure audience routes are kept as clear as possible for toilets and exits. Furthermore, all theatre personnel will be donning face masks and other essential PPE as they undergo rigorous cleaning, attend to customers and ensure visitors are complying with social distancing rules.

In response to UK Prime Minister Boris Johnson’s announcement on 22 February of his roadmap for easing lockdown, a NT spokesperson said: “The roadmap will allow us to plan to resume socially-distanced performances. In parallel, progress by the government’s Events Research Programme will be crucial because a clear route to performing without social distancing is needed.

“Socially distanced performances are not sustainable in the medium term for the NT and remain impossible for many theatres up and down the country. As ever, we remain committed to resuming performances as soon as possible, to employ members of our freelance community and to welcome back audiences who have always supported the National Theatre throughout this closure period.”

As the NT awaits the green light to open its doors once more, Snow offers some words of encouragement to performing arts businesses who’ve been struggling in the current climate: “This is an incredibly difficult time for arts organisations across the country and particularly for freelancers, who’ve not had access to the support that many permanent staff have had.” He concludes: “From both mine and Kieran’s perspective, theatres need to make sure they’re prepared for that light at the end of the tunnel. This means checking that all the required health and safety protocols are in place in their buildings, for when the time comes to reopen. Let’s hope that it does very soon.” ■

PUTTING CSR AT THE HEART OF YOUR BUSINESS

Businesses have the potential to work for change and create an improved world, and the way in which they do this can help build better customer relationships too.

David Finney, CQP MCQI, volunteer for Humane Being and founder of The Energy of Conversation, outlines the principles of corporate social responsibility and explains how to put it into practice

CHANGE

History has taught us that if we leave change solely to governments, significant societal change might not occur – women may never have got the vote and we might not have banned slavery. Campaigning from grassroots level is essential to a continually progressive society. Laws are changed to reflect the feelings of the people and culture evolves as people become more educated.

We can appreciate what we have improved, learn from the past and seek to make further improvements, by preventing future occurrence of these issues. Sounds a bit like a QMS doesn't it? A QMS is dependent – among other things – on effective risk-based thinking, careful analysis of data and a commitment to continual improvement. But what about the customers? They are the central focus of a QMS based on ISO 9001:2015, so why does the definition of quality exclude them? ▶

ISO 9000:2015 defines quality as the “degree to which a set of inherent characteristics of an object fulfils requirements”. The exclusion of the word “customer” here surely implies that if we focused on customers to the exclusion of everything else, we may end up breaking the law, damaging the environment, or engaging in other unethical or harmful practices. To achieve quality, we must ensure we identify and aim to meet the needs and expectations of all the relevant interested parties (clause 4.2).

CORPORATE SOCIAL RESPONSIBILITY

Since ISO 26000 (social responsibility standard) was released in 2010, corporate social responsibility (CSR) has been given a lot of attention. Businesses have realised that by adopting CSR practices, they can acquire more work, build stronger relationships, enhance their corporate reputation and increase staff motivation.

Twenty-first century consumers care about where their money goes, probably more than ever before. The 2019 Aflac CSR Survey found that 77 per cent of consumers surveyed are “motivated to purchase from companies committed to making the world better,” and 49% of Americans say it is more important for a company to “make the world a better place” than “make money for its shareholders.” What is influencing this? The climate crisis and modern slavery are probably two such factors.

Oxford Reference defines CSR as: “Awareness, acceptance, and management of the implications and effects of all corporate decision-making, taking particular account of community investment, human rights, and employee relations, environmental practices, and ethical conduct.”

This is not about initiatives that come and go, this definition lies right at the heart of an organisation and is fully comprehensive. We can look to others for inspiration.

Dale Vince, the owner of Ecotricity and Forest Green Rovers, has recently used plastic taken from the oceans and mixed it with coffee waste to create football shirts.

In 2006, Blake Mycoskie started TOMS Shoes after witnessing the

hardships of Argentinian children having to grow up without shoes, TOMS Shoes pledged to match every pair of shoes sold with a new pair for a child in need (over 60 million given at the last count).

In 2011, Levi Strauss & Co launched a Worker Well-being (WWB) programme to set new standards for the clothing industry by surveying their employees to find out what they need to become more “engaged, healthy and productive”. It aims to improve the lives of workers by addressing issues related to health, financial security and gender equality. The programme runs in 17 countries and covers 190,000 workers; in some cases it generates a 4:1 return on investment.

In response to the frightening statistic that one third of the world’s food produce is wasted, Chipotle and Intermarché pledged to sell their “inglorious” fruit and veg at a 30 per cent discount and even ran ugly fruit and vegetable competitions.

The fashion industry has a reputation for environmental damage, in terms of water usage, pollution and emissions. Hubbub states: “It takes 2,700 litres of water to produce one cotton t-shirt through conventionally grown cotton and it uses lots of toxic pesticides.” The charity teamed up with the Soil Association to promote the use of organic cotton which, it states, “uses up to 91% less water in the growing process”.

Business leaders can work together to create an improved world for people, animals and the planet. If the history of Earth was presented as a 24-hour clock, it is estimated that humans have been around for less than 12 minutes and make up 0.01% of all species on Earth.

In May 2019 – after considerable work by campaign groups – UK MPs approved a motion to declare an environment and climate emergency. As if a climate emergency was not enough to contend with, we find ourselves in the middle of a global pandemic which has caused the worst economy in 300 years and already killed more than 100,000 people in the UK alone.

When colossal events occur, we clearly need to react and deal with



Above: Campaigners David Finney (left) and Jane Tredgett (right) are challenging the UK Government over its failure to address the issues associated with factory farming.

Opposite: Free range versus caged pigs. Kept outdoors, pigs are able to enjoy wallowing and other instinctive behaviours, but these activities are denied to intensively reared pigs.

“TWENTY-FIRST CENTURY CONSUMERS CARE ABOUT WHERE THEIR MONEY GOES, PROBABLY MORE THAN EVER BEFORE”



them, removing the issue as quickly as possible – eg, a vaccine. ISO 9000:2015 defines this as “correction”, but in the spirit of the ISO 9001:2015 standard, cause analysis and corrective action is essential to preventing future recurrence. Is this where some businesses and governments fall down? For instance, what is the government doing now to prevent a future pandemic?

Change drives governments and businesses. Risk-based thinking ensures we are constantly looking ahead, conducting research to use historical data to deal with issues and anticipate future change – without that we are the mercy of change, always reactive, never proactive.

ANIMAL HEALTH: THE CASE FOR CHANGE

The Covid-19 pandemic has raised awareness of how diseases can jump from animals to humans, and how the conditions in which animals are kept – whether in wet markets or on farms – has the potential to affect the health of us all.

Two business leaders, Jane Tredgett, co-director of Results Through Training, former Board Trustee of the RSCPA and founder of non-profit organisation Humane Being, and David Finney, former Quality Director in the Market Research industry and founder of The Energy of Conversation, are challenging the UK government over its failure to address the issues associated with factory farming. Their concerns over animal welfare, the climate crisis and the pandemic led them to challenge the government to be more proactive.

Currently, most new and emerging infectious diseases in humans come from animals – three in four according to the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO).

Swine flu first appeared in Mexico and reached Britain in 2009. In England alone there were 540,000 cases and 138 deaths. Avian flu has been occurring in Britain since 2006 and frequency has intensified in recent years, with 12 outbreaks in 2017 and 25 outbreaks between November 2020 and March 2021.

Various forms of avian flu are present all over the world, and a particularly lethal form of it called HPAI H5N1



is known to infect people, with a 60 per cent mortality rate. In February 2021, Russia reported cases of the first known H5N8 avian flu infection in humans.

Earlier this year, Professor Robert Bragg, a researcher at the Department of Microbial, Biochemical and Food Biotechnology, University of the Free State, South Africa, told Plant Based News: “There will be more pandemics and there is a feeling among some scientists that this could just be a dress rehearsal for the real big pandemic.” He added: “Many virologists, including me, have been predicting an influenza pandemic for many years... The bird-flu virus, influenza H5N1, has a mortality rate of around 60–65 per cent, but it has not yet developed human-to-human transmission. If this virus does develop human-to-human transmission, we could be in for a really serious pandemic!”

Antibiotic resistance is another serious global health concern. It is common to treat farm animals with antibiotics when they get sick – typically pigs and poultry. Sometimes it is more economic and more efficient to treat an entire shed of animals than a few sick ones. Bacteria evolve and become resistant to antibiotics and these superbugs can be transferred through human contact with the animal, through the food chain or through animal waste.

The WHO reported that antimicrobial resistance will cause around 10 million deaths a year by 2050, stating that the biggest driver is the “misuse/overuse [of antibiotics] in humans and animals.” Despite the rising demand for plant-based food, animals are still farmed intensively in the UK, where there has been a rise in mega farms (massive industrial-scale farms with huge numbers of animals). One has 23,000 pigs, while another has 1.7 million chickens. Around 20 dairies in the UK house between 700 and 2,000 cows, mostly kept indoors with their food brought to them. Over 16 million hens are kept in colony cages, which are not much better than the now-banned battery cages they replaced. Non-free-range sows are confined in metal farrowing crates for up to 12 weeks after giving birth. Mutilation of beaks, tails and horns without anaesthetic is common practice, as is the early separation of young from parent. It is well documented that intensive animal agriculture is a contributor to climate change, through methane from cattle and nitrous oxide from animal waste, fertiliser and pesticides (which are estimated to be 28 times and 300 times more potent than carbon dioxide, respectively).

Mackenzie Aime of Food & Water Watch emphasises that the next serious disease could happen anywhere: “As people point fingers at the dangers of ‘wet markets’, it’s easy to overlook the closer-to-home problem of factory farms,” she says. “Our next zoonotic pandemic could easily come from a factory farm.” ▶

THE SCRAP CAMPAIGN

Tredgett and Finney have set up a campaign called SCRAP Factory Farming and aim to launch a legal case to force the government to address these issues. The aims of the campaign are to persuade the government to abolish factory farming (or develop a plan to do so) and to generate awareness of the issues. In addition, there is a long-term aim to set a legal precedent for other countries to follow. SCRAP was created as an acronym to summarise the key issues:

- **Suffering**
- **Climate chaos**
- **Ravaging the planet**
- **Antibiotic resistance**
- **Pandemics and disease**

There were many challenges to taking on this project. Tredgett and Finney needed a strong legal team, funds to cover legal costs and extensive research, plus PR to gain support and generate publicity. There were multiple risks, with the two largest being financial. What would happen if the funds could not be raised? What were the financial implications of losing the case? These risks provided opportunities. Tredgett approached human rights QC Michael Mansfield, who also has a reputation for supporting animal rights. His response was quick and decisive: an immediate yes and a CrowdJustice fundraiser was launched.

The legal team presented a case that was spearheaded by health risks and supported by the abhorrent treatment of sentient animals and the ongoing damage to the environment. They sought to demonstrate that by allowing factory farming to continue, the government was not adequately protecting its citizens or animals.

OPERATION AND EVALUATION

Once the campaign was underway, daily operational activities were focused on communications. Detailed operational and communication plans were drawn up by the wider team with weekly videoconference meetings. The team of volunteers included media and press specialists who were able to help fine-tune the key messages. As this legal challenge on the impacts

of factory farming was a world first, it quickly gained a great deal of attention and the campaign's reach grew to the point where positive messages of support were coming in from individuals and organisations across the world.

Four key performance indicators were set to demonstrate the campaign was working:

- Responses from the government.
- Messages from interested parties.
- Social media hits and shares.
- Funds being raised.

These are all actively monitored as the campaign continues to grow in momentum.

At the time of writing, the Humane Being legal team (Hackett and Dabbs) received a response (on 25 May 2021) from the DEFRA legal team to their Letter Before Action (submitted on 26 April 2021). The response has been deemed unsatisfactory by Humane Being and their legal team and a court application has been made to seek permission to apply for a judicial review.

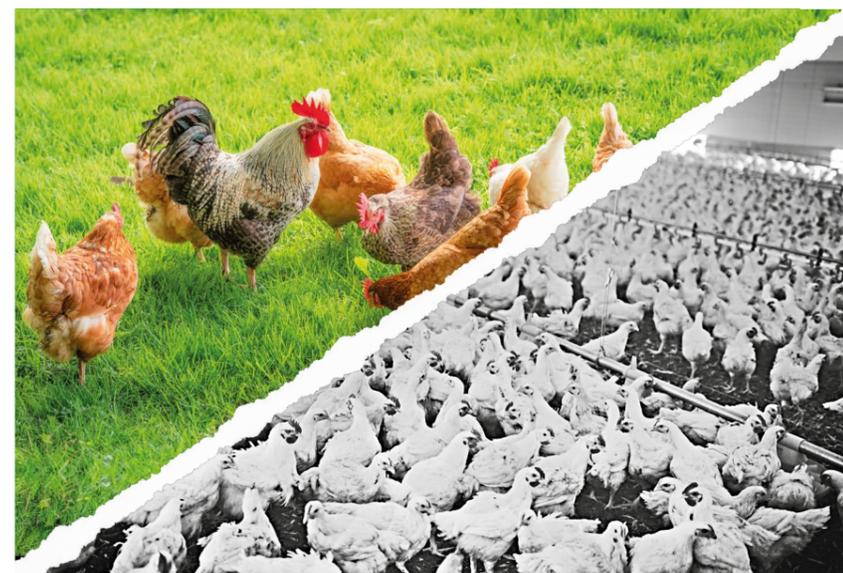
The government's decision to facilitate the continuation of factory farming presents health risks to UK residents (eg, spread of disease and antibiotic resistance), a lack of protection for animals (eg, mutilation and confinement in cages, crates and crowded areas), and damage to the environment (eg, emissions and pollution).

The objective is to present a challenge to a regime that Humane Being, and its legal team, believes is not adequately protecting people, animals and planet. The Humane Being campaign goal is for the government to phase out factory farming in the UK by 2025.



Above: The legal team believe the case is unique.

Below: Free range versus caged chickens. Outdoor birds have an active life with plenty of space, rather than overcrowded and unnatural conditions.



Getty.com/Peopleimages; George Clerk

CSR IN A QMS

How can your organisation tap into your employees' sense of individual social responsibility (ISR) and weave it into your CSR? Here is a step-by-step guide based on Annex SL. What do you care about? What will you focus on: children, people, animals, planet, or a mix of them all?

STEP ONE

Revisit context and reimagine your future by broadening your review of issues and interested parties. Some questions that may be useful are:

- What aspects of our work are currently impacting negatively on the environment?
- What aspects of our lives are currently impacting negatively on the environment?
- Are activities in our supply chain impacting negatively on the environment?
- Are there any aspects of our work impacting negatively on people or animals?
- Are there any aspects of our lives impacting negatively on people or animals?
- Do the activities in our supply chain have any negative social impacts?
- Is there any forced labour in our supply chain?
- What do our interested parties expect of us?

Everything we eat, wear or use has an impact on the quality of the world. The production of non-organic and non-sustainable cotton can devastate local communities and wildlife habitats by causing drought and pollution (eg, Kazakhstan). Around 80% of the world's soya bean crop is fed to farmed animals resulting in deforestation in South America.

STEP TWO

Revisit key policies and extend statements to incorporate broader intent. Maybe the quality policy is focused so much on the customer that it ignores the world around us. Extend business and quality objectives to

incorporate social and environmental objectives. Ask employees about their passions. Calculate how much time you could give employees each week to focus on voluntary work.

STEP THREE

Revisit risks and opportunities and plan actions to create a broader set of benefits to a wider set of interested parties. Weigh up the risk of 'losing' x hours a week to voluntary work against the gains of staff experiencing a deeper sense of fulfilment and to help them feel less isolated, especially if working remotely. There may be additional opportunities to use the great work your staff can get involved in to promote the business and attract more clients.

"IT IS ESSENTIAL THAT WE DO NOT ISOLATE OURSELVES IN OUR WORK BUBBLE WITHOUT... MEANINGFUL CONNECTIONS"

STEP FOUR

Consider resources carefully to ensure there is a strong and effective balance between customer care and extracurricular activities. Maybe a rota system could be useful. This might be a good time to increase (or augment existing) actual or virtual communications by organising workshops and including CSR/ISR in line manager appraisals and catch-ups.

STEP FIVE

Integrate socially responsible activities into the working week. Environmentalist and animal welfare politician, Jane Smith, has consulted with companies in these areas, such

as working with bank employees to spring clean the outdoor areas of a wildlife hospital; an IT department had a team building away day assembling sheds and coops for a farmed animal sanctuary; one company went on a 'face mask litter pick'; another team had a 'tree enrichment' day of applying good soil and planting seeds around the bases of neglected trees in their local town; an engineering company spent a morning applying mesh to grids so toads don't fall down them during their spring migrations. It's important that these kinds of activities are not one-off projects, but become part of the working week. The added value for employees is that it brings them closer to nature and is something that can be done remotely as well as in a team. Workshops could be arranged to share experiences, or they could be posted on a company intranet site.

STEP SIX

Evaluate the effectiveness of activities. Some may be obviously measurable, some less so and hence employee engagement surveys may be helpful or if a small sample size does not facilitate this, qualitative feedback can be just as powerful. Include CSR in team and management reviews and make it an instinctive and routine part of the plan, do, check, act cycle. Seek to continually improve your CSR profile and link it to your strategic direction.

An organisation does not have to have ISO 27001 to care about information security. An organisation does not have to have ISO 14001 to care about the environment. Recent events have created some social separation in our lives, but behind every risk lies an opportunity, such as spending more time in nature. It is essential that we do not isolate ourselves in our work bubble without seeking to create meaningful connections for the greater good.

As Margaret Mead once said: "Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has." ■



**A
HARMONISED
APPROACH TO
MANAGEMENT
SYSTEM
STANDARDS**

The International Standards Organization (ISO) has recently undertaken a limited revision of Annex SL, which forms the basis for nearly all its management system standards. The latest version, published in May 2021 as part of the ISO Supplement to Part 1 of the ISO/IEC Directives, applies to all new ISO Management System Standards as well as the revision of existing ones. Nigel Croft, CQP FCQI, Chair of the ISO Joint Technical Coordination Group (JTCCG) for Management System Standards, and Dick Hortensius, Senior Standardization Consultant Management Systems, from the Netherlands Standardization Institute and Secretary of the JTCCG, share details of the revisions

The ISO Supplement to the ISO/IEC Directives defines the requirements that have to be followed by ISO Technical Committees for all ISO standards (more than 20,000 of them). “Annex

SL” of the Directives is an all-embracing term used to describe the criteria that have to be met in order to ensure a consistent and a harmonised approach to writing the 40-plus MSS that are now within the ISO portfolio.

First published in 2012, and now applied by the vast majority of ISO MSS, Annex SL comprises several components, which in the latest edition are:

- The “body” of Annex SL, which describes among other things the “harmonized approach” to the development of MSS, including the level of autonomy and flexibility that can be exercised by individual ISO Technical Committees when developing their discipline-specific standards.
- Appendix 1, which specifies the justification studies that are required when a proposal is made to develop a new MSS (to avoid overlaps and/or potential conflicts with existing standards).
- Appendix 2 contains the harmonized structure (HS), formerly known as the high-level structure, with the identical core text, common terms and core definitions that MSS writers are required to follow, together with guidance on how to use it (aimed primarily at the standards writers themselves, but which can also be useful to MSS users).

- Appendix 3 contains guidance on the use of terminology.

The ISO’s Joint Technical Coordination Group (JTCG) was established in 2007 and comprises representatives from all of the ISO technical committees with one or more MSS.

Review of Annex SL

All ISO standards are periodically subjected to a systematic review for their relevance and topicality. Although Annex SL is not a “standard” as such, this review was carried out in 2018 by consultation with the various ISO Committees (and their constituent members) with a MSS in their portfolio, and National Standards Bodies (including feedback from users of the standards). That assessment showed that the overall acceptance of Annex SL among standards developers and users had been good, and that there was no need for a major overhaul. However, there were enough points for improvement that justified an update. As a result, a new task force of the JTCG (TF14) was set up at the end of 2018 to prepare a limited review of the high-level structure, as part of a wider revision of Annex SL.

The revision process

Almost 100 representatives of ISO’s Technical Committees and National Member Bodies participated in the revision process, under the leadership of Dr Nigel Croft (Brazilian National Standards Organization) and Dick Hortensius (the Netherlands Standardization Institute). TF14 tried to avoid making changes for change’s sake, and applied a benefit/impact rationale to every individual change. The changes to the high-level structure (now renamed the HS) are therefore quite small and will not have an

immediate impact on users. However, the “Guidance for MSS writers” in Annex SL Appendix 2 has been significantly improved, which should result in enhanced alignment and harmonisation of “discipline-specific” requirements as the changes filter down into the various MSS over time. The revised Annex SL has now been incorporated into the latest version of the Directives, published on 1 May 2021, and will apply to the development of all new MSS (such as the new ISO 42001 for Artificial Intelligence, which is still in its early stages) and any revision of existing standards, such as ISO 9001 (Quality), ISO 14001 (Environment), ISO 45001 (Occupational Health and Safety) and others. However, it should be emphasised that this will occur over time, and the standards are not required to be revised simply as a result of the revision to Annex SL.

The main changes

Scope – link with intended results

The scope of all MSS (Clause 1) must indicate the intended results of the management system that is specified in the standard. For example, ISO 14001:2015 states that it is about improving environmental performance, meeting compliance obligations and achieving environmental objectives. ISO 9001:2015 is clear that the intended results are to consistently

“THE REVISED ANNEX SL HAS NOW BEEN INCORPORATED INTO THE LATEST VERSION OF THE DIRECTIVES ... AND WILL APPLY TO THE DEVELOPMENT OF ALL NEW MSS”

provide conforming products and services, thereby improving customer satisfaction, and so on. This provides a basis on which organisations can consider the relevant risks and opportunities they need to control or exploit in order to achieve or exceed the goals of the management system.

For auditors and those involved in accredited certification, these intended results are an important reference point for determining the

NEW SITUATION: FULLY ALIGNED STANDARDS



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Annex SL is the result of an extensive revision process, with a benefit/rational impact applied to every change.

overall effectiveness of a management system. “Effectiveness” is defined in Appendix 2 of Annex SL as being “the extent to which planned activities are realised and planned results are achieved”. While an organisation might have other additional expectations for its management system, the MSS will define the minimum that should be achieved as part of the concept that “Output Matters”. This is described further in the joint ISO/IAF/ILAC document “Expected outcomes for accredited certification to ISO management system standards” (https://www.iaf.nu/upFiles/CASCO_Expected_Outcomes2018final.pdf).

Terms and definitions always included in the standard

From now on, the terms and definitions from Appendix 2 must be incorporated

into each MSS, supplemented, if desired, with the specific terms and definitions applicable to that standard.

This is a change for ISO 9001, for example, which so far has not included definitions, instead making a normative reference to ISO 9000 (the Fundamentals and Vocabulary standard). This is important for all users of standards, including auditors, because it has been shown time and again that a good understanding of terminology is essential for a good understanding of a standard as a whole.

Removal of “outsourcing” and “control of outsourced processes”

The concepts of “outsourcing” and “control of outsourced processes” will no longer be used. In practice, there has often been discussion about what exactly outsourced processes are and what is the difference with (the control of) purchasing and working with outsourced service providers. ▶

That is why it has now been decided in clause 8 to set requirements for the externally provided processes, products and services that are relevant to the management system. This now also requires these processes to be controlled (typically via purchasing), which has not been the case so far.

The organisation determines which stakeholder requirements will be complied with

In Appendix 2 of Annex SL, the term “requirement” is defined as a need or expectation that is stated, generally implied or obligatory. Clause 4.2 has always required an organisation to identify the relevant requirements of relevant interested parties or stakeholders.

This definition of a requirement indicates that it encompasses more than what is mandatory for an organisation, eg, complying with legal requirements. However, it has been unclear how an organisation should deal with the other needs and expectations of stakeholders.

This was already clarified in standards such as ISO 14001 and ISO 45001, and now a similar wording has been added in clause 4.2 (Understanding the needs and expectations of interested parties) of Annex SL, to make it applicable to all MSS. Namely, that the organisation

“FROM NOW ON, THE TERMS AND DEFINITIONS FROM APPENDIX 2 MUST BE INCORPORATED INTO EACH MSS”

shall determine which of the identified requirements of stakeholders will be addressed in the management system. It is logical that these would then become the “applicable requirements” that the organisation commits to meet, as expressed in the policy in accordance with clause 5.2 (XXX Policy), where “XXX” refers to the specific discipline of the MSS, such as quality, environment, etc.

An example in the case of ISO 9001 might be where a potential customer has a series of needs and expectations that the organisation

cannot, or chooses not, to meet. Such needs and expectations become “applicable requirements” for the quality management system only if the organisation offers or accepts an order for products and services that are based on them.

This is consistent with the concept of “compliance obligations” as defined in the newly published ISO 37301:2021 standard for Compliance Management Systems.

Management of change

Clause 6 now includes the new subclause 6.3, which states that the changes to the management system, for whatever reason, shall be carried out in a pre-planned manner. Clause 8 elaborates on this by requiring that the changes that are being planned in clause 6.3 are carried out in a controlled manner. This means that the basics of Management of Change have become an explicit part of Annex SL. This will not affect users of ISO 9001 (there is already a requirement in ISO 9001 to this effect), but this will need to be addressed by all MSS in the future.

Documented information

One important feature in the 2012 version of Annex SL was the departure from the well-known concepts of “documents, procedures and records”, and the introduction of the idea of “documented information”. The purpose of this was to emphasise that it is the information that is important for the effective functioning of the management system, and not so much the way in which that information is captured or documented.

In any case, the JTCG has been very reluctant to include specific requirements for documentation in Annex SL to provide the maximum flexibility for individual MSS writers to define this for their specific discipline, with the minimum of bureaucracy. The extent of documentation is a choice that an organisation makes itself (based on the analysis of its own needs for things like process control, knowledge management, demonstration of conformity and any requirements imposed by relevant interested parties), and not because “ISO requires it to be documented”.

By using different verbs, such as “maintaining” documented information (eg, procedures or work instructions) and “retaining” documented information (for records), some MSS hung on to the old concepts in a roundabout way.

This has led to endless discussions about when a document or record is involved and what specific requirements apply to its management and control, while in modern practice there are all kinds of hybrid forms of making information available in an effective and agile way. Therefore, the new version of Annex SL adopts the idea that documented information needs to “be available”, rather than prescribing how exactly it should happen.

Improvement

There were a number of comments made about clause 10 of the Appendix 2 text (“Improvement”), for instance

too much emphasis on “learning from mistakes” by taking corrective action on identified nonconformities. This has resulted in the order of the subclauses in clause 10 now being reversed so it now starts with a short section on “continual improvement” in general. This change is unlikely to have a significant impact on users, but it is in line with standards such as ISO 9001 and ISO 14001, in which a separate “general” paragraph on improvement is already included.

Risks and opportunities – no change

The question of “risk” and the ways in which the various MSS address “risks and opportunities” varies significantly between different disciplines and sectors (most notably those that operate in a regulated environment). Therefore, it was not surprising that these topics were the subject of much debate during the revision process. The ISO’s Technical Committee on

Risk Management (TC262), which participated in the work, has since approached ISO to recommend a strategic high-level review on how all ISO and IEC (International Electrotechnical Commission) standards (not only MSS) define and address risk.

As a result, neither the definition of risk nor the text on how to deal with risks and opportunities in clause 6.1 of Appendix 2 has been changed. This was considered to be the best option available within the project time frame – to have made any “quick-fix” changes ahead of the significant discussions that are being initiated at the ISO and IEC level could have caused more confusion than clarity.

However, TF14 did succeed in developing significantly improved guidance for MSS writers, which should provide some flexibility in the application of Appendix 2 when needed within a discipline-specific MSS.

Transition to the new HS

The new core text for MSS prescribed by Appendix 2 of Annex SL applies from 1 May 2021, after which all new MSS and revisions of existing standards must be based on this new version of the HS. A few standards are already ahead of the game, such as the aforementioned ISO 37301:2021, published in April 2021. However, there is no requirement for published MSS to transition to the new HS within a specified time period, so it is likely that the 2012 and 2021 versions will co-exist for some time. However, since there are no fundamental differences between the two, this is not expected to become a major issue.

Summary – socially responsible business operations

In light of this updated version of Annex SL, the ISO has indicated that the path taken in 2012 to improve the alignment and consistency of its portfolio of management system standards is irreversible, and the millions of users of MSS can expect that further steps will be taken in the coming years to support such an approach that facilitates their adoption within a single (“integrated”) management system.

Societal change can be facilitated by the adoption of the appropriate MSS. Examples include business continuity and crisis management (highlighted by Covid-19), resource scarcity, adaptation to climate change, digital transformation, Industry 4.0, the circular economy, sustainability, the sustainable development goals (SDGs), and others. All of these bring both business opportunities and risks that can be addressed within a single, robust, business management model.

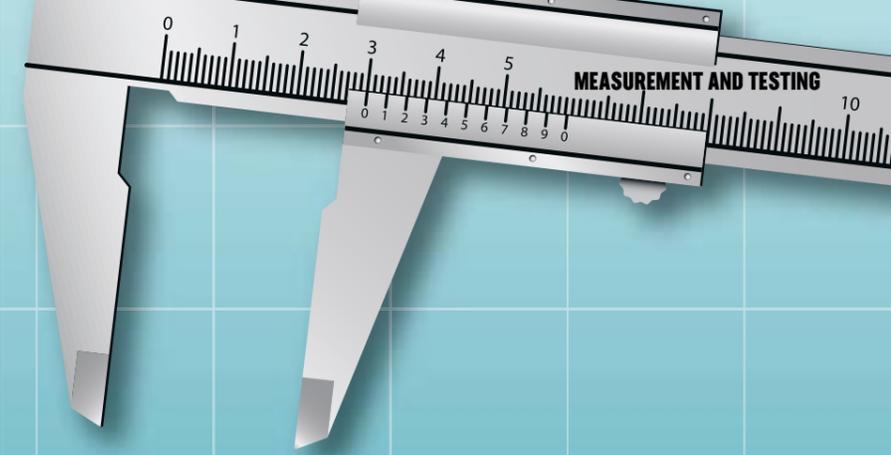
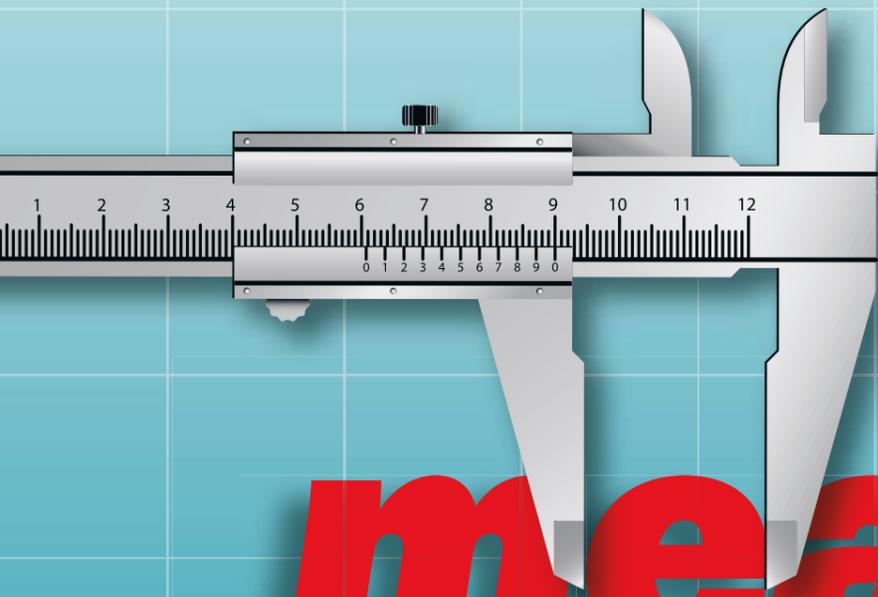
The new Annex SL provides the basic elements for this, so that any organisation can easily understand and embed the relevant MSS into its business operations in a way that best fit its strategy and goals, core processes, products and services, and the context in which it operates. ■

“THERE IS NO REQUIREMENT FOR PUBLISHED MSS TO TRANSITION TO THE NEW HARMONIZED STRUCTURE WITHIN A SPECIFIED TIME PERIOD, SO IT IS LIKELY THAT THE 2012 AND 2021 VERSIONS WILL CO-EXIST FOR SOME TIME”

Getty.com/Creative-Touch

The latest version of Annex SL is available to view online at:

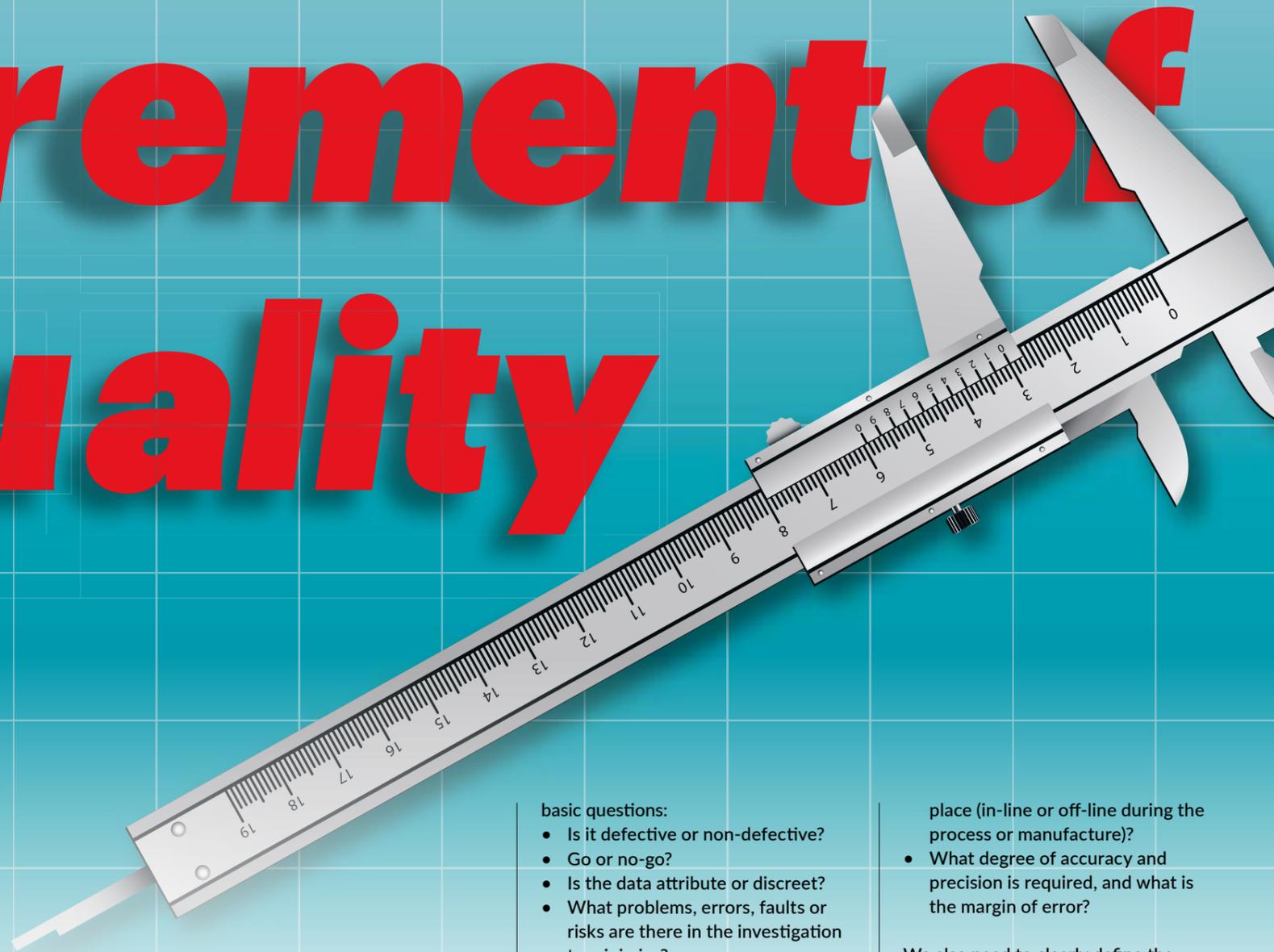
bit.ly/3wAzyRT



The

measurements of

quality



Mehrdad Kamali, CQP MCQI, MSc, explains why measurement and testing is crucial for the quality control of products and services

As quality professionals, how much do we need to know about measurement and testing? There is plenty of published information on quality assurance, quality control and quality systems; however, no matter how robust our quality assurance is, without solid benchmarks for products and services, we will not be able to accurately measure our success. Even if the whole process is left in the hands of a specialist, there will be a need

for an overall understanding of the measurement subject or control.

On writing this feature, I reflected on the quote by Galileo Galilei: "Measure what can be measured, and make measurable what cannot be measured".

How to carry out the measurement

After planning, measurement is a major element of quality control. Any work is still incomplete without planning, data collection, data analysis and turning this analysis into useful information.

When planning, we need to establish why there is a need for measurement, and what actions will follow based on the measurement. It is only then that we can logically start thinking about how to measure.

The good news is that we don't need to reinvent the wheel. The fundamental requirements of testing and measuring remain unchanged, and systems have been developed by thousands of other organisations that have faced similar issues. When we absolutely must create a new way to measure, we are in for some hard work. In that

case, it is crucial to know exactly what information we need, the correct decision and what action will be taken based on this information, then start creating a measurement method.

To proceed, we need to answer some

basic questions:

- Is it defective or non-defective?
- Go or no-go?
- Is the data attribute or discreet?
- What problems, errors, faults or risks are there in the investigation to minimise?
- How would you establish a (false) alarm and its severity?
- How often should we measure?
- What equipment is required?
- What sample size is required?
- How will we analyse and present the final information and to whom?
- When and where should it take

place (in-line or off-line during the process or manufacture)?

- What degree of accuracy and precision is required, and what is the margin of error?

We also need to clearly define the responsibilities for creating the measurement plan and assuring it works as intended. It is also important to identify who will be managing the plan and inspection on an ongoing basis, and what skills they need. There is news of firms facing a talent shortage. To start with, a quality ►

professional needs in-depth knowledge of Geometric Dimensioning and Tolerancing (a system for defining and communicating engineering tolerances), as well as how this is incorporated into quality assurance processes. As measurement equipment is continually improving and becoming more sophisticated, the challenge is training and employing people who can work with it and handle the data. This is a more pronounced issue in certain industries than it is in others.

The essential requirement in all of the above is the traceability of the measurement results. This is demonstrated through a documented and unbroken chain of calibrations, each contributing to the measurement uncertainty. It is up to the organisation that performed the measurement to prove through calibration documents that traceability is linked to organisations such as the National Physical Laboratory (NPL) in the UK or the National Institute of Standards and Technology (NIST) in the US.

In search of certainty

Certainty is an elusive commodity. An agile, data-driven organisation can absorb, react to and mitigate the impact of measurement data if it is aware of the level of uncertainty.

The adoption of digital technologies – often referred to as Industry 4.0 or the fourth industrial revolution – within companies is helping them to reduce their costs and stay ahead of their competition. To benefit fully, businesses will need to step up all levels of their training and data collection.

The application of data analytics technology can provide the ability to interrogate the collected data and to maximise the precision and accuracy of information.

This information will assist in monitoring product, productivity, benchmarking, performance, improving workflow, identifying and acting on under/over-utilised equipment, waste and preventive maintenance.

When collecting the data, it is important to know that a measurement result is complete, and only when it is accompanied by a statement of the associated uncertainty. To understand uncertainty, please refer to *A Beginner's Guide to Uncertainty of Measurement*

(bit.ly/3oph9UR) by Stephanie Bell, published by NPL.

Once we are happy with the data, we then need to analyse and transform it into information usable for our purpose. John Wilder Tukey, an American mathematician, described data analysis as: "Procedures for analysing data, techniques for interpreting the results of such procedures, ways of planning the gathering of data to make its analysis easier, more precise or more accurate, and all the machinery and results of (mathematical) statistics, which apply to analysing data."

Data modelling and data visualisation such as formulas, tables, graphs, etc, will assist in the communication.

It is also important to apply techniques such as Measurement System Analysis and Statistical Process Control, which are employed to assist in accuracy, certainty and prevention of defects getting into the next process.

Finally, like any other project, consider the costs. Obviously, all the activities discussed above have an associated cost that needs to be considered beforehand, to make sure that it does not run over-budget.

All of the above is a consideration for measuring a single parameter. A more complex measure of product or service requires further discussion.

In conclusion, this activity is a collaboration between the designers who need to have an understanding of how each parameter is going to be measured, and the manufacturers, service providers, suppliers and quality personnel who need to understand the importance of the parameter and are trained in the equipment that is used for this purpose.

What has been examined here so far is by no means the only consideration, but it emphasises the fact that although quality assurance and quality systems are essential failure prevention tools, quality control tools, methods and techniques remain the proof of the pudding! There is so much more to know and so much to learn.

We only need to look at recent product failures from leading organisations to realise that data can be used as evidence in courts when it comes to customer satisfaction with all its reputational outcome. ■

"An agile, data-driven organisation can absorb, react to and mitigate the impact of measurement data, if it is aware of the level of uncertainty"

Understanding the difference between clauses 6.1.3 and 9.1.2

Cheryl Savage, Managing Director at Management and Risk Solutions Ltd, discusses the importance of knowing the difference between clauses 6.1.3 and 9.1.2 in ISO 14001:2015 and ISO 45001:2018

It is important for anyone certifying to ISO 45001 (occupational health and safety management) or ISO 14001 (environmental management) to understand the difference between 'identifying' the legal requirements (6.1.3) and 'knowing that you are compliant' with them (9.1.2). Both management system standards require an organisation to identify the applicable legal requirements that are appropriate to its activities, products and services, and therefore it is a prerequisite to understand what legislation and other requirements are applicable to your business.

Organisations can employ a competent person and/or subscribe to a compliance updating service to determine which legal and other obligations are applicable to its business (6.1.3). However, the requirement in clause number 9.1.2 is that you need to understand and be able to demonstrate how you know your compliance status.

If an organisation fails to understand the differences between the two clauses, it could also lead to prosecution, ie, arising from the breaches of the businesses' applicable legislative obligations and other regulatory actions that could negatively impact on operational delivery, as well as the customer and other interested parties.

Unfortunately, many organisations are falling short in conforming to clause 9.1.2 (which requires you to 'prove' you are compliant with the legislation identified and provide evidence of this), which may result in a major nonconformity from its certification body as well as posing a serious risk to the business.

So, how would an organisation demonstrate its compliance status to an external auditor? To start, it should be able to demonstrate:

- its process for evaluating compliance;
- its documented evidence of compliance (the standard states: "the organisation

shall retain documented information as evidence of the compliance status");

- regular inspections conducted of the controls in place to meet compliance obligations;
- what evidence it has.

If an organisation is going to use its internal audit process as a method to determine compliance, it is important that it ensures its internal auditor(s) has the competence to do so. The auditor(s) should be competent not only to carry out an audit of the process, but also have knowledge/understanding of the specific legislation/regulations.

One option an organisation could consider, to show how it is meeting legal and compliance obligations, is to add a column or two onto its legal register so that it can document when it conducted the evaluation, and the status of evaluation. As some examples, the information could include:

- Control of Substances Hazardous to Health (COSHH) is applicable to us as we use chemicals (6.1.3). The inspection of the storage of chemical XX was conducted on XX and was found to be in compliance with the regulation (9.1.2).
 - Lifting Operations and Lifting Equipment Regulations (LOLER) is applicable to us as we use lifting equipment (6.1.3). We have an external body issue a certificate once every XX months and this is how we know we are compliant with the regulation (9.1.2).
- There are many more examples of legislation and regulations, which would be specific to your organisation/industry; therefore, it is even more important that you ensure your management system works for your organisation. If you would like further information, there are many great training organisations and/or consultants that would be more than happy to support you.



"Many organisations are falling short in conforming to clause 9.1.2, which may result in a major nonconformity"

LOOKING FOR A COURSE?
SEARCH FOR CERTIFIED LEAD
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How to undertake layered process audits

Dr David Scrimshire, TEC Transnational Ltd, explains how to plan, undertake and report an effective layered process audit using ‘work instructions’ as your audit criteria

A layered process audit (LPA) is a workplace activity focused on observing and verifying how products are made, rather than inspecting finished products or evaluating the quality management system (QMS). The LPA looks at individual process elements involved in manufacturing and service delivery in every department and area concerned.

Organisations expend considerable resources planning, implementing and controlling the processes needed to create products or deliver services. In the automotive and aerospace sectors, the process is highly structured and is known as Advanced Product Quality Planning. This proactively identifies and corrects potential risks in product design and (manufacturing) process design to guarantee the ongoing delivery of perfect product to the customer – zero parts per million defects, on time and in full, within budget.

Nevertheless, problems can arise; for instance, there could be a lack of consistency in working to the established work instructions at the shop-floor level. If this is left unmonitored, experience has shown that ‘mission drift’ is inevitable.

To proactively prevent this problem, a radically different type of audit is required to augment the conventional QMS internal audit programme. This is where LPAs come to the fore.

LPAs focus on controlled conditions

The focus of LPAs is controlled conditions, which ensure that products

Question	Explanation	Reaction plan
WHAT/WHERE/HOW to check	WHY the question was selected	HOW the auditor is to react when a nonconformance is found
Intended to verify general work elements that have a direct impact on quality or are likely to vary day-to-day. Review relevant risk aspects by using tools such as Process Failure Mode and Effects Analysis (PFMEA), Turtle Diagram, or Ishikawa Diagram.	All questions must have a defined purpose and an expected response. Answering “Why?” underlines the value of the question and its relationship to key performance indicators, controls and the process.	For example, a pre-established reaction plan to prompt the responsible individual to correct the situation: 1. Action #1 2. Action #2 3. Action #3, etc.

and services are created and delivered in the same manner, every time, by everyone, using the same materials and tools – so as to produce perfect deliverables for customers. Central to this objective are work instructions, which specify in unambiguous terms what the operator needs to do.

LPAs are designed to ‘turn up the magnification’ and focus on the detail. They systematically evaluate the extent to which work activities align with the process steps contained in the work instructions.

LPA personnel

LPA derives its name from the requirement that multiple layers (ie, personnel at various levels) of an organisation conduct the audits.

This is not the quality assurance manager or the QMS audit team, but:

- operators (shop-floor workers from other departments or cells)
- team leaders and supervisors
- department managers and top managers (eg, the plant manager).

It is advisable to designate an LPA process owner. Never, under any circumstance, should the job be ‘abdicated’ to the quality manager! The best choice would be the operations manager as she/he is ultimately responsible for the quality of products and services being created for customers – they have a vested interest.

Selecting processes

Manufacturing and service processes are selected for LPAs based on the risk to the quality of the product or service, which require the identification of processes or process steps that are causing serious or frequent problems.

LPA check sheet questions

A crucial element of LPA deployment is defining the check sheet questions (see above table, for example) that focus on work instruction elements. Each question is listed with an associated explanation of why it was selected.

The questions also have a pre-defined ‘reaction plan’ (ie, how the auditor is to react if nonconformance is found).

LPA questions verify what is actually happening in real time (snapshot) compared with what is expected as defined in the work instructions.

A cross-functional team provides information and ideas to develop the LPA check sheet questions. They focus on work instructions and the individual process steps/elements.

The questions should include whatever the organisation believes is critical to product quality. The items are typically those that pose a high risk to customer satisfaction, downstream operations and/or product safety and durability.

Once created, the set of LPA questions must be revised as required to incorporate the latest improvements and process updates based on audit findings, employee suggestions, etc.

LPA tips

First, identify the locations (eg, manufacturing cells) where LPAs will take place. Concentrate LPAs where they will be most effective.

LPAs must be undertaken on a regular and predetermined frequency. Stick with the LPA schedule.

Then, set up a Layer 1 (operators, shop-floor workers) audit schedule for each location/cell to cover all shifts (as applicable).

LPAs are fast and furious! They should:

- take 10–15 minutes;
- include 5–10 questions;
- be performed every day;
- cover all shifts (if applicable).

The frequency of LPAs is adjusted depending on the results obtained (ie, number of nonconformances encountered).

LPA schedules for higher levels of management will be less frequent:

- Layer 2 (middle management) – weekly/monthly.
- Layer 3 (plant managers, directors) – quarterly/annually.

Management must be involved in updating the LPA schedule. The schedule must be approved by the location (cell) management. Once established, the audit schedule should be followed and results recorded.

Preparing for an LPA

First, review the list of audit questions based on the selected manufacturing cell and the associated work instructions. Remember, 5–10 questions are needed.

Schedule a day/time for the LPA and obtain agreement of the department manager. Plan on taking 30 minutes or so for the first LPA. Normally, a LPA should take no more than 15 minutes.

Conducting the LPA and recording results/actions taken

Conduct the LPA using the check-sheet questions to:

- identify nonconformances;
- deploy a reaction plan (auditor with the operator);
- record actions taken (who/when);
- correct problems during the audit.

LPA results are either:

- okay (work element is being undertaken as specified in the work instruction); or
- not okay (work element is not being undertaken as specified in the work instruction).

Unlike a QMS internal audit, where corrective actions must always be undertaken by the auditee, with LPA the auditor is actively involved in correcting problems and nonconformances. It is an immediate fix reminiscent of Kaizen Blitz.

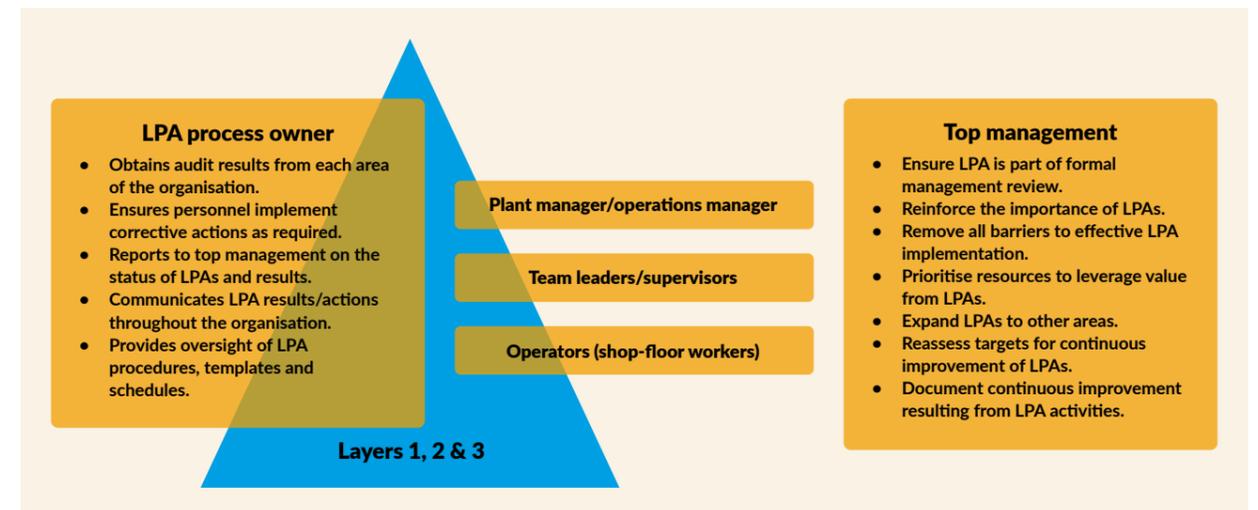
Report the LPA results to the department manager on completion and agree timescales for any actions which cannot be undertaken immediately – these should be the exceptions.

Conclusion

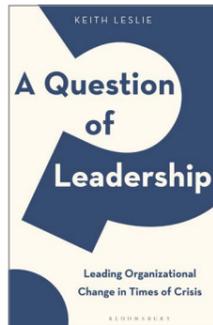
The LPA places people of multiple layers (levels) of the organisation where the work is being done to verify critical items. This facilitates communication between management and the shop-floor team members.

Above all, the LPA demonstrates to all personnel that following work instructions to the letter is very important. “If the plant manager is here to verify that it is done, it must be critical!”

The deployment of LPAs will help instil a culture of zero defects throughout an organisation – zero parts per million defects, on time and in full, within budget.



BOOK REVIEWS



A Question of Leadership: Leading Organizational Change in Times of Crisis
By Keith Leslie, Bloomsbury Business (2021), £20

I was drawn to this book by the different angle of including the mental health of the workforce when discussing change management.

I have not previously seen this explicitly written about in this type of book. The inclusion of mental health has confirmed to me that other books are selling the impact of change short by its omission.

The book is well structured, with each section of the book building on the previous one, although this does require it to be read sequentially. I can appreciate that it may be tempting to dip into the different sections, especially if you are currently working on implementing a change and fear that it may not be going to plan!

The author uses a variety of examples and stories from many industries and time periods, helping to demonstrate not only his vast experience, but also that ineffective change leadership is not confined to certain industries nor is it a new problem.

The one negative issue I had with the book is that it kept referring to the Covid-19 pandemic as if it were over, which did start to grate a little when reading it during another period of lockdown.

This book would be very useful for anyone who has experienced problems with change initiatives 'sticking', regardless of their position in an organisation.

However, I feel that change managers and senior teams would stand to gain the most benefit from the insights in *A Question of Leadership*.

Claire Bailey, PCQI, is Quality Assurance Business Partner at The Manufacturing Technology Centre, UK



High Impact Tools for Teams
By Stefano Mastrogiacomo and Alex Osterwalder, Wiley (2021), £26.99

Throughout my career I have firmly believed that successful teams are pivotal for achieving success. *High-Impact Tools*

for Teams is well designed, with detailed explanations supported by working examples. The book provides an excellent approach to bringing a team together, defining its purpose and how the team members will be effective in delivering it together.

Throughout the book, the authors use visuals and quotes very effectively at the start of each chapter to provide an insight into the tools under review. This results in the book being easily readable and effective for teams, large or small, in all business environments.

Section 1 introduces a tool called the

Team Alignment Map and the associated risk management activity that accompanies development of objectives.

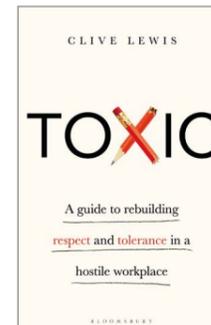
The tools for putting the Team Alignment Map into action in meetings, projects and organisations are covered in Section 2.

Section 3 introduces the Team Contract, Fact Finder and Respect Cards. These are nice, simple tools for visualising the team agreement to behaviours that would be needed to support success. Too often these tools are developed as static charters rather than embraced by team members.

The book finishes with a reminder of the importance of teams working effectively together.

I would highly recommend this book to any team that is starting up or existing teams looking to review the controls that are currently in place. The structure of the tools and templates are designed to effectively provide results, which should help teams to collectively deliver improved work.

Tony Jordon, CQP MCQI, was Head of Quality at Bombardier, UK



Toxic: A Guide to Rebuilding Respect and Tolerance in a Hostile Workplace
By Clive Lewis, Bloomsbury Business (2021), £20.00

Toxic is raw and real because it mentions things that should have been discussed in public discourse years ago regarding workplace toxicity, its driving agents and mitigating factors.

As quality professionals, we often challenge the status quo and are tasked with finding and solving problems, which can sometimes lead to conflict in the workplace.

Through a number of real-world examples from many industries, *Toxic* not only analyses root causes and outcomes of conflicts, but it also provides us with guidance to minimise them and keep difficult conversations civil and constructive.

Although the book does not refer to contemporary topics, such as emotional intelligence or remote working, the reader can

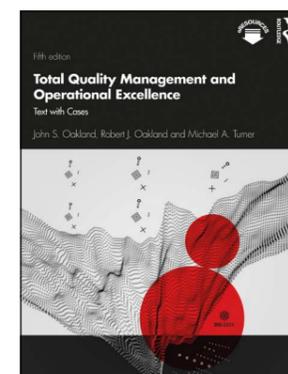
learn how to identify situations and react to conflict accordingly.

The book provides both reactive approaches to deal with conflict once it has occurred and proactive ones to avoid conflict or ready oneself for constructive conflict in their organisation.

In addition, the author analyses the topics of psychological safety, conflict management, culture and even diversity/inclusion, among others from multiple lenses. This includes organisational dynamics, cognitive science, psychology and physiology with intellectual gravity that is practical enough to be used by line managers and employees.

Toxic is an easy read, and can make the lives of quality professionals easier as they navigate through their quest to drive quality improvement and excellence.

Jayet Moon, CQP MCQI, is Quality Engineering Lead at Terumo Medical Corporation, US



Total Quality Management and Operational Excellence: Text with Cases (Fifth Edition)
By John S. Oakland, Robert J. Oakland and Michael A. Turner, Routledge (2020), £46.99

John Oakland's total quality management (TQM) concept is more important than ever. In this new edition, the authors once again show how to improve the models to remain relevant. To me, TQM has become a management lifestyle and I have got practical experience that turning quality policy into culture really works.

This book is not only for quality professionals, but also for all leaders and employees striving for operational excellence. The quality profession has significantly changed over the years and the addition of the CQI Competency Framework strengthens TQM and the employee dimension.

Despite the large number of TQM models, the authors capture both the need to approach big and real-time application data and how to manage the ever-increasing speed and complexity of business. Today, it is essential to understand how to use data

correctly to safeguard quality during digital transformations, and it is vital not to forget quality and safety during software development and testing. Another important aspect the authors address is the nature of modern communications methods and how the risk of reputational damage has never been more linked to quality performance.

Another area that risks operational excellence is partnering in procurement and supply chain management, and this is well covered here. The references to the collaborative business relationships management systems are more relevant than ever.

Going forward I believe that by applying our knowledge in quality management to address the mutual sustainability challenges could become a game changer and the natural next step to refine the TQM model. This would potentially open up deeper discussions on new circular business models to leverage the operational excellence aspects.

Tobias Bunne, MSc, is Vice President Research & Development and former Head of Quality at Hiab, Sweden

IF YOU WOULD LIKE TO REVIEW A BOOK, EMAIL EDITORIAL@QUALITY.ORG TO FIND OUT WHAT'S INVOLVED. WE ALSO WELCOME SUGGESTIONS OF BOOKS YOU WOULD LIKE TO SEE REVIEWED IN *QUALITY WORLD*.

How to build a robust risk management framework

Covid-19 has revealed some harsh business realities, one of them being that response time and agility are crucial for survival. As the full implications of Covid-19 and Brexit loom large over our economy, how should risk management frameworks be treated by business professionals?



Getty.com/Martin Nancekivill

While traditional risk management often doesn't permit you to manage black swan events like Covid-19, risk measurement does permit management to respond to the cascade of risks that arise from a black swan event, like supply chain risks and responses to market uncertainties.

ISO 9001:2015 provides a framework which requires risk to be considered at every stage, and organisations looking for a framework for managing risk can refer to ISO 31000:2018. Addressing risk as per ISO 9001 requires four stages: identifying the risks and opportunities, planning your response, integrating the response into your quality management system (QMS) and evaluating the effectiveness of the affirmative action. Risk-based thinking has been given a far more prominent role in ISO 9001:2015 and is designed to create a strong foundation for growth and sustained success. Companies certified to ISO 9001:2015 focus on leadership engagement and address organisational opportunities and risks in a structured manner. They also have the following key ingredients.

A commitment to quality from leaders

Responsible, engaging leaders drive positive change. When an executive team delivers process improvement efforts to the wider organisation, it could mean the difference between success and failure for the business. Executives have a power to deliver resources and strategy with more immediate effect and help implement process improvement training. Their leadership must align business practices with risk initiatives (avoidance, retention, sharing, transferring, and loss prevention and reduction) and promote a positive process management culture

by being confident in the benefits change brings for the organisation, and by being consistent in its application across the business.

Understanding how risk management fits within your organisation

A strong foundation for risk management during the early stages of business development is key in helping the business forecast, prepare for and prevent future disturbances. The objective is to create a risk management process that fits into the infrastructure without being cumbersome, resource demanding or ineffective. There are companies who use templates with rigid rules or ready-made templates that do not fit the business and cannot effectively

“Risk management must evolve and develop analytic solutions that deliver more flexible, adaptable and better performing risk strategies”

operate organisation wide. As a result, their risk management system is more likely to fail or bring up inaccurate data, as well as a range of unintended consequences from faulty reports to potentially fraudulent activity. Here, the onus is on the top management to portray risk leadership and lay down the foundations of a risk management framework, which suits the organisational context and works effectively for all stakeholders.

Information sharing

There are a great many challenges and risks associated with data sharing, and this has led to a boom in the global market for governance, risk management and compliance (GRC)

software. Although such software isn't always the best option for businesses, audits and risk assessments can be done with a supportive organisational infrastructure and good, interdepartmental communication. As information and even raw data can be augmented across reports, maintaining good records and their sources is of key importance.

The inputs to risk management are based on historical and current information, as well as on future expectations. Risk management explicitly takes into account any limitations and uncertainties associated with such information and expectations. All assumptions must be explicit and continually challenged. If proven wrong, the risk process must be updated accordingly to preserve accuracy. Information should be timely, clear, and available to relevant stakeholders.

Business continuity and the 'black swan'

Risk management is a critical part of business continuity planning (BCP) and is the foundation of organisational resilience in face of planned and unplanned risks, and risk response planning is at the centre of BCP. A black swan event falls outside the realm of regular expectations and carries an extreme impact, one for which no conventional risk-management textbooks prepare us. Covid-19 is a rare, albeit classic, example of this and has ushered in a new future for disaster risk management.

It is important to align risk strategy to financial imperatives. Most importantly, risk management must evolve and develop analytic solutions that deliver more flexible, adaptable and better performing risk strategies, which work in synergy with business continuity planning.



DIGITAL SUSTAINABILITY: A CHANGE FOR THE BETTER

Bob Purchase, PCQI, explains why he believes quality professionals are ideally placed to assist in the roll-out of environmental and corporate social responsibility agendas within their organisations

“Both digitalisation and sustainability consist of individual elements – each with a specific purpose – which make up the fundamental components of an interconnected system”

Digital transformation (DX) and sustainability can be notoriously ambiguous. However, each discipline contains potential salves for the threats faced by our planet, our societies and global business. The multiple facets of DX, including the industrial Internet of Things (IoT), machine learning and digital twins, can be understood as concepts or tools to facilitate a system evolution; just as net zero, circularity and regenerative ecology are for sustainable development. When attempting to understand the complexity of these topics and how they relate to business functions, I would suggest that quality professionals are equipped to both demystify and desegregate these vital environmental, social and corporate agendas.

Success in leveraging these disciplines requires a thorough knowledge of the organisation, society or system in question. Both digitalisation and sustainability consist of individual elements – each with a specific purpose – which make up the fundamental components of an interconnected system. Unlike pockets of a traditional business hierarchy, these elements must reach across the entire system in order to evolve. Unfortunately, as the pressure builds for autonomous and resilient transformation of our occupations, cities and industries, so too does the creation of mysterious teams formed to future-proof our institutions and to ensure this is accomplished in an ethical and eco-friendly way. It is no coincidence then that these misunderstood philosophies often appear in the quality team’s in-tray.

It is a common for human beings to find change uncomfortable, which could explain why in organisations using a quarterly cycle for budgeting, change or innovation tends to be swift and, in

some cases, brutal.

However, the Japanese phrases ‘kai’ and ‘zen’, coined by Masaaki Imai and mentioned in his 1975 book *Kaizen: The Key to Japan’s Competitive Success*, promoted input across all levels to incrementally change culture and in turn reap the benefits of continuous improvement. ‘Kai’ and ‘zen’ roughly translate to ‘change’ and ‘for the better’. This Kaizen method and philosophy is a long-term strategy rooted in regular action. The similarities between this methodology and the crucial need to extend the growth horizon and stimulate individual positive sustainability impact is clear. Even energy poverty could be addressed by embracing all when realising renewable, circular resources. But what about DX? Surely Imai’s work could not support our progression from infinite to discrete signals. Just research the consultative approach to initiating a digital transformation and you may reveal four extremely familiar letters: PDCA.

If we could imagine digitalisation and sustainability as a combined discipline, fundamentally in the context of the business, there is a huge opportunity for process improvement. Quality professionals are ideally placed to leverage their experience and expertise to help eliminate both physical (ie, materials and environmental) and abstract (ie, time and potential) operational waste. While specialisms in edge computing, cybersecurity, corporate social responsibility (CSR) and environmental, social and corporate governance (ESG) disclosure may not be second nature to our membership, as the essential enablers of governance, assurance and improvement, we are certainly in a position to make change for the better.

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PROPERTY MAINTENANCE

Nigel Birkinshaw, Chief Operating Officer of Integral UK Ltd

Nigel Birkinshaw, Chief Operating Officer of Integral UK Ltd, a leading mechanical, electrical and fabric property maintenance business in the UK, discusses what quality management means to him and the company

What does quality mean to you and your business?

Quality is at the heart of the core management principles around which we do our business. As a Chief Operating Officer, quality and quality systems give me the confidence that we have controls and processes to manage our business. Without a quality system in place, managing the business would be difficult, with inconsistent processes and no transparency, thereby increasing the risks that our business faces.

How do you encourage your staff and customers to focus on quality improvement?

I don’t think about ‘quality improvement’. If quality is part of your normal thinking and core to the way of working, as it should be, it becomes a business improvement conversation. The fear is, if we just talk about quality in the context of systems, people can stop seeing the relevance to them and switch off. Quality is at the heart of everything we do as a business, so the focus is and should be about how we improve the business. That in turn will drive

the improvement of quality alongside everything else.

How have quality improvement and quality processes benefited your organisation?

It brings structure, consistency, ownership and a vision to the business with a framework within which new ways of working can be established, allowing us to create narratives for how we want the business to operate and grow. Moreover, through sharing our vision with our clients, employees and supply chain, it helps to align us all around the quality journey that we are on, informing culture and desired behaviours.

What advice would you give to quality professionals who want to be heard by senior management?

The same advice I would give to anyone – make it relevant. If I go back to my procurement background 20 to 30 years ago, the discussions in the profession were all about making procurement heard within your organisation. The only way that this was achieved was by making procurement relevant to the business, and the same applies to quality. Show your leaders and managers the benefit of having quality in the organisation by demonstrating its relevance to the issues that the business faces and how quality can add value to the business agenda, your brand, and ultimately, the bottom line. Recognise that your team-leaders time is in demand, so be quick, be bold, and be relevant. This applies whether that is direct or indirect, but always bring demonstrable value to the table.

What challenges relating to quality assurance might you see businesses and organisations facing in the future?

We are in a rapidly changing environment and events in the past 12-18 months have proven how volatile the world can be. The key to success will be keeping quality relevant to the issues that businesses are facing. The professionals who achieve this will be flexible and quick to respond, yet stick to the core principles both personally and professionally to develop and support the wider business objectives that will make themselves and quality relevant.





Nicole Thompson, PCQI
Quality Engineer at Costain Group Plc, UK

Why did you choose to work in quality?

In my previous role as document controller and administrator for a construction company, I found that I was self-motivated and keen to make a difference by driving a right first time culture. This led to the start of my career in quality. I started at Costain as a Project Co-ordinator for the quality team and progressed to Quality Practitioner and now to Quality Engineer. I have always been process-driven; I enjoy making improvements to achieve the highest standard, as well as guiding and supporting others to do the same.

What are your main responsibilities at Costain, and how do you get results?

One of my primary duties is the overall quality management of my designated supplier, ensuring that the regulatory, client and company requirements are met. To get results, I always ensure that my designated supplier produces documentation, which is both compliant with the client's specification and supports the project's key performance indicators.

We have continuous deadlines to meet, so I work with them in the shape of root cause analysis meetings and preventative action recommendations.

What is the biggest achievement in your quality career so far?

Becoming a finalist in the Emerging

Talent category at the CQI's 2020 International Quality Awards. To satisfy the entry criteria, I had to show how I contributed to my organisation in the areas of the CQI Competency Framework in the first eight years of my career.

This achievement and the judges' feedback made me realise how many positive changes and improvements I have made within the two years that I have worked in the quality team.

What has been one of the hardest challenges in your career and how did you overcome it?

On a highly complex and major project, the main challenge is to make sure we maintain the programme of construction and commissioning, stay within the budget and maintain the highest levels of compliance.

Within my role, I coach and support suppliers throughout the project lifecycle. This can be extremely challenging, and this was my first position within the Costain team.

In some instances, I would be spending up to 60 or 70 per cent of my time aligning supply chain procedures and processes with the requirements of a nuclear licensed site.

I found this to be my biggest challenge, especially when I was coaching and providing support to those who had been in the industry far longer than I had.

However, I managed to overcome

that challenge by building strong relationships with peers and key stakeholders. The benefit of this approach is that we collectively arrive at the true root cause of an issue, which allows us to prevent recurrences and, in turn, drive the right first time culture.

Looking back, what would you do differently?

In hindsight, I wouldn't change anything. I believe you can learn a great deal from past experiences to make improvements next time.

You can share those experiences and lessons with other colleagues to make further improvements and implement positive changes in your organisation.

What's next? What do you want to have achieved in five years' time?

I would like to have achieved Chartered status at the CQI, secured a lead quality engineering role and acquired more experience in different sectors at Costain, such as energy, transportation and other defence projects.

What's your main piece of advice for others in their careers?

Always work hard and take every opportunity that you are given. Be open to learning and feedback, and always try to venture out of your comfort zone.

FIND OUT HOW THE CQI CAN HELP YOU TO STAY AT THE FOREFRONT OF THE PROFESSION AT:
[QUALITY.ORG/YOUR-PROFESSIONAL-DEVELOPMENT](https://quality.org/your-professional-development)

INSPIRE

SCHOOL STUDENTS AND HELP THEM TO LEARN ABOUT QUALITY

Become a STEM ambassador

The CQI has partnered with STEM Learning, the UK's largest provider of education and careers support in science, technology, engineering and mathematics (STEM), to bring quality to the classroom.

We're now looking for members to volunteer as STEM ambassadors and quality advocates.

This involves going into schools and sharing your passion for the profession. Most importantly, you'll help students to understand what quality is, why it matters, and the career opportunities it brings.



What are the benefits?



Develop your soft skills
Enhance your presentation, communication and leadership skills.



Support new talent
Help to build the next generation of quality and auditing professionals.



Get career satisfaction
You're guaranteed to feel rewarded by inspiring others and being inspired.



Give back to education
Schools benefit enormously from free access to your experience and enthusiasm.



Find out more about becoming a STEM ambassador:
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Collaborate with Quality Connect

Make the most of our new dedicated networking space — share ideas, experiences and make connections with other professionals around the world. Discover Quality Connect through 'My Networks' in your Members' Area.



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